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Bedri Kamil Onur Tas

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Cooperation Council (GCC) Countries**

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EDITORIAL NOTE

Five papers make up this issue. The first one, titled **Money-Price Relationship in Gulf Cooperation Council (GCC) Countries** by Bedri Kamil Onur Tas investigates the money-price relationship in GCC countries and contributes to the literature by empirically examining the contemporaneous short-run relationship as indicated by economic theory. The empirical results indicate that the short-run relationship is identical in all countries but the long-run relationship is significantly different. These results have many policy implications for the monetary union of GCC countries. The central bank of the union should take into account the differences in the dynamic long-run relationship and the monetary dynamics are suitable for the union since the contemporaneous relationship is identical in all countries.

The second paper, titled **Does Trade Openness Reduce Inflation? Empirical Evidence from Pakistan** by Tahir Mukhtar inspects the Romer's hypothesis in Pakistan. For this purpose multivariate cointegration and Vector Error Correction Model (VECM) techniques have been applied. The study covers the time period from 1960 to 2007. The empirical findings under cointegration test have shown that there is a significant negative long run relationship between inflation and trade openness, which confirms the existence of Romer's Hypothesis in Pakistan.

The third paper, titled **Training and Innovation among Knowledge-Based Companies in Malaysia** by Izyani Zulkifli (1) examines the innovative efforts undertaken by knowledge-based companies in Malaysia and (2) investigates whether or not training has any impact on those innovative efforts using data from an online survey. It was found that innovation was evident among the vast majority of the knowledge-based companies, namely, in the "development of a major new product", an "upgrade of an existing product", "patents or copyrights for a product" and the "introduction of a new technology that improved production process". A simple crosstab analysis suggests that when a training policy is in place, it not only positively influences innovation

but innovation seems to be more important to the growth of the companies. Additionally, the regression result shows that training has a significant and positive impact on the company's propensity to innovate.

The fourth paper, titled **Malaysia-OIC Trade: Static and Dynamic Gravity Model Approaches** by Mohd Adib Ismail and Murni Yunus Mawar examines the impact of the Organization of Islamic Conference (OIC) membership on Malaysian exports. Using the static and dynamic gravity model approaches to analyse the relationship using annual data from 1980 to 2010. The empirical results reveal that the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance and border are the main determinants of Malaysian exports. The evidence also suggests that there is also considerable room for improvement trade between Malaysia and OIC membership countries.

The last and final paper, titled **Macro and Socioeconomic Determinants of Turkish Private Savings** by Kivilcim Metin Ozcan, Asli Gunay and Seda Ertac investigates the effects on private saving rates of a number of macroeconomic and socio economic variables, by estimating an empirical private savings model for Turkey over the period 1975-2008. The following variables are found to increase savings: inflation, income level, terms of trade, real interest rates, credits, young dependency ratio, urbanization rate, economic crisis and political instability and the following variables are found to decrease it: financial depth, income growth, current account deficit, old dependency ratio and life expectations. Last but not least, we find that the private savings have strong inertia, and government savings tends to partially crowd out them. On the other hand, we also find that the female labor participation rate, the rate of self-employed employment and the rate of employment having university education decrease savings in Turkey after 1988.

Money-Price Relationship in Gulf Cooperation Council (GCC) Countries

Bedri Kamil Onur Tas

Starting from 2013, the monetary policy of the GCC countries will be governed by a single central bank. Examination of optimal monetary policy in these countries requires the analysis of the differences in monetary dynamics among these countries. This paper investigates the money-price relationship in GCC countries. The paper contributes to the literature by empirically examining the contemporaneous short-run relationship as indicated by economic theory. We propose and implement an alternative test of endogeneity to analyze the contemporaneous short-run relation. We also conduct Granger causality tests of dynamic long-run relationship between money and price level to be able to make comparisons between previous studies in the literature. The empirical results indicate that the short-run relationship is identical in all countries but the long-run relationship is significantly different. These results have many policy implication for the monetary union of GCC countries. The central bank of the union should take into account the differences in the dynamic long-run relationship and the monetary dynamics are suitable for the union since the contemporaneous relationship is identical in all countries.

1 Introduction

The Gulf Cooperation council (GCC) economies, namely, Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE) are heading towards monetary unification and single monetary policy. The target date is 2013. The relationship between money supply and aggregate prices in an integral part of transmission of monetary policy. Achieving price stability is one of the main objectives of central banks and central banks can impact the price level through the money-price relationship. Thus, successful implementation of monetary policy requires a good understanding of the relation between monetary

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aggregates and price level. In this study, we investigate this relation by analyzing the contemporaneous relationship between money and price level in the GCC countries using a new methodology. This methodology has not been implemented in the analysis of money-price relationship before. Previous studies of money-price relationship analyze the dynamic long-run relationship using time-series methods which is an approximation for the theoretical arguments. Our results have important policy implications for the upcoming monetary union of GCC countries since the country specific features will be incremental in effective monetary policy implementation.

There are counter views about money-price relationship. The widely accepted Quantity Theory of Money (QTM) argues that inflation is caused by exogenous changes in money supply. This view is called the “monetarist” view. On the other side of the debate, the “structuralist” view argues that inflation is developed by pressures from economic growth in economics with institutional rigidities. In response, monetary and fiscal authorities choose to expand the money supply. Thus, this view indicates that money supply expansion is a consequence of structural inflation.

The "monetarist view" argues that the money supply is the chief determinant of the demand side of short-run economic activity. Led by Milton Friedman the monetarist approach states that an increase in money supply causes an increase in the price level and output. In other words, monetary policy can affect the real economy. Friedman argues that the government should seek to promote economic stability, but only by controlling the rate of growth of the money supply.

Alternatively, Post Keynesians have developed the view that pressures emerging endogenously within financial markets are the basic determinant both of fluctuations in money supply growth and of credit availability. The orthodox monetary approach presents a direct contradiction to the endogenous money hypothesis. Moore (1988) explains it as the following:

In the orthodox monetary approach, the central bank plays a central role on controlling the growth money supply. It assumes that the central bank can increase or reduce the quantity of the monetary base, which consists of its liabilities, at its discretion. Monetarists believed that the

central bank could exogenously control the base to achieve the targeted money supply levels.

Many central bank (CB) practitioners indicated that their practical experiences are in contrast with the orthodox approach of the monetarists. King (1994) indicates that “In the United Kingdom, money is endogenous ... broad money is created by the banking system.” Also, Goodhart (1994) mentions that “All most all those who have worked in a CB believe that (the monetarist) view is totally mistaken.” Thus, the Post Keynesian approach of money supply endogeneity has many anecdotal evidence.

The question of whether inflation is a monetary phenomenon has been extensively analyzed theoretically and empirically. Several studies in the literature investigate money-price relationship empirically: Belrs and Jones (1993) for Algeria; Pradhan and Subramanian (1998) for India; Sun and Ma (2004) for China and Pinga and Nelson (2001) for 26 countries. Vymyatnina (2006) conducts the analysis from a post-Keynesian perspective for Russia. To the best of our knowledge, there are no studies that investigates money-price relationship for the GCC countries.

Many studies in the literature analyze the issue of monetary union between GCC countries. Most of these studies examine the suitability of monetary union by comparing the costs and benefits for each country. Mostly inflation, real GDP growth, fiscal imbalances, current accounts, debt structure, trade volume etc. (Sturm and Siegfried, 2005; Pattanaik, 2007; Dar and Presley, 2001; Jadresic, 2002; Iqbal and Fasano, 2003; Fasano and Schaechter, 2003; Fasano and Iqbal, 2002, 2003; Hebous, 2006; Laabas and Limam, 2002; and Ibrahim, 2004). Besides these descriptive studies, several studies focus on the differences in the responses of the GCC countries to similar macroeconomic shocks. Abu-Bader and Abu-Qarn (2006) use bivariate SVARs of total output and prices to extract AD and AS shocks for the GCC countries. They conclude that transitory demand shocks are symmetric and permanent supply shocks are asymmetric among GCC countries. Louis et al. (2008) implement a structural VAR model and show that demand and supply shocks are symmetrical between GCC countries and suggest that a monetary union is feasible. Mehanna and Hassan examine GCC countries over three time periods and conclude that GCC countries are

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still out of phase and not harmonized in terms of trade, monetary policy and economic development. Despite its importance for optimal monetary policy, money-price relation in GCC countries is not investigated in the literature.

Several studies investigate optimal policy for the upcoming monetary union of the GCC countries. Considering increased economic integration among GCC countries, Khan (2009) examines the costs and benefits of alternative exchange rate regimes for the GCC. He concludes that the dollar peg is the best option following the establishment of a GCC monetary union when current structural characteristics of the GCC countries are taken into account. Kandil and Trabelsi (2010) investigate the feasibility of the GCC monetary union by analyzing the co-movements of shocks across countries. They find that most GCC countries are not integrated enough and suggest structural policy changes to increase economic integration. Rosmy, Bali and Osman (2008) test the suitability of monetary union in GCC countries using the symmetry of shocks based on a bivariate SVAR. The authors conclude that the monetary union is feasible and the US dollar, rather than the Euro, is more appropriate as an anchor for the new currency. US dollar is preferred because AD shocks are symmetrical with the US while there is no symmetry with major countries of the EURO area.

We analyze the contemporaneous short-run relationship between monetary aggregates and price level by conducting endogeneity tests using different measures of money supply: M1, M2 and reserve money. We implement the C-statistic endogeneity test as suggested by Baum et. al. (2007) to examine the contemporaneous short-run relationship between the two variables. This methodology has not been implemented before for the analysis of money-price relationship. To be able to make comparisons between previous studies in the literature, we also examine the dynamic long-run relationship using Granger causality tests as in Pinga and Nelson (2001).

Table I summarizes the empirical results. First, we conclude that in all analyzed countries monetary aggregates are endogenous. This result indicates that there is a bidirectional contemporaneous short-run relationship between money and price in GCC countries. Second, the dynamic long-run relationship between money and price level differs significantly among GCC countries. As a result, the findings of this

study indicates that after monetary unification the newly established central bank of GCC should take into account this diversity among countries while conducting monetary policy. But the contemporaneous short-run relationship does not pose a challenge for monetary unification.

Table I. Summary of causality evidence in individual countries

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
	Contemporaneous short-run Relationship					
	Endogenous	Endogenous	Endogenous	Endogenous	Endogenous	-
	Dynamic long-run Relationship					
LMB	Monetarist	Monetarist	Bidirectional	Monetarist	No causality	-
LM1	Bidirectional	Structuralist	Structuralist	No causality	Mixed results ^a	-
LM2	Structuralist	Monetarist	Monetarist	Structuralist	Structuralist	-

Notes: ^a Structuralist for 12-24 lags and monetarist for 25-36 lags. LMB, LM1 and LM2 are log values of monetary base, M1 and M2 respectively.

The rest of the paper is organized as the following. Section 2 presents theoretical and empirical studies about money-price relationship. Section 3 describes the economic characteristics of the GCC countries. Section 4 outlines the dataset. Section 5 explains the econometric methodology implemented in this paper. Sections 6 illustrates the empirical results of the contemporaneous short-run and dynamic long-run results respectively. Section 7 concludes.

2 Money and Price Relationship in the literature: theory and empirical evidence

Since Friedman (1963) stated that "inflation is always and everywhere a monetary phenomenon" both theoretical and empirical studies extensively analyzed the relationship between money and prices. Empirical studies like Lucas (1980), Dwyer and Hafer (1988) and McCandless and Weber (1995) examine different group of countries and conclude that there is a strong positive correlation between money growth and inflation. In a recent study, Basco et al. (2009) investigate the Argentinean high inflation experience and find that strong positive

money-price relationship exists during high inflation periods and this relationship weakens under low inflation. US economy is investigated by Browne and Cronin (2010). They use a cointegrating VAR framework and show that both commodity and consumer prices are proportional to the money supply in the long run.

McCallum (2001) and Meyer (2001) construct a theoretical framework based on the standard New Keynesian setup to examine the long-run relationship between money and inflation. Both studies conclude that inflation is "pinned down" by the nominal money-growth indicating the strong positive relationship. Nelson (2003) compares several theoretical and empirical arguments about money-price relationship in the literature. He concludes that "The proposition that inflation is always and everywhere a monetary phenomenon remains valid in present-day models, and can be applied both to the analysis of inflation dynamics and of the determination of steady-state inflation." To sum up, several theoretical and empirical studies in the literature support the strong positive relationship between monetary aggregates and price level.

3 Characteristics of the GCC countries

In this section we provide a brief description of the GCC countries and describe our motivation to investigate the endogeneity of money in these countries. As stated in Hebous (2006), the GCC aims at supporting the economic integration among its six members since its establishment in 1981. The GCC formed a customs union in 2003 and the GCC members agreed on launching a common currency by 2010 at the Muscat summit in December 2001.

Even though joining a monetary union has many benefits like promoting trade, reducing country risk and lowering transaction costs, there are major shortcomings for the member country. One of the major costs is that a member country loses its ability to conduct a national monetary policy that best fits its economic conditions. Hebous (2006) argues that although the GCC states have similar economic structures, share a common language and cultural similarities, there are significant challenges of the monetary union. To name a few, the choice of the future exchange rate regime and the convergence criteria might cause serious problems for the union.

In 2004, the GCC countries had agreed on the convergence criteria which sets limits on the size of budget deficit, inflation rate, interest rates, foreign reserves and ratio of public debt to GDP similar to the Eurozone criteria. As presented in Table II the GCC countries have significantly different macroeconomic conditions. Thus, the capacity of the countries to meet the criteria differ significantly. Especially, smaller countries face more difficulties to meet the criteria. At the end of 2009, all GCC countries were almost within the convergence system although the UAE and Oman have pulled out of the project for different reasons,

Table II displays the main economic indicators of the GCC states. The graphs that present the time-series behavior of key economic indicators are displayed in the Appendix. The GDP for the GCC members as a whole is about 1023 billion US dollars in 2009. Additionally, when the GCC union is established, it will be the largest monetary union after the Euro Area. The total GDP of GCC increased from 3.4 % of EU GDP to 8 % in 2008. GDP varies significantly among these countries. For example, Saudi Arabia is the biggest economy with a GDP of 469.43 billion which constitutes 43.74 percent of the GCC GDP. The second largest economy is UAE with a 24.43 percent share in the total GDP for all members, while the smallest economy is Bahrain (1.98) percent. The GDP growth rates are relatively high in the GCC region, for example 10 and 9.4 percent in Kuwait and Qatar respectively. Saudi Arabia is the largest country with 67.3 % of all 37 million GCC population. All GCC countries are oil-dependent economies. The share of oil production in GDP is highest in Qatar (60.8 percent) and lowest in Bahrain (28.5 percent).

The rate of inflation significantly varies among the member states and the average inflation rate of the GCC region as a whole is relatively low (5.76 percent). The percentage of government expenditure in GDP is similar in most of the states except for Saudi Arabia where 23.29 percent of GDP is government expenditures. Key macroeconomic variables and monetary policy in the GCC are described in detail in the Appendix.

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Table II. Main Economic Indicators in the GCC in 2006

[illegible]

To sum up, the GCC countries have many economic similarities and differences. All GCC states are open and highly oil-dependent economies which implement a fixed exchange rate regime pegged to the US dollar. The member states are integrated at many levels with the establishment of a customs union in 2003 and the agreement to introduce a single currency by 2010. For a successful implementation of the monetary union the dynamics behind the monetary systems of each countries should be understood. Specifically, money-price relationship should be investigated thoroughly in the GCC countries since monetary policy implications highly depend on the supply mechanisms of money.

4 Data

The data are from the International Financial Statistics (IFS). The frequency of the data is monthly. Compared to the previous studies in the literature that use quarterly data, we use higher frequency which should produce more accurate results. We are constrained by the availability of monetary aggregates and CPI data for all countries. The period of study for each country are listed in the Appendix table A.1.

Variables are:

- Consumer price index (CPI)
- Monetary base (MB) : Reserve money in the IFS
- Narrow and broad money aggregates (M1 and M2):

M1 is money in the IFS and M2 is money plus quasi money.

Log levels of the variables are used for the analysis.

5 Econometric methodology

Previous empirical studies on the money-price relationship implement different causality techniques (Granger causality tests, cointegration and error correction models etc.). All of these methods test the causality between price level and different monetary aggregates from a time series perspective. In other words, the relationship between lagged values of price level and money is analyzed using these methods. Although the quantity theory of money indicates a contemporaneous short-run relationship and theoretical studies of endogeneity of money do not restrict the relationship to only lagged values of the price level, the contemporaneous short-run relationship is neglected in the literature. This is mainly caused by the fact that there are many different methods

of time-series econometrics to test causality between lagged values of variables. But these methods have several significant limitations. First of all, the results highly depend on lag selection. Second, in some cases (like cointegration tests), they only measure whether two variables move together over time. Thus, they do not directly test causality but they are only approximate tests of relationships. Third, the causality tests do not present the sign of the correlation between two variables. In other words, whether the relationship is negative or positive cannot be identified by the causality tests. Finally and most importantly, they do not investigate contemporaneous short-run relationship between variables and limited to causality between a variable and lagged values of other variables. In this paper, we propose and implement a direct test of contemporaneous short-run relationship between money and price level (endogeneity test).

5.1 Endogeneity test of contemporaneous short-run relationship

In the econometric theory literature endogeneity is explained as the case when the independent variable is correlated with the error term in a regression model. From an econometric theory perspective, the existing causality studies do not make a clear distinction between exogeneity and causality. Thus, the presence of causal relationship from price level to money supply is neither necessary nor a sufficient condition for testing the endogenous money hypothesis. As recommended by Baum et. al. (2007), we propose a test of overidentifying restrictions, C-statistic test, to the test endogeneity of money hypothesis. Details of the test are presented in the Appendix.

The proposed IV GMM methodology to investigate the contemporaneous short-run relationship between price level and money can be summarized as the following:

- Step I: Determine the valid instrumental variables
- Step II: Run the GMM regression with the instruments
- Step III: Check the validity of the instruments using Sargan-Hansen and underidentification tests
- Step III: Conduct the C-statistic endogeneity tests and determine whether money is endogenous
- Step IV: Determine whether the relationship is bidirectional by analyzing the coefficients of the IV GMM regression results and the endogeneity tests

5.2 Dynamic long-run (Time-series) relation

To investigate the dynamic long-run relationship, we implement the Granger causality tests to all GCC countries as in Pinga and Nelson (2001). As in Shanmugam et al. (2003), we first test for unit roots using the Phillips-Perron test (Phillips and Perron, 1998). This test is implemented because the test is designed to ensure that serial correlation does not affect the asymptotic distributions. Also, it is shown that the Phillips-Perron test has more power than the augmented Dickey-Fuller test. (Davidson and McKinnon, 1993). The optimal length of the unit root test is determined by the Newey-West methodology.

Granger (1969) developed the methodology to test causality between two related economic time series by applying distributed lag models. The Granger causality test identifies whether the current value of a variable can be explained by a regression containing the lagged values of itself and the related variable. In this paper, the Granger causality test of money-price relationship can be presented by the following regressions:

$$P_t = f(P_{t-1}, P_{t-2}, \dots, P_{t-l}, M_{t-1}, M_{t-2}, \dots, M_{t-l})$$

H_0 = coefficients of the lagged M's are jointly insignificant.

$$M_t = f(M_{t-1}, M_{t-2}, \dots, M_{t-l}, P_{t-1}, P_{t-2}, \dots, P_{t-l})$$

H_0 = coefficients of the lagged P's are jointly insignificant.

where P is the price level and M is the monetary aggregates. t and l denote time period and number of lag length respectively.

Using the F-test of joint significance a rejection of the null hypothesis concludes that there is a causality relationship. As presented in Batten and Thornton (1985) causality tests are sensitive to the choice of lag lengths thus we study lags of one to thirty six.

6 Empirical Results

6.1 Short-run (Contemporaneous) relationship

In this section, we implement the proposed IV methodology explained in section 3.1 to investigate endogeneity of money. Table III presents the IV regression results of eq.1 for each GCC country. Table IV shows the C-statistic of endogeneity of alternative monetary aggregates. First, we determine the appropriate instruments and test the validity of the instruments using the Hansen J statistic and underidentification tests. For all of the countries and for all alternative monetary aggregates, analysis of the Hansen J statistics indicate that we accept the null hypothesis that the instruments are valid instruments i.e., uncorrelated with the error term. We conclude that the excluded instruments are correctly excluded from the estimated equation. The underidentification tests of all regression specifications reject the null hypothesis that the regression equations are underidentified. Thus, we conclude that the IV regressions that we run for all countries are valid and we can proceed with the endogeneity tests.

Table IV. Endogeneity tests for all countries (Monetary Aggregates)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
LMB	79.25*** P-value = 0.00	214.47*** P-value = 0.00	21.69*** P-value = 0.00	27.94*** P-value = 0.00	148.02*** P-value = 0.00	-
LM1	79.67*** P-value = 0.00	151.1*** P-value = 0.00	22.86*** P-value = 0.00	71.62*** P-value = 0.00	162.91*** P-value = 0.00	-
LM2	82.49*** P-value = 0.00	60.61*** P-value = 0.00	23.47*** P-value = 0.00	79.82*** P-value = 0.00	147.56*** P-value = 0.00	-

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table IV conducts the endogeneity tests. The null hypothesis of the C-statistic endogeneity test is that the tested variable is exogenous. So, rejecting the null hypothesis indicates that the variable is endogenous. Table IV shows that for all of the countries the null hypothesis is rejected at one-percent significance level. As a result, we conclude that money is endogenous in all GCC countries. In table III, the coefficient of monetary aggregates, β_1 is significant. Thus, there is bidirectional relationship between price level and monetary aggregates in GCC countries.

6.2 Long-run (Time-Series) relationship

Granger tests of causality between money and prices are performed on time series data for GCC countries. The unit root tests presented in Table V show that the logarithm of variables are not stationary but the first differences of the logarithm of the variables are stationary. Thus, we conduct the Granger causality test using the first differences of the logarithms of the variables as in Pinga and Nelson (2001).

Table V. Unit Root Tests Phillips Perron

Variable	Bahrain		Kuwait		Oman		Qatar ^b		Saudi Arabia	
	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag	Test Statistic	Lag
LCPI	-8.82***	9	-1.13	0	8.4	3	-2.06 ^c	9	1.54	9
DLCPI	-21.49***	10	-21.24***	1	-6.89***	6	-18.59***	12	-17.05***	9
LMB	-0.83	4	-1.32	5	-2.44	15	-2.25	20	-2.23	9
DLMB	-27.62***	1	-27.44***	0	-36.71***	2	-9.08***	9	-28.04***	11
LM1	-0.3	14	-0.63	4	-3.28**	1	-1.19	7	-2.17	12
DLM1	-29.27***	4	-24.87***	5	-24.07***	7	-11.48***	7	-27.09***	13
LM2	-1.47	10	-1.32	12 ^a	-2.42	2	-1.4	7	-2.34	14
DLM2	-30.56***	1	-10.86	11	-21.71***	5	-12.27***	7	-28.14	15

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%. Newey West lags.

^a Augmented Dickey Fuller test results. Phillips Peron test has identical results. Augmented Dickey Fuller test is implemented because the Newey-West Bandwith is extremely wide (467 lags).

^b Quarterly data is used because of lack of monthly CPI data for Qatar.

^c GDP deflator is used to measure the price level.

Table VI displays the Granger causality results at alternative lag lengths. The first column of the table presents the hypothesis that is tested. For example, $DLCPI \rightarrow DLMB$ indicates that the null hypothesis of the test is log difference of CPI, DLCPI, does not Granger cause log difference of monetary base, DLMB. Thus, a rejection of the null hypothesis validates the existence of causality from DLCPI to DLMB.

The Granger Causality tests of Bahrain reject the null hypothesis and confirm the following relationships: $DLMB \rightarrow DLCPI$, $DLCPI \rightarrow DLM1$, $DLM1 \rightarrow DLCPI$, $DLCPI \rightarrow DLM1$. For Kuwait, $DLMB \rightarrow DLCPI$, $DLCPI \rightarrow DLM1$ and $DLM2 \rightarrow DLCPI$ relationships are found. Tests of Oman present the following causality relationships: $DLCPI \rightarrow DLMB$, $DLMB \rightarrow DLCPI$, $DLCPI \rightarrow DLM1$, $DLCPI \rightarrow DLM2$, $DLM2 \rightarrow DLCPI$. For Qatar, a weak causality is found for $DLMB \rightarrow DLCPI$ and $DLCPI \rightarrow DLM2$. Finally, for Saudi Arabia, Granger causality tests presents that $DLM1 \rightarrow DLCPI$, $DLCPI \rightarrow DLM1$ and $DLCPI \rightarrow DLM2$.

Table VI. Standard Granger causality tests as in Malaysia (2003) paper

Variable	Lag	Bahrain		Kuwait		Oman		Qatar ^a		Saudi Arabia	
		Test Statistic		Test Statistic		Test Statistic		Test Statistic		Test Statistic	
DLCPI → DLMB	1-12	15.2 (0.29)		12.51 (0.41)		14.02 (0.30)		14.19 (0.29)		14.32 (0.28)	
	13-24	14.48 (0.27)		6.02 (0.92)		10.74 (0.55)		6.38 (0.90)		9.56 (0.66)	
	25-36	10.48 (0.57)		5.15 (0.95)		29.13*** (0.00)		18.13 (0.11)		5.63 (0.93)	
DLMB → DLCPI	1-12	21.8** (0.04)		9.61 (0.65)		5.85 (0.92)		19.46* (0.08)		14.02 (0.30)	
	13-24	22.55** (0.03)		25.97*** (0.01)		26.82*** (0.01)		18.13 (0.11)		6.04 (0.91)	
	25-36	34.37*** (0.00)		13.9 (0.31)		27.71*** (0.01)		14.92 (0.25)		14.02 (0.30)	
DLCPI → DLM1	1-12	22.89** (0.03)		18.59* (0.10)		26.56*** (0.01)		10.58 (0.56)		10.67 (0.56)	
	13-24	15.51 (0.22)		11.74 (0.47)		12.25 (0.43)		7.87 (0.80)		26.5*** (0.01)	
	25-36	11.61 (0.48)		33.21*** (0.00)		12.03 (0.44)		12.31 (0.42)		11.5 (0.49)	
	1-12	19.82* (0.07)		4.94 (0.96)		17.75 (0.12)		13.23 (0.35)		14.56 (0.27)	

**Table VI. Standard Granger causality tests as in Malaysia (2003) paper
(continued)**

DLM1 → DLCPI	13-24	11.97 (0.45)	3.39 (0.99)	8.78 (0.72)	4.12 (0.98)	13.54 (0.33)
	25-36	12.18 (0.43)	3.65 (0.99)	19.96* (0.07)	10.71 (0.55)	25.14*** (0.01)
	1-12	36.38*** (0.00)	7.58 (0.82)	7.04 (0.86)	11.39 (0.50)	21.46** (0.04)
DLCPI → DLM2	13-24	34.49*** (0.00)	7.91 (.79)	10.82 (0.55)	20.14* (0.06)	23.41** (0.02)
	25-36	21.06** (0.05)	2.05 (0.99)	30.69*** (0.00)	17.65 (0.13)	18.46 (0.10)
	1-12	11.62 (0.48)	65.7*** (0.00)	25.31*** (0.01)	12.45 (0.41)	11.29 (0.50)
DLM2 → DLCPI	13-24	15.88 (0.2)	3.13 (0.99)	9.87 (0.63)	12.69 (0.59)	17.54 (0.13)
	25-36	8.53 (0.74)	0.94 (1)	21.54** (0.04)	17.02 (0.30)	17.11 (0.15)

Notes: P-values in parenthesis below coefficients.

* significant at 10%; ** significant at 5%; *** significant at 1%. ^aQuarterly data is used because of lack of monthly CPI data for Qatar. GDP deflator is used to measure the price level.

As a result, the Granger causality tests of GCC countries have two main results. First, the money-price relationship significantly differs among GCC countries. Second, the relationship might be different for different monetary aggregates. As a result, we conclude that the dynamic long-run relationship of money and price varies significantly among countries and a unified monetary policy should take into account this differences in the dynamic long-run relationship.

7 Conclusion

Understanding the relationship between money and price level is incremental for efficient implementation of monetary policy. The GCC countries are set to form a monetary union in 2013. Starting from 2013, GCC countries will have a single currency and will be governed by central monetary policy. Thus, it is essential to understand the differences in monetary dynamics in GCC countries. Especially, money-price relationship is significant since achieving price stability is one of the main objectives of central banks and central banks can impact the price level through the money-price relationship.

The relationship between the price level and monetary aggregates in GCC countries is not investigated before. In this study, we contribute to the literature by analyzing the contemporaneous short-run relationship using an econometric technique which is not been implemented for the analysis of money-price relationship. We also investigate the dynamic long-run relationship. We conclude that the contemporaneous short-run relation between money and price is identical in all GCC countries but the dynamic long-run relationship differs significantly among countries. These empirical results have significant policy implications. As a result, the empirical results of the paper indicate that the monetary dynamics of the GCC countries are suitable for monetary unification since all GCC countries have the same money-price relationship. But one can argue that after monetary unification the central bank should take into account the differences in the dynamic long-run relation between monetary aggregates and the price level.

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Appendix

A. Econometric Methodology

As shown in Hayashi (2000), a regressor is endogenous if it is not predetermined (i.e., not orthogonal to the error term), that is, if it does not satisfy the orthogonality condition. Following this argument, we test whether money is endogenous using the C statistic (also known as a GMM distance or difference-in-Sargan statistic). Under the null hypothesis that the specified endogenous regressors can actually be treated as exogenous, the test statistic is distributed as chi-squared with degrees of freedom equal to the number of regressors tested. The endogeneity test is, like the C statistic, defined as the difference of two Sargan-Hansen statistics: one for the equation with the smaller set of instruments, where the suspect regressor(s) are treated as endogenous, and one for the equation with the larger set of instruments, where the suspect regressors are treated as exogenous. Also like the C statistic, the estimated covariance matrix used guarantees a nonnegative test statistic. Under conditional homoskedasticity, this endogeneity test statistic is numerically equal to a Hausman test statistic; see Hayashi (2000, 233-234).

Specifically, the C statistic endogeneity test of money can be represented by the following steps:

1) Estimate the linear equation in which CPI is the dependent variable and monetary aggregates is the explanatory variable using Instrumental Variables (IV) regression methods. The linear equation is defined as,

$$LCPI_t = \beta_0 + \beta_1 LM2_t + \varepsilon_t \quad (1)$$

where $LCPI_t$ is log level of consumer price index and $LM2$ is log level of monetary aggregate, $M2$. This equation is estimated because by definition of endogeneity, the test is defined for the explanatory variables. If money (for example $LM2$) is endogenous then the coefficient of $LBCPI$, γ_1 , in the following regression is significant and there is a contemporaneous short-run two-way (feedback) relationship between the two variables.

$$LM2_t = \gamma_0 + \gamma_1 LCPI_t + \varsigma_t \quad (2)$$

The Generalized Method of Moments (GMM) methodology is implemented to carry out the IV estimation and endogeneity tests. GMM makes use of the orthogonality conditions to allow for efficient estimation in the presence of heteroskedasticity of unknown form as stated by Hansen (1982). In general GMM methodology can be described as an estimator of the following equation,

$$y_i = X_i\beta + u_i \quad (3)$$

where error term u_i is distributed with mean zero and the covariance matrix Ω . The set of instrumental variables is denoted by Z ; this is the full set of variables that are assumed to be exogenous; i.e., $E(Z_i u_i) = 0$.

As explained in Baum et al. (2007), the assumption that the valid instruments, Z , are exogenous indicate the following moment condition,

$$g_i(\hat{\beta}) = Z_i' \hat{u}_i = Z_i' (y_i - X_i \hat{\beta}) \quad (4)$$

The exogeneity of the instruments means that the moment conditions, or orthogonality conditions, will be satisfied at the true value of β :

$$E\{g_i(\beta)\} = 0 \quad (5)$$

Using the orthogonality conditions displayed in eq.5 the GMM objective function can be presented as,

$$J(\hat{\beta}) = n \bar{g}(\hat{\beta})' W n \bar{g}(\hat{\beta}) \quad (6)$$

The GMM estimator for β is the $\hat{\beta}$ that minimizes $J(\hat{\beta})$. Deriving and solving the first order conditions,

$$\frac{\partial J(\hat{\beta})}{\partial \hat{\beta}}$$

yields the following GMM estimator:

$$\hat{\beta}_{GMM} = (X' Z W Z' X)^{-1} X' Z W Z' y \quad (8)$$

Using eq.8, the coefficients of the IV regression are computed and the endogeneity test statistic of money (C statistic) is calculated.

To conduct IV methodology, valid instruments for $LM2_t$ should be determined. Usually lagged values of the dependent variables can be used as instruments. The validity of the instruments can be tested using the Sargan (1958) statistic.¹ To be able to conduct a robust IV regression, it is also essential to test that we are using all possible instruments in other words whether there are any redundant instruments. To be able to test that all of the instruments are needed (valid) we need to implement the underidentification test of Anderson (1951).²

The calculated statistics indicate that the instruments that we use do not cast considerable doubts. The Anderson (1951)'s underidentification statistic shows that the model is identified. In other words, the instruments are "relevant" in the sense that they are correlated with (assumed) endogenous regressors. The Sargan (1958)-Hansen (1982)'s J statistic for overidentifying restrictions does not reject the null hypothesis that our instruments are uncorrelated with the error term (and that excluded instruments are correctly excluded from the estimated equation).

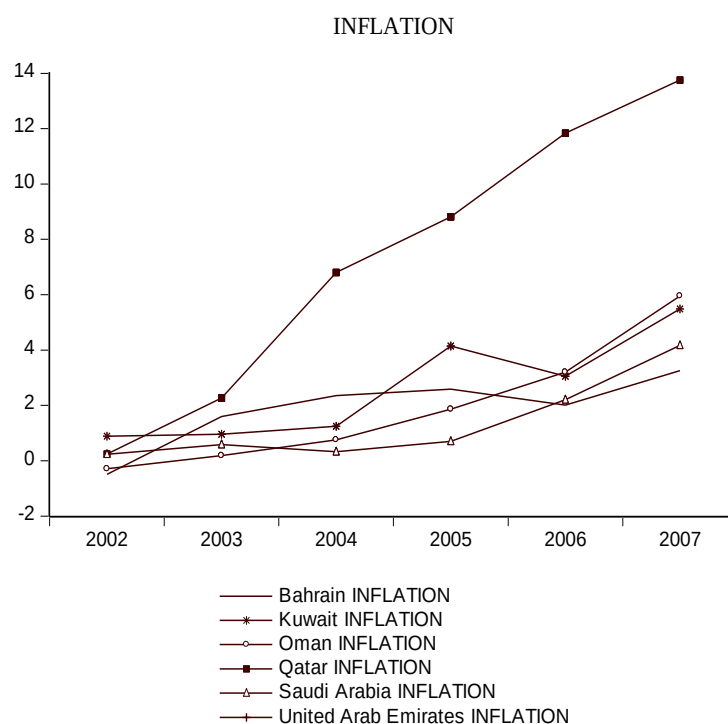
2) After the IV regression, the C statistic should be calculated using the GMM results. The null hypothesis of the test is that the specified endogenous regressors can actually be treated as exogenous. Thus, if we reject the null hypothesis than the test concludes that the regressor, money, is endogenous.

¹ The Sargan-Hansen test is a test of overidentifying restrictions. The joint null hypothesis is that the instruments are valid instruments, i.e., uncorrelated with the error term, and the excluded instruments are correctly excluded from the estimated equation. Thus, if the null hypothesis is accepted then the instruments are valid meaning that they satisfy the condition that they are uncorrelated with the error term and correlated with the endogenous variable.

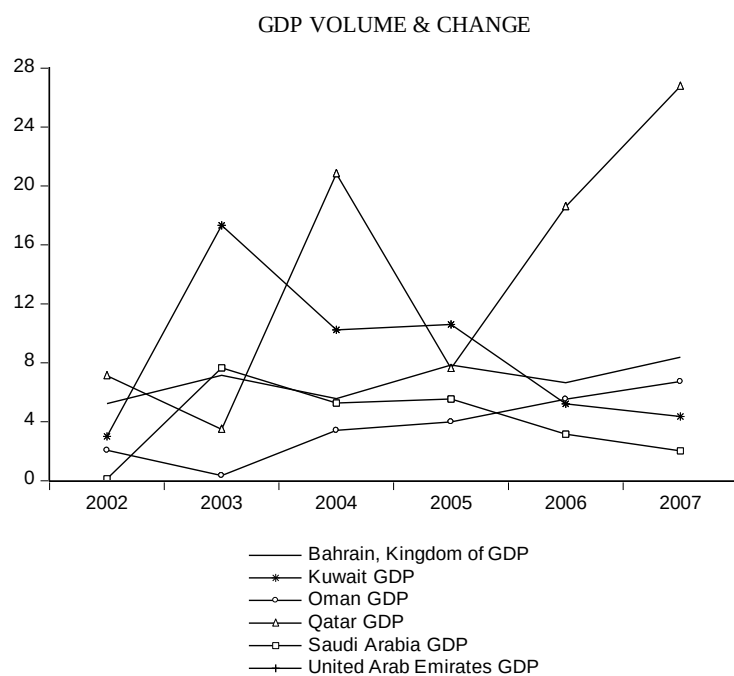
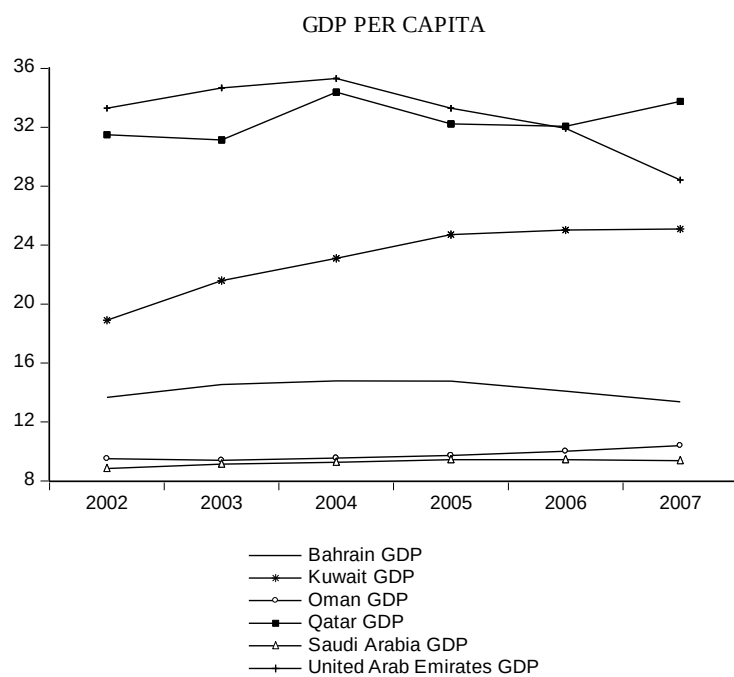
² The underidentification test is an LM test of whether the equation is identified, i.e., that the excluded instruments are relevant, meaning correlated with the endogenous regressors.

B. Time Series Behavior of Key Macroeconomic Variables

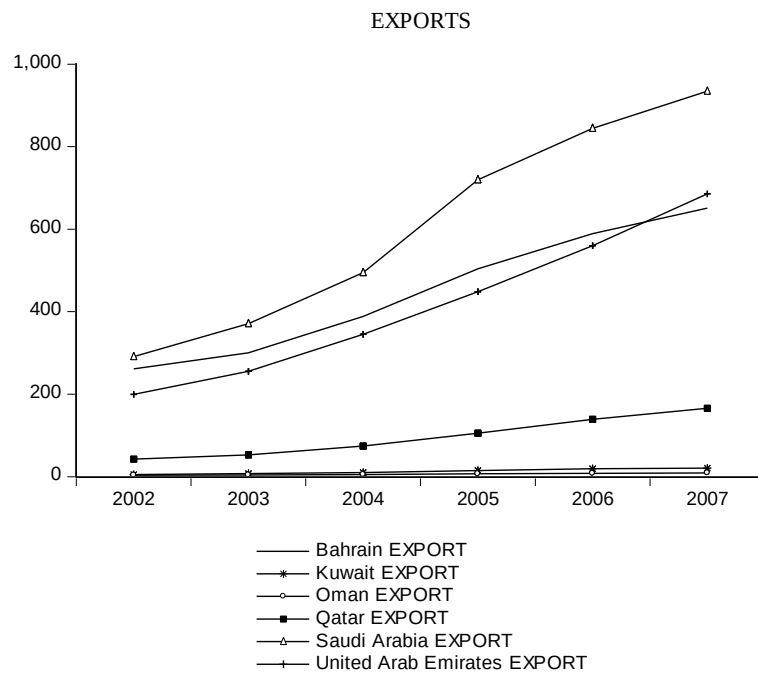
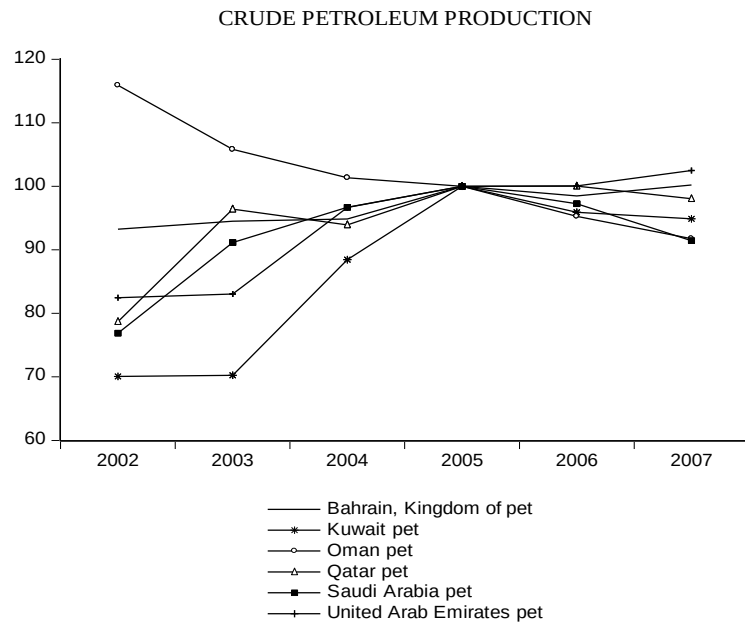
Time series behavior of key macroeconomic and monetary variables are presented in this section. First graph below displays inflation rates in the GCC. Qatar has the highest rate and the remaining GCC have lower inflation rates. Inflation rates of all GCC are increasing after 2006.

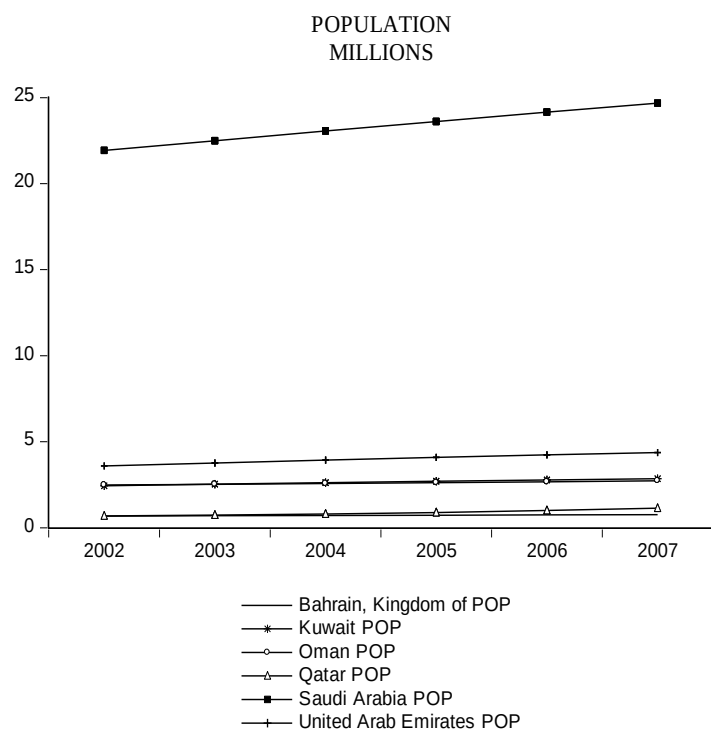
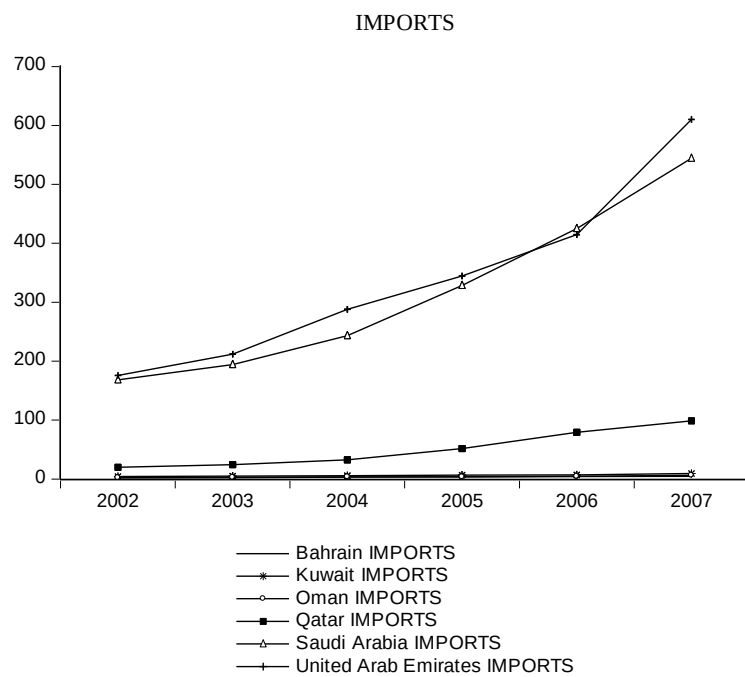


Qatar has the highest GDP per capita as shown in the figure below. Also, the GDP growth rate of Qatar is higher than the remaining GCC. The growth rate of GDP is similar in the other GCC.



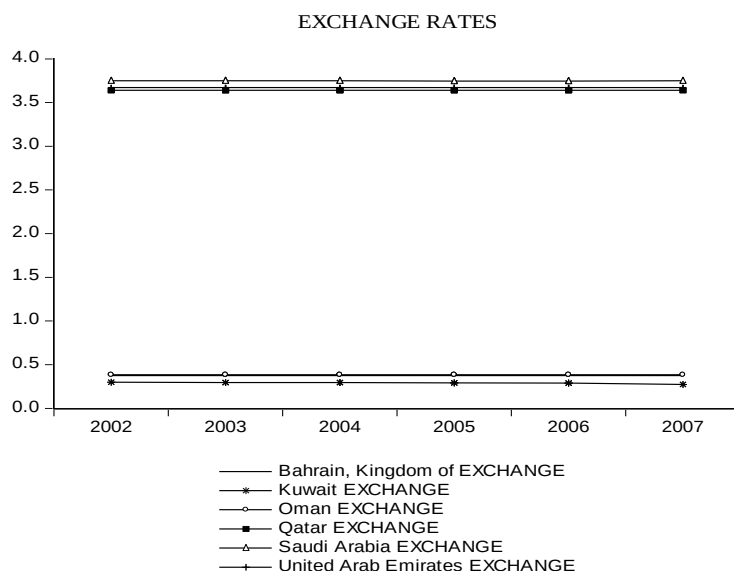
Petroleum production, exports and imports are differ significantly among GCC as presented in the figures below.



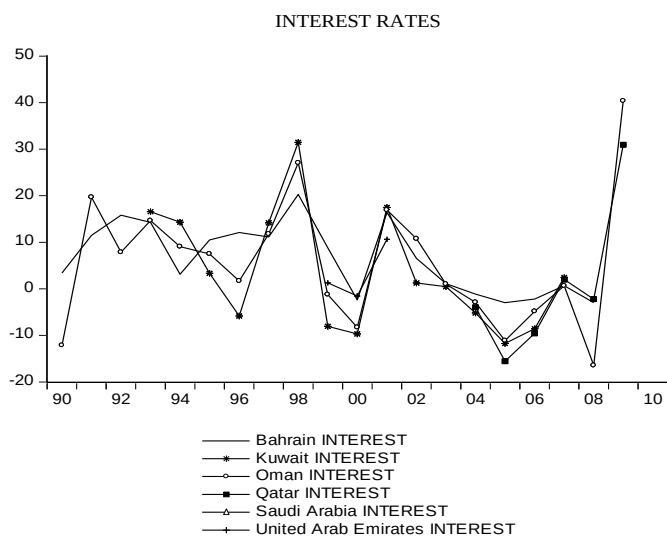


30 Money-Price Relationship in Gulf Cooperation Council (GCC) Countries

The remaining figures present the monetary side of the GCC by displaying the exchange rate and interest rate dynamics.



All GCC exchange rates are pegged. The Bahraini dinar and Qatar riyal have been pegged to the US dollar at the rate of 0.37 and 3.64 respectively. The Omani riyal is officially pegged to the US dollar and the Kuwaiti dinar is determined according to a weighted basket. The Saudi Riyal and UAE dirham are fixed at the rate of 3.75 and 3.65 per US dollar.



The central banks of GCC countries have very low transparency. As stated in Dincer and Eichengreen (2009), the transparency indices of the Central Bank of GCC countries out of 10 is as the following:

Table A.1 Transparency Indices

Country	Transparency Index
Bahrain	4
Kuwait	2
Oman	1.5
Qatar	3
Saudi Arabia	1
United Arab Emirates	2

Also, the GCC central banks have lower independence indices. For example Central Bank of Qatar has an index of 0.21. Keefer and Stasavage (2003) state that all GCC central banks have an independence score of 0 out of 2 which indicates that they are not independent.

Espinoza and Prasad (2012) investigate the monetary policy transmission in the GCC countries. They conclude that the policy interest rate is not very effective in the GCC countries. This caused by the fact that the financial markets are not developed. In addition to policy rates, the GCC monetary authorities use reserve requirement ratios and loan-to deposit ratios to affect the real economy. Also, the interbank interest rates of the GCC central banks are closely related with the Federal funds rate.

Table A.1 Period of Study for each Country

Country	Period of study ³
Bahrain	1974:M12 - 2005:M12
Kuwait	1973:M1 - 2008:M10
Oman	2001:M1 - 2008:M11
Qatar ⁴	1972:Q1 - 2008:Q4
Saudi Arabia	1980:M1 - 2008:M10
United Arab Emirates ⁵	

³ Available time-period at the IFS database.

⁴ Monthly monetary aggregates are not available for Qatar. Thus, we use quarterly data for the analysis of Qatar.

⁵ The Price index of UAE is only annual from 2000-2008. Thus there are not enough observations to conduct endogeneity tests.

Does Trade Openness Reduce Inflation? Empirical Evidence from Pakistan

Tahir Mukhtar*

One of the more celebrated propositions found in every international trade text is the case that trade liberalization is associated with declining prices, so that protectionism is inflationary. In line with this view Romer (1993) postulates a hypothesis that inflation is lower in small and open economies. The objective of this study is to examine the Romer's hypothesis in Pakistan. For this purpose multivariate cointegration and Vector Error Correction Model (VECM) techniques have been applied. The study covers the time period from 1960 to 2007. The empirical findings under cointegration test have shown that there is a significant negative long run relationship between inflation and trade openness, which confirms the existence of Romer's Hypothesis in Pakistan.

I. Introduction

One of the more celebrated propositions found in every international trade text is the case that trade liberalization is associated with declining prices, so that protectionism is inflationary. In today's world no developing country can afford to isolate itself from the world economy. The benefits of outward-looking policies that help in taking advantage of the possibilities of international trade and capital flows are extensively discussed in the literature. In the 1990s, economic liberalization, globalization and openness have become the buzzwords. There has been a distinct shift in favor of greater integration of the world economy. The trend has been towards greater opening up and there is evidently a move away from the typical closed economy structure in most of the developing economies.

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Sustained low inflation has been a stylized fact of the late 1990s and early 2000s, both in advanced and increasingly in emerging markets. Some have argued that these developments could reflect stiffer global competition and the increased weight of developing countries in the global trading system (Rogoff, 2003). The relationship between inflation and openness has been a subject of research, theoretical as well as empirical. However, the literature on the subject is relatively scant. According to 'New Growth Theory', openness is likely to affect inflation through its likely effect on output (Jin, 2000). This link could be operating through: a) increased efficiency which is likely to reduce cost through changes in composition of inputs procured domestically and internationally, b) better allocation of resources, c) increased capacity utilization, d) rise in foreign investment which can stimulate output growth and ease pressures on prices (Ashra 2002).

When we move on to a review of some of the existing empirical studies of the relationship between openness and inflation, we find inconclusive evidence suggesting that greater openness is associated with lower trend inflation. Romer (1993) finds closed economies tend to have higher inflation. He argues that central banks in economies more open to trade find currency fluctuations caused by money surprises more painful and therefore exercise more restraint than their closed economy counterparts. Several studies have tested Romer's argument in different ways and have supported the conventional view of the negative relationship between trade openness and inflation. Thus empirical findings of Lane (1997), Ashra (2002), Sachsida *et al.* (2003), Yanikkaya (2003), Gruben and Mcleod (2004), Kim and Beladi (2004), Daniels *et al.* (2005), Razin and Loungani (2005), Aron and Muellbauer (2007), Badinger (2007), Bowdler and Nunziata (2007) have validated Romer's argument. However, Terra (1998) marginally supports Romer's argument by claiming that the negative correlation is only evident in severely indebted countries during 1980s crisis period. Similarly, Batra (2001) argues that tariff does not necessarily cause inflation at least in the United States. The findings of Gruben and Mcleod (2004) show that there does not exist any significant openness-inflation relationship among OECD economies. Kim and Beladi (2004) have estimated a positive relationship between price level and trade openness for some advanced economies, such as the U.S., Belgium and Ireland while for other countries, both developed and developing included in the study, their finding is in line with Romer's argument. Finally it is interesting to

note that Romer (1993) himself finds no significant openness–inflation relationship among OECD economies.

Most studies of the role of openness have focused upon the estimation of cross-country averages of many different levels of economies. However, these studies cannot identify country-specific differences. Little has been done for dynamics of the impact of openness on inflation at a country level. The literature on trade openness-inflation association is scarce in Pakistan. Ashra (2002), Kim and Beladi (2004) and Gruben and Mcleod (2004) have reported evidence of negative relationship between trade openness and inflation for Pakistan under panel data framework. However, we have come across only one study on Pakistan that has used time series data. Hanif and Batool (2006) have tested Romer's hypothesis for Pakistan economy using annual time series data for the period 1973-2005. They find that besides the conventional explanatory variables like real GDP growth, monetary growth, interest rate, and wheat support price, the openness variable such as growth in 'overall trade to GDP ratio' also has significant negative impact on the domestic price growth in Pakistan. However, this study suffers from a serious limitation as it has used a small number of observations (i.e.32 in all) for carrying out their analysis using Heteroscedasticity and Autocorrelation Consistent (HAC) Standards Errors estimation technique. This technique is only valid in large samples and may not be appropriate in small samples (Gujarati, 2003). Thus, in the presence of relatively small data, the study is unable to provide some conclusive results. Therefore, there is a need to reexamine the issue using relatively larger data set and some more sophisticated estimation technique for getting more reliable findings. This study is an attempt in this direction.

Until the mid 1980, Pakistan pursued an economic policy that was strongly interventionist. During the late 1980s, Pakistan turned from inward-looking policies towards trade liberalization and export promotion strategies. From the late 1980s onwards, the governments changed frequently but all of them considerably liberalized the economy. But despite making the economy steadily open, inflation has not been maintained within the desirable limits in Pakistan. Therefore, the objective of the study is to determine the nature of relationship between inflation and trade openness in Pakistan.

Rest of the study is organized as follows: The theoretical model, sources of data and estimation technique are described in Section II. Section III presents the discussion on the estimated results. Final Section concludes the study.

II. Model, Data and Estimation

Inflation is a complex process and it is very difficult to construct an empirical model for a country. However, it is possible to find the key variables impacting the inflation process in a country like Pakistan. The most common empirical method to examine the trade openness-inflation relationship has been to employ a single equation model for inflation, treating trade openness as an exogenous variable among others. Solomon and de Wet (2004) have used a four variable single equation model where budget deficit (BD), gross domestic product (GDP) and exchange rate (ER) are treated as an exogenous variables and inflation (CPI) as an endogenous variable. I have just added trade openness (TO) as an exogenous variable in their model. Thus we have estimated the following model

$$LCPI_t = \alpha_1 + \alpha_2 LBD_t + \alpha_3 LER_t + \alpha_4 TO_t + \alpha_5 LGDP_t + u_t \quad (1)$$

where $LCPI_t$, LBD_t , LER_t , TO_t and $LGDP_t$ represent consumer price index, budget deficit, exchange rate, trade openness and gross domestic product respectively expressed in natural logarithms except for trade openness at time t . u is stochastic error term.

Now a brief discussion on the expected relationship between inflation and all the explanatory variables of the above model is presented. The influence of the budget deficit on inflation is positive. The higher the budget deficit, the greater will be the rate of inflation. The budget deficit affects inflation only if it is monetized to increase the monetary base of the economy. From Friedman's theory of money inflation is a monetary phenomenon. Accordingly, if the budget deficit is monetized it increases the money supply thereby increasing the price level. When the budget deficit is monetized, an extremely high correlation exists between the budget deficit and money supply. The problem of multicollinearity and reducibility precludes one from using both money supply and the budget deficit as explanatory variables in the regression analysis. Therefore, in

order to estimate the effect of the budget deficit on inflation, the budget deficit is used as explanatory variable instead of the money supply. The exchange rate has a deterministic effect on the level of prices in underdeveloped economies. In countries like Pakistan, an exchange rate depreciation (appreciation) could increase (decrease) the price of imported commodities. Pakistan's markets are significantly based on imported commodities, which imply the depreciation of the exchange rate could be immediately reflected on an increase on the price of the consumer's basket of commodities.

Expected impact of trade openness on inflation is negative because direct and indirect price effects of cheaper imports of finished goods and intermediate inputs may net out to a decline in the overall price level. Additionally, opening an economy to the rest of the world may alter the incentives to which central banks respond in determining a country's long-run inflation rate. Finally openness could also lead to lower inflation indirectly by fostering faster domestic productivity growth as a result of increased competition. Because trade enables countries to specialize in the activities in which they have a comparative advantage, sectors in which countries are relatively inefficient shrink, while sectors in which countries have a comparative advantage expand. Faster productivity growth allows firms to pay higher wages without passing these costs on in the form of higher prices. The fourth important explanatory variable is the level of GDP, which has expectedly a negative impact on inflation rate as availability of goods and services in the economy eases pressure on the domestic price growth¹.

Time span covered in this study is from 1960 to 2007 and I have used annual time series data. The main focus of this paper is on inflation rate and trade openness (TO). Inflation rate is proxied using logarithm of the composite consumer price index (CPI). The control of inflation, measured as the annual growth rate of this variable, is the main goal of monetary policy and State Bank of Pakistan (SBP) sets a target. The most commonly used measure of openness in practice is the sum of imports and exports divided by GDP. This ratio generally reveals the degree of a country's openness to world trade: The more open a

¹ There is a vast literature on inflation and growth. I did not go into the details of it.

domestic economy, the less is the restriction in world trade, and the higher is the trade share in GDP. No doubt, there are various other possible measures that could be used as a proxy for openness but it is difficult to obtain long historical time series for most of these (Ashra, 2002). So, I have restricted myself to trade to GDP ratio, which indicates the overall openness of the economy. Other variables included in the analysis are government budget deficit (BD), exchange rate (ER), and Gross Domestic product (GDP). The data, seasonally unadjusted and expressed in nominal terms, have been obtained from various issues of *Economic Survey*, Government of Pakistan and *International Financial Statistics*, IMF.

II.1. Unit Root Test

Since macroeconomic time-series data are usually non-stationary (Nelson and Plosser, 1982) and thus conducive to spurious regression, we test for stationarity of a time series at the outset of cointegration analysis. As testing for a unit root is an active research area, several testing procedures have been developed over the years. Many of these tests are designed to overcome difficulties encountered in practice. In this regard, the present study has conducted an Augmented Dickey-Fuller (ADF) test, which is based on the t-ratio of the parameter in the following regression.

$$\Delta X_t = \kappa + \phi t + \Theta_i X_{t-i} + \sum_{i=1}^n \varphi_i \Delta X_{t-i} + \varepsilon_t \quad (2)$$

where X is the variable under consideration, Δ is the first difference operator, t captures any time trend, ε_t is a random error, and n is the maximum lag length. The optimal lag length is identified so as to ensure that the error term is white noise. While κ, ϕ, Θ and φ are the parameters to be estimated. If we cannot reject the null hypothesis $\Theta = 0$, we conclude that the series under consideration has a unit root and is therefore non-stationary.

However, the ADF unit root test is known to lose power dramatically against stationary alternatives with a low order MA process: a characterization that fits well to a number of macroeconomic time series. Consequently, along the lines of ADF test, a more powerful variant is the Dicky-Fuller Generalized Least Square (DFGLS) de-trending test

proposed by Elliott, Rothenberg and Stock (ERS, 1996). This test is similar to an Augmented Dickey-Fuller test, but has the best overall performance in terms of small-sample size and power, dominating the ordinary Dickey-Fuller test. Therefore, to check the stationarity of variables, I have also used the DFGLS test.

It is essential at the onset of cointegration analysis that we should solve the problem of optimal lag length because multivariate cointegration analysis, which we are going to conduct in the study, is very sensitive to lag length selection. The two most commonly used lag length selection criteria are the Akaike Information Criterion (AIC) and the Schwartz Bayesian Criterion (SBC).

II.2.Cointegration Test

The econometric framework used for analysis in the study is the Johansen (1998) and Johansen and Juselius (1990) Maximum-Likelihood cointegration technique, which tests both the existence and the number of cointegration vectors. This multivariate cointegration test can be expressed as:

$$Z_t = K_1 Z_{t-1} + K_2 Z_{t-2} + \dots + K_{k-1} Z_{t-k} + \mu + v_t \quad (3)$$

Where

$Z_t = (CPI, BD, ER, TO, GDP)$ i.e. a 5 x 1 vector of variables that are integrated of order one [i.e. $I(1)$], CPI , BD , ER , TO and GDP are price level, budget deficit, exchange rate, trade openness and gross domestic product respectively

μ = a vector of constant and

v_t = a vector of normally and independently distributed error term.

The equation (3) can be reformulated in a vector error correction model (VECM) as follows:

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \Gamma_2 \Delta Z_{t-2} + \dots + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-1} + \mu + v_t \quad (4)$$

where, $\Gamma_i = (I - A_1 - A_2 \dots - A_i)$ ($i = 1, 2, 3 \dots k-1$) and $\Pi = -(I - A_1 - A_2 - A_3 \dots - A_k)$. The coefficient matrix Π provides information about the long run relationships among the variables in the data. Π can be factored into $\alpha\beta'$ where α will include the speed of adjustment to the equilibrium coefficients while the β' will be the long run matrix of coefficients. The presence of r cointegrating vectors between the elements of Z implies that Π is of the rank r ($0 < r < 5$). To determine the number of cointegrating vectors, Johansen developed two likelihood ratio tests: Trace test (λ_{trace}) and maximum eigenvalue test (λ_{max}). If there is any divergence of results between these two tests, it is advisable to rely on the evidence based on the λ_{max} test because it is more reliable in small samples (see Dutta and Ahmed, 1997 and Odhiambo, 2005).

III. Results and Discussion

The first step in cointegration analysis is to test the unit roots in each variable.² To this end, firstly I apply Augmented Dickey-Fuller (ADF) stationary tests on LCPI, LBD, LER, TO and LGDP³. From the results of the ADF test presented in the table 1, it is evident that all the time series used in the study are stationary at first difference as expected. It implies that they are integrated of order one i.e. $I(1)$. Similar results for all macroeconomic variables have been found under the DFGLS test⁴. For getting optimal lag length for cointegration analysis, I have used two criteria, namely the Akaike Information Criteria (AIC) and the Schwarz Bayesian Criteria (SBC). The SBC has suggested a lag length of 1 as optimal, while the AIC has indicated 3 as optimal lag length (See table A2 in Appendix). However, I have selected optimal lag length 1 as suggested by the SBC because when I use the lag length 3 for cointegration analysis, I find no cointegrating vector under both trace and maximum eigen statistics, while at lag length 1, I get one cointegrating vector under both these statistics.

² Since the cointegration methodology involves finding a stationary linear combination of a set of variables, which are themselves non-stationary, therefore, a precondition for cointegration to be held is that all variables should be non-stationary.

³ All the variables are logarithmic except trade openness.

⁴ See table A1 in the Appendix.

Table 1. Augmented Dickey Fuller (ADF) Unit Root Tests

Variables	Level	First Difference	Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root			Decision	Order of Integration
			1 %	5 %	10 %		
LCPI	6.7906	-1.6213	-2.583	-1.94	-1.62	Nonstationary at level but stationary at first difference	$I(1)$
LBD	-0.0508	-10.439	-2.583	-1.94	-1.62	Nonstationary at level but stationary at first difference	$I(1)$
LEX	1.2831	-7.0888	-2.583	-1.94	-1.62	Nonstationary at level but stationary at first difference	$I(1)$
TO	-2.1076	-3.7438	-2.583	-1.94	-1.62	Nonstationary at level but stationary at first difference	$I(1)$
LGDP	4.9091	-4.4760	-2.583	-1.94	-1.62	Nonstationary at level but stationary at first difference	$I(1)$

Cointegration relationship among CPI, BD, ER, TO and GDP has been investigated assuming linear trend in data, and both an intercept and a trend in the cointegrating equation using the Johansen technique. Table 2 reports our cointegration test results based on Johansen’s maximum likelihood method. Both trace statistic (λ_{trace}) and

maximal eigenvalue (λ_{max}) statistic indicate that there is at least one cointegrating vector among all the five time series. We can reject the null hypothesis of no cointegrating vector in favour of one cointegrating vector under both test statistics at 5 percent level of significance. We also cannot reject the null hypothesis of at most one cointegrating vector against the alternative hypothesis of two cointegrating vectors, for both the trace and max-eigen test statistics. Consequently, we can conclude that there is only one cointegrating relationship among CPI, BD, ER, TO and GDP. This implies that price level, budget deficit, exchange rate, trade openness and gross domestic product establish a long run relationship in Pakistan.

Table 2. Cointegration Test Based on Johansen's Maximum Likelihood Method

Null Hypothesis	Alternative Hypothesis	Critical Values			
		95 %		P-values●●	
λ_{trace} rank tests		Eigen values	λ_{trace} rank value		
$H_0 : r = 0$	$H_1 : r = 1$	0.682256	103.3127***	76.97277	0.0001
$H_0 : r = 1$	$H_1 : r = 2$	0.391552	51.71982	54.07904	0.0799
$H_0 : r = 2$	$H_1 : r = 3$	0.262939	29.36187	35.19275	0.1856
λ_{max} rank tests			λ_{max} rank value		
$H_0 : r = 0$	$H_1 : r > 0$	0.682256	51.592***	34.80587	0.0002
$H_0 : r \leq 1$	$H_1 : r > 1$	0.391552	22.35795	28.58808	0.2542
$H_0 : r \leq 2$	$H_1 : r > 2$	0.262939	13.72878	22.29962	0.4871

Normalized Cointegrating Equation:

$$LCPI = 1.987 + 0.102*LBD + 0.388*LEX - 0.681*TO - 0.421*LGDP$$

(2.031)** (13.116)*** (2.514)** (-4.732)*** (-4.236)***

***denotes rejection of the null hypothesis at the 1 percent significance level.

** denotes rejection of the null hypothesis at the 5 percent significance level.

●● MacKinnon-Haug-Michelis (1999) p-values.

Trace test indicates 1 cointegrating equation at 1 percent significance level.

Max-eigenvalue test indicates 1 cointegrating equation at 1 percent significance level.

The cointegrating equation, which is given at the bottom of the table 2, normalized for LCPI just to get meanings from the coefficients. All the explanatory variables significantly affect CPI. The coefficients of all the logarithmic variables may be interpreted in terms of elasticity. So it can be stated that 1 percent increase in BD is associated with 0.10 percent increase in CPI in Pakistan. Since the parameter of budget deficit is significant, it implies that there is a significant long run relationship between inflation and budget deficit. This result is in accordance with the findings of Chaudhary and Ahmad (1995) and Agha and Khan (2006) that budget deficit ultimately induces inflation in Pakistan. There exists a positive relationship between LCPI and LEX in such a way that 1 percent increase in nominal exchange rate results in 0.38 percent increase in inflation rate in the country. It implies that it is not recommended for the authorities to implement a flexible exchange rate system because that may lead to a major depreciation that will create inflationary problem. The coefficient of trade openness carries negative sign, which shows that 1 unit increase in trade openness brings 0.68 percent decrease in inflation rate. This finding is consistent with the empirical findings of Romer (1993), Kim and Beladi (2004), Ashra (2002) and Gruben and McLeod (2004) among many others. Furthermore, it validates the results of Hanif and Batool (2006) that openness has significant negative impact on the domestic price growth in Pakistan. This finding confirms the existence of Romer's hypothesis in Pakistan that inflation is lower in small and open economies. Furthermore, it indicates that the traditional closed economy explanation for inflationary process remains important and adding the openness variables in the analysis complements the analytical and empirical perspective. Finally there is a significant negative relationship between CPI and GDP such that 0.42 percent decrease in CPI is associated with 1 percent increase in GDP.

A principal feature of cointegrated variables was that their time paths were influenced by the extent of any deviation from the long run equilibrium (Walter Anders, 1995). Error correction term represents

percent of correction to any deviation in long run equilibrium price in a single period and also represents how fast the deviations in the long-run equilibrium are corrected. The coefficient of the ECT of inflation variable carries the correct sign (negative) and statistically significant at 10 percent level with the speed of convergence to equilibrium of 27 percent (Table 3). It means that whenever there is any disturbance in the system in the long run, in every short run period 27 percent correction to disequilibrium will take place. The over all restoration to equilibrium will happen in almost 4 years. It indicates the stability of the model. The coefficients of the error correction terms of trade openness, exchange rate and GDP are statistically significant but they carry positive sign. It means that in case of any disturbance, divergence from the equilibrium path will take place and the whole system cannot be brought to equilibrium position in each case. The coefficient of error correction term of budget deficit is not only insignificant but also carries incorrect sign i.e. positive. The insignificance of the ECT component for this variable indicates that this variable is weakly exogenous to the model. The diagnostic tests involve χ^2 -tests for the hypothesis that there is no serial correlation; that the residual follow the normal distribution; that there is no heteroscedasticity; and lastly that there is no autoregressive conditional heteroscedasticity. In all equations the diagnostics suggest that the residuals are Gaussian as the Johansen method presupposes.

Table 3. Summary Results from VECMs and Diagnostic Tests

	$\Delta L(CPI)$	$\Delta L(BD)$	$\Delta L(EX)$	$\Delta L(TO)$	$\Delta L(GDP)$
Constant	0.026 (2.737)***	0.177 (0.880)	0.121 (3.667)**	0.043 (1.576)**	0.038 (1.857)**
ECT(-1)	-0.275 (1.898)*	1.761 (1.683)	0.417 (2.422)**	0.853 (5.887)***	0.102 (0.952)
R^2	0.684	0.277	0.548	0.604	0.391
Adjusted R^2	0.633	0.163	0.477	0.543	0.354
S.E. of Regression	0.032	0.669	0.111	0.093	0.068
Diagnostic Tests χ^2 (p values are in the parenthesis)					
Serial Correlation (Breusch–Godfrey serial LM)	1.24(0.441)	0.791(0.557)	1.31(0.262)	2.15(0.156)	1.34(0.238)
Heteroscedasticity (White eteroskedasticity Test)	0.04(0.982)	1.33(0.268)	1.351(0.252)	2.27(0.157)	0.084(0.897)
Normality (Jorque-Bera) AR.Cond.	0.411(0.644)	0.774(0.361)	0.524(0.391)	2.3(0.194)	0.46(0.78)
Heteroscedasticity (ARCH LM Test)	0.007(0.938)	1.344(0.261)	0.004(0.964)	1.247(0.285)	1.086(0.337)

Note: t-values given in parenthesis with, ***, **, *, indicate significance at 1 percent, 5 percent and 10 percent probability level respectively.

V. Conclusion

Inflation has always been a concern for the policy makers as it creates uncertainty in the economy that may adversely affect economic growth. Therefore, maintaining noninflationary stable economic growth has been at the core of macroeconomic policies in Pakistan like in many other developing countries. The concern with inflation stems not only from the need to maintain overall macroeconomic stability, but also from the fact that inflation hurts the poor particularly hard as they do not possess effective inflation hedges.

An important debate has centered on the effects of openness (in the trade-flow sense) on inflation. Theoretically, two alternative views have been espoused concerning the issue. One of these states the openness causes a slower rate of inflation, while the other states that openness causes a faster rate of inflation. Many empirical studies have been performed to test these hypotheses. But still there is inconclusive evidence in support of these two views.

Like in other developing countries maintaining low inflation without hurting the economic growth of the economy are the main macroeconomic policy objectives in Pakistan. Inflation is complex process and developing an empirical model for the same is not an easy task. The main objective of this paper is to apply cointegration approach in order to reexamine whether the hypothesis proposed by Romer (1993), that there is a negative relation between inflation and trade openness holds for Pakistan. The study has used annual observations for the period 1960 to 2007. The results obtained corroborate Romer's proposition. In a summarized manner, this study further supports the results obtained by Romer (1993), demonstrating that there is a negative relation between openness and inflation. Thus, whatever its cause, that greater openness to trade is associated with lower inflation should provide some comfort to those who fear trade liberalization and flexible exchange rates increase macroeconomic instability in Pakistan.

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Appendix

Table A1. DF-GLS Unit Root Tests

Variables	Level	First Difference	Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root			Decision	Order of Integration
			1 %	5 %	10 %		
LCPI	-0.438	-4.935	-3.77	-3.19	-2.89	Nonstationary at level but stationary at first difference	$I(1)$
TO	-1.955	-4.959	-3.77	-3.19	-2.89	Nonstationary at level but stationary at first difference	$I(1)$
LRGDP	-3.497	-6.375	-3.77	-3.19	-2.89	Nonstationary at level but stationary at first difference	$I(1)$
LEX	-2.151	-7.436	-3.77	-3.19	-2.89	Nonstationary at level but stationary at first difference	$I(1)$
LBD	-2.101	-7.523	-3.77	-3.19	-2.89	Nonstationary at level but stationary at first difference	$I(1)$

Table A2.Lag Order Selection

Lag	AIC	SC
0	1.776864	1.981655
1	-7.158782	-5.930038*
2	-7.945100	-5.692402
3	-8.880952*	-5.604301
4	-8.698020	-4.397415

* indicates lag order selected by the criterion

AIC: Akaike information criterion

SC: Schwarz information criterion

Training and Innovation among Knowledge-Based Companies in Malaysia

Izyani Zulkifli*

Using data from an online survey, this paper attempts to (1) examine the innovative efforts undertaken by knowledge-based companies in Malaysia and (2) to investigate whether or not training has any impact on those innovative efforts. It was found that innovation was evident among the vast majority of the knowledge-based companies, namely, in the “development of a major new product”, an “upgrade of an existing product”, “patents or copyrights for a product” and the “introduction of a new technology that improved production process”. A simple crosstab analysis suggests that when a training policy is in place, it not only positively influences innovation but innovation seems to be more important to the growth of the companies. Additionally, the regression result shows that training has a significant and positive impact on the company’s propensity to innovate.

1. Introduction

Firms train their workforce for various reasons. One, in particular, is to accommodate the operational running of the business. As most firms operate in a competitive environment where stiff rivalry exists among similar businesses and each firm is knowledgeable about the activities of their rivals; firms traditionally compete via ‘price competition’, that is, by matching and beating the prices of their competitors. To succeed in price competition, firms strive to become the lowest cost producer.¹ For that reason, training is often carried out to improve the skills of workers

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¹ This is the standard neoclassical view, which assumes that competition prevents any individual firm from raising the price of its output to more than what covers the costs of its inputs.

because according to the human capital theory (Becker, 1962) this will increase the productivity level of the workers and, in turn, bring competitiveness to the firm.

However, as global economies progress to one that is more knowledge-based, this form of competition becomes no longer effective. With technology constantly evolving and opportunities to invest in R&D are made more available; firms find themselves another option to be the least-cost producer, that is, via innovation. By bringing new ideas into product design as well as production process, firms can not only reduce their costs but can ultimately improve the quality of their products or services they render. Training plays an important role here as well. As opposed to the previous situation where training is merely carried out to improve skills and productivity of workers, training now offers a boost to the workers' confidence and encourages them to become more innovative.

In Malaysia, empirical studies on training and innovation are very limited. The lack of such studies on knowledge-based companies is even more profound given that information on training for individual companies is neither available nor accessible to the public. To fill this lacuna in literature, the present study conducts an online survey on knowledge-based companies in MSC Malaysia to examine (1) the innovative efforts undertaken by these companies and (2) whether or not training has any impact on those innovative efforts.

The organization of this paper is as follows. Section 2 provides an overview of, mainly empirical, literature related to the link between training and innovation. Section 3 gives the rationale for focusing on MSC Malaysia, followed by a description of the data in Section 4. Sections 5 and 6 describe the model and variables used in the study. The empirical results are discussed in Section 7 and Section 8 concludes the paper.

2. Brief Review of Literature

Decades before his time, Joseph Schumpeter (1947) envisioned that when technology and know-how control the conduct of businesses, price competition "is not the kind of competition which counts, but the competition for the new commodity, the new technology, the new

source of supply, the new type of organization (the largest-scale unit of control for instance) i.e. competition that commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms, but at their foundations and at their very lives” (p.84). True enough, nowadays technology is continuously evolving and with various opportunities available to invest in R&D, firms find themselves the need to incorporate innovation into their operational strategy in order to remain competitive.

Innovation basically refers to something that adds value to a firm (Bhaskaran, 2006). It differs from invention because unlike the latter, innovation transforms an invention into a commercially useable technique or product (Laplagne and Bensted, 1999). Schumpeter is one of the first economists to define and draw attention to the importance of innovation. He distinguishes between “radical” and “incremental” innovations in which the former brings big changes in the world whereas the latter fills in the process of change continuously. Schumpeter also identified five types of innovation (see OECD, 1997: p.16), namely, (1) introduction of a new good; (2) the introduction of a new method of production; (3) the opening of a new market; (4) the conquest of a new source of supply of raw materials and (5) the carrying out of a new organization.

The first two types of innovation above form the basis of the Oslo Manual’s (OECD, 1997) classification of innovation as they are relatively easier to understand and measure. These classifications are “technological product innovation”, which involves either a new or improved product whose characteristics differ significantly from previous products, and “technological process innovation”, which is the adoption of new or significantly improved production methods, including methods of product delivery (p.32).² Given the broad scope of innovative activities, the measurement of innovation is likely to be difficult. Rogers (1998) distinguished the measures of innovation according to its inputs and outputs. Among the common input measures of innovation are R&D expenditures, intellectual property statistics and patents and licenses; whereas output measures of innovation are commonly in the form of firm performance, introduction of new or

² ‘Products’ refers to both goods and services

improved products or processes and percentage of sales from new or improved products or processes.

One branch of literature has found it worthwhile to investigate why firms innovate in the first place. According to Schumpeter, the main reason is that firms seek rents. With innovation, firms are able to bring new technologies into the economy so when an innovative process occurs, the firm gets a cost advantage over its competitors. This allows the innovator (or the firm) to gain a higher mark-up at the prevailing market price, or depending on the elasticity of demand, to use a combination of lower price and higher mark-up than its competitors to gain market share and seek further rents. In the case of product innovation, the firm gets a monopoly position due to either a patent or to the delay before competitors can imitate its product. This monopoly position allows the firm to set a higher price than would be possible in a competitive market, thereby gaining a rent.

Firms may also innovate to defend their competitive positioning as well as to seek competitive advantage. As shown in a model by Aghion *et al.* (2006), technologically advanced entry creates a competitive environment that forces incumbent firms to be innovative. In this situation, each potential entrant comes with leading-edge technology. If the incumbent is less technologically advanced, the entrant will replace the incumbent. Likewise, if the incumbent is also employing a leading edge technology, it can use its reputation advantage and block entry.

Given the importance of innovation to firms, it is clear why employers would want to impart innovativeness as part of their work culture. An effective way to do so is by training the workers. Previously when firms engage in price competition and focus only on being the least-cost producer, training was undertaken to improve workers' performance by coaching them to reduce wastes, work more efficiently and produce goods more abundantly. But all those feats were carried out by using existing technology. When firms realize that technology need *not* be stagnant, training may be used to coach the workers on how to (1) find cheaper ways to make existing products, (2) make new products using existing technology, or (3) make new products using new technology. Thus, training not only generates innovation, but together with investments in R&D, it develops the firm's "absorptive capacity", a concept developed by Cohen and Levinthal (1989, 1990), which refers

to the firm's ability to identify, assimilate and exploit knowledge from the environment. These are among the qualities needed for firms to remain competitive in the new age, a view that is supported by Ballot, Fakhfakh and Taymaz (2001) who found that training and its interaction with R&D are significant inputs in firms' productivity growth.

In short, there is an intricate link between innovation and training in today's economies (Booth and Snower, 1996). Firms that do not engage in training will fail to develop their workers' skills. As a result, these firms will risk the inability to take advantage of innovations or fail to promote innovation in the first place by not investing enough in their workers who are able to carry out R&D. In both instances, the lack of skills and training acts as a constraint for the firms to progress with their innovations (Mohnen and Röller, 2001). As workers participate in training and improve their skills, they will be able to undertake more complex tasks or to complete tasks better or faster. They may also have more confidence to share new ideas regarding the firm's products with their superiors. In some cases, innovation and training reinforce one another with the training of workers enhancing the profitability of innovative and more sophisticated technology.

3. Background of MSC Malaysia

MSC Malaysia is a national initiative spearheaded by the Malaysian government to develop and nurture the nation's ICT industry as well as to provide a test-bed for the global ICT industry (MDeC, 2008).³ Conceptualized in 1996, MSC Malaysia was designed to help transform the nation into a knowledge-based economy driven by a knowledge society.⁴ To facilitate future development and promotion of MSC Malaysia, the Multimedia Development Corporation (MDeC) was established to shape specific laws and policies for MSC Malaysia as well as to work closely with companies that want to set up their operations there (MDeC, 2007).

³ The concept of MSC Malaysia is similar to the Free Trade Zones (FTZ) concept developed in the late 1960s, which was to assist MNCs in exporting their products. The only difference is that MSC Malaysia is concentrated on knowledge-based and ICT-related products.

⁴ This is the nation's Vision 2020 i.e. a long-term national agenda that was introduced by former Prime Minister, Tun Dr Mahathir Mohamed in 1991, which aspires for Malaysia to become a fully developed nation by the year 2020.

This study focuses on knowledge-based companies that attain the MSC Malaysia Status, henceforth, MSC-status companies.⁵ There are several reasons for this. Firstly, these are local and foreign firms that rely heavily on multimedia and high-end technology to produce or enhance their products and for process development (MDeC, 2007), all of which are crucial in the process of innovation. Secondly, to qualify for the status, companies must meet several eligibility criteria, among which is to employ a substantial number of 'knowledge workers'. In the Malaysian context, knowledge workers are individuals who hold either a degree in any field from an institute of higher learning, OR a diploma in multimedia/ICT or specialized ICT certification plus at least two years' of relevant experience in multimedia/ICT or in a field that is a heavy user of ICT, OR a professional, executive, management and technical, work categories in IT-enabled services (MDeC, 2007). Knowledge workers are essential to the development of innovations as they are the manpower that drives the firms' operational strategies.

Thirdly, companies with MSC-status enjoy numerous benefits in the form of world class services and infrastructure, advanced communications infostructure, cyberlaws as well as financial and non-financial incentives. These privileges are backed by the Bill of Guarantees (see Table 1), which is part of the Malaysian Government's commitment to provide an environment that is conducive to the development of MSC Malaysia.

Given the nature of these companies along with the initiatives provided by MSC Malaysia, it is only expected that the MSC-status companies be innovative. Hence, this study also aims to affirm this situation as no other studies, to the best of the author's knowledge, have attempted to do so in the past.

⁵ This status is awarded to private limited companies, incubators and institutes of higher learning (IHLs), each with different application criteria and guidelines. For the purpose of this study, only companies are of interest.

Table 1. Bill of Guarantees for MSC-status companies

-
- Provide a world-class physical and information structure
 - Allow unrestricted employment of local and foreign knowledge workers
 - Ensure freedom of ownership by exempting companies with MSC Malaysia status from local ownership requirements
 - Give the freedom to source capital globally for MSC Malaysia infrastructure and the right to borrow funds globally
 - Provide competitive financial incentives, including no income tax for up to 10 years or an investment tax allowance, and no duties on import of multimedia equipment.
 - Become a regional leader in intellectual property protection and cyberlaws.
 - Ensure no Internet censorship.
 - Provide globally competitive telecommunications
 - Tender key MSC Malaysia infrastructure contracts to leading companies willing to use the MSC Malaysia as their regional hub.
 - Provide an effective one-stop agency - the Multimedia Development (MDeC)
-

Source: Multimedia Development Corporation (MDeC), 2008

4. Data

Data used in this study are drawn from an online survey of MSC-status companies.⁶ The decision to use an online mode was based primarily on the characteristics of the sample. Since the MSC-status companies are accustomed to regular ICT usage, an online survey is considered appropriate and makes it more convenient for the Managers to respond despite their hectic and irregular work schedules.⁷ Moreover, given the need to acquire as many responses as possible to yield a fairly

⁶ The survey was conducted as part of the researcher's PhD programme with some funds acquired from the University of Nottingham and IIUM. Surveys on both the companies and KWs were conducted online and face-to-face, but for the purpose of this paper, only the company survey was utilised.

⁷ According to Schaefer and Dillman (1998), a faster response rate is obtained with e-mail. In their study, respondents took on average of 9.16 days to return the questionnaires by e-mail versus an average of 14.39 days by postal mail.

acceptable estimate, an online survey was deemed more practical especially when there are time and financial constraints involved.

The working population consists of 1560 companies and are identified from the directory at the MSC Malaysia website.⁸ Of this, 308 MSC-status companies were targeted for the survey and selection was made using a stratified random sampling to ensure representation from both local and foreign ownerships as well as the six sub-sectors or technological clusters in MSC Malaysia. The sample size was calculated based on a formula for small population size in Rea and Parker (1997), of which a 95 per cent confidence level and an acceptable margin of error of 5 per cent were used.⁹

Prior to contacting the companies, support letters from the University and the Ministry of Science, Technology and Innovation (MOSTI) were obtained as proof of research authenticity, should they be required. The Human Resource or Training Managers of the targeted MSC-status companies were then informed of the researcher's intentions and those who agreed to peruse the questionnaire were emailed a 'survey pack', which includes a cover letter stating the purpose of the survey, support letters, a document version of the Survey Questionnaire for MSC-status Companies (SQ1) and a link to the Web-based version of the survey.

Companies that declined participation were replaced by other companies from the same strata. Eventually, as increasing number of MSC-status companies that were *not* in the original sample list were contacted; the sample survey became a census. But due to non-response, the use of the census still does not guarantee that information was collected about all members of the population (Rodeghier, 1996), thus, the data constitute only a sample of the population and generalizations still had to be made back to the full population.

⁸ During the fieldwork period (late-2008), 1878 MSC-status companies were officially registered but not all of these companies were contactable, as they may have discontinued business due to poor performance. As advised by MDeC, only 'active MSC-status companies' were included in the sampling frame. Also, the survey excludes Institutes of Higher Learning, Incubators and companies located outside of the Klang Valley due to time and financial constraints.

⁹ The response rate for online surveys that use telephone calls to contact potential respondents is as low as 36.3 per cent (Dillman *et al.*, 1998). Thus, in prudence, 848 companies were contacted for this study. This technique of 'over sampling' is commonly used in an attempt to attain the required sample size for a particular confidence level (Sheehan and Hoy, 1999).

A total of 100 MSC-status companies responded to the survey, giving a response rate of 32.5 per cent (100 respondents out of 308 recommended sample size). This is consistent with most past studies and is acceptable for the purpose of analysis. Table 2 reports the breakdown of the respondents.

Table 2. The breakdown of the MSC-status companies by ownership and sub-sector

Sub-sector ¹	Local companies	Foreign companies ²	Total companies
Creative multimedia	12	5	17
Software development	38	12	50
Support services	5	1	6
Hardware design	4	3	7
Internet-based business	9	1	10
Shared services & outsourcing (SSO)	3	7	10
Total	71	29	100

Note: ¹Since 2010, these sub-sectors have been renamed to Creative Multimedia, IHLs & Incubators, InfoTech and Shared Services Outsourcing; ²There are three entities of MSC-status companies but for the purpose of analysis, joint ventures and foreign-owned companies are pooled together as 'foreign companies'.

Source: Survey Questionnaire for the MSC-status Companies (SQ1)

5. Model Specification

A Probit model is used to estimate the factors that influence whether or not an MSC-status company undertakes innovative efforts. Following Greene (2000), assume there is a latent variable, y_i^* , that describes a firm's propensity to innovate

$$y_i^* = X_i' \beta + \mu_i$$

where X_i' is a vector of explanatory variables with the associated β vector and μ_i is the error term, which is assumed to be normally distributed. What is observed, however, is a binary variable defined as

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

It follows that $y_i = 1$ indicates that the firm is innovative and $y_i = 0$ indicates otherwise. The conditional expectation of the binary variable y given x is, by definition, a probability:

$$E(y|x) = Pr(y = 1|x_1 \dots x_k) = p = \Phi(\alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)$$

where Φ represents the standard normal cumulative density function. β_i gives the marginal effect along the horizontal axis due to the increment in x . To translate this effect, the following calculation is needed

$$\frac{\partial Pr(y_i = 1|x_i; \beta)}{\partial x_{ij}} = \phi(x'_i \beta) \beta_j$$

In the last term, ϕ is the derivative of the CDF, which is the probability density function (PDF). Since this regression function is non-linear in nature, the Maximum Likelihood (ML) solution technique is employed in place of the usual OLS.

The ML estimation for the Probit model is given by

$$Pr(y_i = 1|x_i \beta) = \Phi(x'_i \beta) \quad Pr(y_i = 0|x_i \beta) = 1 - \Phi(x'_i \beta)$$

Two important issues should be addressed beforehand. One is the potential endogeneity between training and innovativeness. Some may argue that the decisions on major innovations should come prior to the decisions to train workers so that they will be able to utilize an innovated technology. But according to Chowhan (2005), the inclusion of training does not present an endogeneity problem if the decision on whether or not to provide training is made ex-ante. This is when firms make training decisions, particularly training expenditures into their operations, based on past budgets while adjusting for inflation and growth. Allocating expenditures to training based on past budgets reflects historical legitimacy, emphasis on current organizational and presumed performance (Cyert and March, 1963).

The second issue, which is unobserved heterogeneity, can be dealt with in a number of ways. If panel data with repeated observations on the binary outcome of interest are available then unobserved heterogeneity is usually dealt with by either conditioning on the unobserved heterogeneity through random effects or by transforming the data to

eliminate individual-specific fixed effects (see Halaby, 2004). These methods reduce the potential parameter bias from unobserved heterogeneity. Unfortunately, in studies that rely on cross-sectional data, such as the present one, it is often difficult to deal effectively with potential bias from unobserved heterogeneity because there is only little information in the data that allows the researcher to identify and correct from the unobserved heterogeneity.

6. Variables Description

Data on innovation, training and other firm-level characteristics relevant to this study are generated from the Survey Questionnaire for the MSC-status Companies (SQ1). Innovativeness of a company is measured by its progress in undertaking a number of initiatives or ‘innovative efforts’ as defined in question A10 of the survey questionnaire. A list of ten initiatives was constructed based on two of Schumpeter’s classification of innovation, namely, the introduction of a new product or a qualitative change in an existing product (product innovation) and process innovation new to an industry (process innovation). The companies were asked whether they had undertaken any of these innovative efforts since joining MSC Malaysia: “developed a major new product”, “upgraded an existing product”, “obtained patents or copyrights for products”, “introduced new technology that improved production process”, “certified to ISO 9000”, “agreed on a new JV with a foreign or local partner”, “obtained a new licensing agreement”, “outsourced a major production activity that was previously in-house”, “brought in-house a major production activity that was previously outsourced” or “opened a new plant or branch”.¹⁰ The respondents are allowed to choose more than one form of innovative activity and upon answering ‘yes’, they are further asked to rank the importance of those initiatives on their companies’ growth based on a five-point Likert scale (not important to extremely important).

¹⁰ Although ISO 9000 is essentially a TQM measure, there exists a significant relationship between TQM practices and innovation performance, as highlighted by Prajogo and Sohal (2001) in their literature review. In another study (Prajogo and Sohal, 2006), TQM has been analyzed as a mediating factor between company strategy and innovation.

For the Probit regression analysis, innovation is a binary variable that takes the value 1 if a company had undertaken the first four innovative efforts and 0 otherwise (*INNOVATION*). These items are used to define innovation because they are primarily undertaken by most MSC-status companies and are also perceived to be important for their companies' growth.

In the survey, training is measured in a number of ways, namely, by the amount of training expenditure spent, the number of knowledge workers trained, the average duration of days and hours of training, whether or not the company provides training in the last year and the existence of a formal training policy, or scheme, within the company. But for the purpose of this study i.e. to analyze whether or not training supports company innovations in MSC Malaysia, only the last measure is used (*TRAINING*), where it takes the value 1 if a company has a training policy, including those on ad hoc basis and 0 otherwise.

This measure is chosen for three reasons. Firstly, it follows the same time line as the innovation measure, that is, since the inception of the business in MSC Malaysia (assuming that the company had established a training policy right from the start). Secondly, companies with a training policy regularly train their workers (Hansson, 2005; Smith and Hayton, 1999) or are, at least, consistent in providing training to their workers. Although the existence of a training policy does not necessarily lead to an actual provision of training, there is a positive correlation between the two variables (0.251, $p < 0.05$) for the current sample. Furthermore, a cross tabulation of the variables also show that almost 90 per cent of companies that have a training policy actually provide training in the last year. For the current sample, 72 per cent of the MSC-status companies have a training policy. Thirdly, while the other training measures may seem more ideal, but due to the lack or inaccuracy of data obtained from the respondents, as well as to ensure sufficient response to enable regression analysis, this measure is deemed the most fit.

Other variables used to control firm-level characteristics are described as follows. According to Schumpeter (1947), innovations are more likely to be initiated by large rather than small firms, so the size of the company (*SIZE*) as measured by total workforce at the end of December 2007 is included in the model. MSC-status companies may also be characterized by whether or not there exists any foreign ownership

(*FOWNERSHIP*) and by how long they have operated in MSC Malaysia (*DURMSC*). Innovation is also related to the level of technology usage as well as competition faced by the firm. To represent these factors, two binary variables are used with value 1 assigned to the company if it uses own technology (*OWNTECH*) and faces medium to high level of competition in the local and overseas market (*COMPETITION*), 0 otherwise. Following the literature, a workforce with high absorptive capacity too is an important source of innovation. In this analysis, such variable is measured by the workers' level of adaptability (*ADAPTABLE*) and higher education (*GRADUATE*). The former is measured by how fast new recruits are able to perform their jobs as well as more experienced workers already in the company whereas the latter refers to the share of knowledge workers with a degree or higher qualification.

7. Results

Descriptive Statistics

Table 3 presents the incidence of innovation among MSC-status companies since joining MSC Malaysia. The percentage of companies that undertake each initiative ranges from 56 per cent to 94 per cent, indicating that most MSC-status companies are innovative. The majority of respondents perceived the first four innovative efforts to have either a "very important" or "extremely important" impact on their companies' growth. These efforts include the "development of a major new product", "upgrade of an existing product", "patents or copyrights for a product" and "introduction of a new technology that improved production process". The remaining six initiatives are not that popular among the respondents and those who did viewed those efforts as "not important" or just "fairly important" on their company growth.

Regarding the link between training and the companies' innovative efforts, a simple computation of the relative frequency suggests that when a training policy is in place, it not only positively influences innovation but innovation seems to be more important to the growth of the MSC-status company. From Table 4, it can be seen that for the first four innovative efforts that greatly affect the companies' growth, all but one instance are undertaken more when the company has a training policy. An interesting pattern is also found for the least popular

innovative efforts, where their absence seem to occur more among companies that have no training policies. For instance, 37 per cent of companies with a training policy did not certify to ISO 9000 compared to 42 per cent of their counterparts with no training policy.

Table 3. Innovation undertaken by MSC-status companies

Innovative efforts taken	Importance to the Company's Growth					Total
	Not important	Slightly important	Fairly important	Very important	Extremely important	
Developed a major new product or line of service	4 4.1	3 3.1	20 20.4	31 31.6	34 34.7	98 100.00
Upgraded an existing product or line of service	5 5.1	0 00.0	16 16.3	45 45.9	24 24.5	98 100.00
Obtain patents or copyrights for the company products	12 12.2	9 9.2	11 11.2	25 25.5	16 16.3	98 100.00
Introduced new technology that improved production process	7 7.1	4 4.1	17 17.3	32 32.7	23 23.5	98 100.00
Certified to ISO 9000	27 27.6	11 11.2	8 8.2	8 8.2	7 7.1	98 100.00
Agreed on a new JV with a foreign or local partner	13 13.3	11 11.2	19 19.4	18 18.4	11 11.2	98 100.00
Obtained a new licensing agreement	21 21.4	10 10.2	13 13.3	19 19.4	6 6.1	98 100.00
Outsourced a major production activity that was previously in-house	24 24.5	7 7.1	11 11.2	10 10.2	3 3.1	98 100.00
Brought in-house a major production activity that was previously outsourced	22 22.4	6 6.1	15 15.3	13 13.3	3 3.1	98 100.00
Opened a new plant or branch	26 26.5	14 14.3	10 10.2	10 10.2	6 6.1	98 100.00

Note: Percentage is in italics; "product" includes both good and services

Table 4. Cross tabulation on training and innovative efforts

		Training policy in place		Total (N=98)
		Yes (N=71)	No (N= 27)	
Developed a major new product	Not important	3 (4.2)	1 (3.7)	4 (4.1)
	Slightly important	2 (2.8)	1 (3.7)	3 (3.1)
	Fairly important	15 (21.1)	5 (18.5)	20 (20.4)
	Very important	20 (28.2)	11 (40.7)	31 (31.6)
	Extremely important	28 (39.4)	6 (22.2)	34 (34.7)
	Not taken	3 (4.2)	3 (11.1)	6 (6.1)
Upgraded an existing product	Not important	2 (2.8)	3 (11.1)	5 (5.1)
	Fairly important	10 (14.1)	6 (22.2)	16 (16.3)
	Very important	34 (47.9)	11 (40.7)	45 (45.9)
	Extremely important	20 (28.2)	4 (14.8)	24 (24.5)
	Not taken	5 (7.0)	3 (11.1)	8 (8.2)
Obtain patents or copyrights for a product	Not important	9 (12.7)	3 (11.1)	12 (12.2)
	Slightly important	8 (11.3)	1 (3.7)	9 (9.2)
	Fairly important	6 (8.5)	5 (18.5)	11 (11.2)
	Very important	19 (26.8)	6 (22.2)	25 (25.5)
	Extremely important	14 (19.7)	2 (7.4)	16 (16.3)
	Not taken	15 (21.1)	10 (37.0)	25 (25.5)
Introduced new technology that improved production process	Not important	4 (5.6)	3 (11.1)	7 (7.1)
	Slightly important	2 (2.8)	2 (7.4)	4 (4.1)
	Fairly important	8 (11.3)	9 (33.3)	17 (17.3)
	Very important	27 (38.0)	5 (18.5)	32 (32.7)
	Extremely important	20 (28.2)	3 (11.1)	23 (23.5)
	Not taken	10 (14.1)	5 (18.5)	15 (15.3)

Note: Percentage in parentheses

Regression Results

Two specifications of the hierarchical Probit model are adopted; the first controls for the firm characteristics while the second model includes the training variable. Both models are estimated using robust standard errors. The pseudo R^2 likelihood ratio and Hosmer-Lemeshow test statistics support a sound fit of the model. The results of the Probit regressions are presented in Table 5.

Without training, the propensity to innovate is higher among smaller MSC-status companies ($p < 0.1$), those facing medium to high level of competition in the market ($p < 0.01$) and those with an adaptable workforce ($p < 0.1$). The inclusion of the training variable improves the fit of the model slightly. As expected, training has a significant and positive impact on the company's propensity to innovate, but this effect is only significant at the 10 per cent level. With training added to the model, two other factors became significant in influencing the

company's propensity to innovate, namely, the existence of foreign ownership and the share of graduates in the workforce (both at $p < 0.1$).

While all the variables follow the expected signs, interestingly, the effect of company size does not seem to adhere to theory in that smaller MSC-status companies are more likely to be innovative than bigger companies.¹¹ It is plausible that this is due to the overwhelming share of SMEs in the sample (83 per cent). A cross tabulation between innovation and company size also reveal that smaller companies involve in more innovative efforts compared to larger firms. Additionally, it might seem strange that foreign companies tend to innovate less than their local counterparts in MSC Malaysia. While there is no clear explanation of this matter, it may be assumed that given the competitive nature and high technological content of the knowledge-based industry, firm ownership may not bear that much difference in the companies' desire to perform well. In fact, local MSC-status companies may inevitably work harder than their peers to prove their worth in attracting investors.

The potential problem of endogeneity bias is recognized in the model. This issue arises when a firm trains its workers because of an innovation that requires new skills of the firm's workforce (reverse causality). To reduce this problem, the training variable is measured by the existence of a training policy, which was assumed to have existed since the inception of the company in MSC Malaysia. Related to this problem is sample selection bias, which refers to where the dependant variable is observed only for a restricted, non-random sample. In this case, one observes a firm's innovative propensity only if the firm provides training for its workers

¹¹Similar result is found when company size is measured by total revenue (turnover). This finding, however, is in line with Schumpeter's (1934) earlier hypothesis that small firms are best at innovating.

Table 5. Estimation coefficients and marginal effects

Independent Variables	Model 1		Model 2	
	B	Exp(B)	B	Exp(B)
CONSTANT	-1.001* (0.607)	0.368	-1.501** (0.651)	0.223
SIZE	-0.003* (0.002)	0.997	-0.003** (0.002)	0.997
FOWNERSHIP	-0.449 (0.299)	0.638	-0.546* (0.301)	0.579
DURMSC	0.061 (0.047)	1.063	0.054 (0.046)	1.055
COMPETITION	0.831*** (0.315)	2.296	0.819*** (0.314)	2.268
OWNTECH	0.514 (0.315)	1.672	0.499 (0.314)	1.647
ADAPTABLE	0.503* (0.298)	1.654	0.558* (0.308)	1.747
GRADUATE	0.784 (0.595)	2.190	1.05* (0.602)	2.858
TRAINING			0.558* (0.305)	1.747
N	96		96	
H-L statistic ^a	10.357		7.332	
Prob (H-L stat)	0.241		0.501	
LR statistic	13.595		16.501	
Prob (LR stat)	0.059		0.036	
McFadden R ²	0.116		0.140	

8. Conclusion

This study utilized data from an online survey to, firstly, examine the innovative efforts undertaken by knowledge-based companies in Malaysia and, secondly, to investigate whether or not training has any impact on those innovative efforts. From the survey, it was found that innovation was evident among the vast majority of the knowledge-based companies, particularly in the “development of a major new product”, an “upgrade of an existing product”, “patents or copyrights for a product” and the “introduction of a new technology that improved production process”. A simple crosstab analysis suggests that when a training policy is in place, it not only positively influences innovation to take place within the company but innovation seems to be more important to the growth of the companies. In addition, the result of the regression analysis shows that training has a significant and positive impact on the company’s propensity to innovate.

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Malaysia-OIC Trade: Static and Dynamic Gravity Model Approaches

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This paper examines the impact of the Organization of Islamic Conference (OIC) membership on Malaysian exports. We use the static and dynamic gravity model approaches to analyse the relationship using annual data from 1980 to 2010. The empirical results reveal that the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance and border are the main determinants of Malaysian exports. The evidence also suggests that there is also considerable room for improvement trade between Malaysia and OIC membership countries.

1. Introduction

One of the Organization of Islamic Conference (OIC) ³ objectives and principles as has been outlined in the OIC Charter is to strengthen intra-bloc economic and trade cooperation. The ultimate goal of this objective is to create Islamic Common Market. In 2005, OIC developed its ten-

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³ The OIC was first established 42 years ago. It was founded in Rabat, Morocco on 25 September 1969 following the incident of criminal arson perpetrated on 21 August 1969 by Zionist element against Mosque al-Aqsa (OIC, 2008). The First Islamic Conference of Ministers of Foreign Affairs held in Jeddah on March 1970 to set up a permanent general secretariat. They chose Jeddah as the HQ but permanent HQ will be in Jerusalem. The OIC adopted the Charter of the Organization two and half years after the Rabat Summit. The aim of the charter is to strengthen solidarity and cooperation among Islamic states in the political, economic, cultural, scientific and social fields. In order to achieve this ultimate aim the OIC constructed main bodies, secondary organs, institutions and specialized committees (OIC, 2008).

year action plan to re-coordinate collective actions of its members in various fields including economy. The action plan also outlined the negotiations of implementing preferential tariff scheme among member countries which were the initial steps to more integrated trade arrangements.

Therefore, this paper is aimed to conduct an empirical research to assess the effect of OIC membership on Malaysia exports. This study is a response to the call for doing research and development on Muslim countries to measure the effectiveness of OIC in promoting trade among member countries where the number of researches in this area is limited. In addition, as one of founding member of OIC, Malaysia has indeed involved in many economic cooperation and trade negotiations. This study will examine the importance of the negotiations within the OIC and the effects to the Malaysian exports. To empirically analyse the effect, we employ the static and dynamic gravity models. In addition to the static approach which is widely used, the dynamic approach is able to capture the persistence effect of trade or export activities.

Furthermore, all OIC member countries are developing countries. Even more, 23 (including Palestine) of them are categorized under least developed low income countries⁴. These least-developed countries constitute more than half of the total OIC population. Therefore, collective actions should be taken cooperatively by well-developed member countries to help those least-well developed members through trade negotiations because the trade is able to treat for the balanced development among members. This willingness to help will show the spirit of Muslim brotherhood. This study helps to understand the impact of economic characteristics of other members to Malaysian exports that may provide room for improvement in trade relationships.

This study finds that the common determinants of gravity model, which are the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance, and border, are the main determinants of Malaysian exports. The export variable also shows its dynamic behaviour as its lagged dependent variable is significant. The OIC membership is otherwise insignificant. However, the sign is

⁴ See http://www.un.org/esa/policy/devplan/profile/ldc_list.pdf (online: 15 October 2011).

positive. These findings are crucial as they show the important determinants of Malaysian export demand from the OIC member countries and the impact of OIC membership to the export.

The remainder of the paper is organized as follows. The next section illustrates Malaysian exports to the OIC. Section 3 discusses previous literatures on the gravity model and trade agreements. Section 4 describes the methodology of the study which comprises of static and dynamic gravity models. Section 5 describes data sources, variable definition and expected signs. Section 6 discusses the econometric methods and their empirical results. Last, Section 7 concludes the paper.

2. Trade: Malaysia and the OIC

The organization that promotes multilateral trade is the World Trade Organization (WTO) that was established after the collapse of GATT (General Agreement for Tariff and Trade). As 10 May 2012, WTO has 155 countries in its membership. Its main function is to smooth the trade activities through liberalizing the trade. Its spirit is the most favoured nation (MFN) integrated with non-discriminatory respect to all members. However, to achieve a freer free trade it will take a long of time as unanimity of all members must prevail in prior to the free trade practices. However, under GATT's Article 24, it is allowed for a group of countries to form regional trade arrangements so long the arrangements do not violate WTO rules. The approach of regionalism⁵ divides the economists into two groups (Clarete *et al.* 2003). The opponents argue that the process of regionalism is like putting another distortion into the world trading system. This will cause trading system to be like a spaghetti bowl i.e. complex trading rules.

However, other economists believe that in order to establish a pure multilateral trade without distortions is the first best solution but it is something impossible to happen in this complicated world order. They argue that putting another distortion does not mean complicating world trade pattern. It is based on the Second Best Theory. Based on this argument, this paper justifies that the trade cooperation among OIC

⁵ Regionalism is an action of forming regional trade areas whether the parties involved in free trade agreements (FTAs) or Preferential Trade Agreements (PTAs).

member countries is considered as multilateral trade activities rather than regional trade activities.

In recent two decades, the volume of trade among OIC member countries has been increasing rapidly. Both exports and imports of the OIC member countries increased rapidly in recent years after an interruption in 2001. It was due to the global economic slowdown in the early 2000s accompanied by fluctuations in oil prices. Currently, the world economy was again interrupted by the sub-prime crisis. This sub-prime crisis that occurred in developed countries such as the United States, the United Kingdom, Spain, Italy, Greece and Iceland, caused the reduction in the demand on products imported from the OIC. In 2008, the OIC exports were USD1.808 trillion, but in 2009, the exports dropped to USD1.206 trillion.

More than half of the total exports of the OIC belong to the group of Fuel Exporting Countries (FECs), and this share has been steadily increasing in recent years. Their share in total imports, at the same time, has also been on the rise to the detriment of the group of Middle-Developed Countries (MDCs), whose share accounted for almost two-thirds of the total imports in 2000. Malaysia is one of the MDCs. Although the share is rising largely due to higher oil and other commodity prices, it also highlights the fact that OIC countries, with the exception of Malaysia, Turkey and Indonesia, have not notably diversified away from primary commodities to a broader export basket.

In the case of Malaysia, Malaysia exported products at amount of USD5 billion to OIC countries in 2001. The amount increased five folds in 2010. Major export destinations among others are Indonesia, United Arab Emirates (UAE), Pakistan, Egypt, Bangladesh and Pakistan, which are mostly among D8⁶ member countries (Table 1). Major export products includes HS15 (animal, vegetable fat and oils, cleavage product, etc), HS85 (electrical, electronic equipment), HS27 (mineral fuels, oils, distillation products, etc), HS84 (machinery, nuclear reactors, boilers, etc), HS71 (pearls, precious stones, metals, coins, etc), and

⁶ D8 is known for Development 8 of eight major developing Muslim countries. The organization comprises of Malaysia, Indonesia, Turkey, Iran, Bangladesh, Pakistan, Egypt and Nigeria.

HS39 (plastics and articles thereof)⁷. Table 2 shows the figures in details. Overall, the Malaysian exports to the OIC increases from year to year for those major commodities. Besides, Malaysia's exports of halal products and services were also expected to increase significantly in the coming years due to the growing demand from the member countries of OIC specifically from high income Arab countries. Due to that, Malaysia gave a special focus on halal industry as a part of its strategic thrusts and policy measures under the Third Industrial Master Plan (2006 – 2020) (MITI 2006).

3. Previous Studies

The Gravity model that will be used in the analysis part of this research has been used by many previous researchers like Frankel *et al.* (1995), Rajapakse and Arunatilake (1997), Hassan (2001) and others. The gravity model was introduced by Tinbergen (1960). Its widely use is due to its robustness and its ability to analyse various trade issues (van Bergeijk and Brakman, 2010).

In contrast, Frankel *et al.* (1995) examine the PTA in American continent. They argue that the bilateral trade is unable to be explained only by natural variables such as national income, geographical size, and common language and border. However, other literatures show the importance of such variables which are the core components of the gravity model. Previous studies such as Martinez-Zarzoso *et al.* (2009) and Head *et al.* (2010) have significant results for the variables as well as other older studies such as Rajapakse and Arunatilake (1997) and Hassan (2001).

⁷ Based on HS4 codes.

Table 1 Malaysian exports 2001 – 2010 (Based on HS4 USD '000)

<i>Importers</i>	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
OIC, total	5001135	5723040	7210778	9197179	10095737	11840906	15345928	20273301	16987969	20811711
onesia	1563104	1790370	2127983	3062935	3312085	4069163	5148242	6215029	4913274	5628912
UAE	833467	858864	1114717	1555261	1847642	2266554	2947093	3758678	2850239	3791790
Pakistan	399268	525090	667728	702293	747908	842598	1255059	1718703	1632818	2336545
Egypt	209917	295533	454633	365146	459609	342127	476732	715844	809573	1400951
Bangladesh	171328	225886	320184	364606	409399	422460	407931	684905	803495	1259325
Saudi Arabia	341232	383234	407574	482824	474281	530333	717195	1053051	813092	893914
Iran	178343	229082	327911	345836	358638	440847	617949	733442	682143	848926
Turkey	366926	211167	318273	399055	534583	640264	902111	815521	475448	656991
Benin	3184	3638	21820	11845	26420	98495	210513	396293	298597	477472
Brunei	272935	300303	317055	318126	359821	345836	402437	447869	443430	449850
Togo	4777	16238	35213	58480	50396	71954	93984	135700	107185	268288
Jordan	66451	62740	79082	343349	113757	149895	89921	549150	149902	260087
Oman	96735	49545	52359	71109	81034	99835	151358	229826	173010	180366
Kuwait	63288	70972	89446	108047	122205	159890	167923	375991	163018	180345
Djibouti	4582	5021	12732	13336	21812	32980	79147	140467	146632	180303
Syria	50649	66502	154266	149121	164226	156077	166107	173391	174345	176718
Yemen	50818	76544	104474	111114	119080	261954	220496	334317	204809	167643

Source: Trade Map, International Trade Centre (www.trademap.org).

Table 2 Malaysian products of export to OIC member countries, 2001 – 2010 (Based on HS4 USD '000)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
All products	5001135	5723040	7210778	9197179	10095737	11840906	15345928	20273301	16987969	20811711
Animal,vegetable fats and oils, cleavage products, etc (HS15)	826239	1247389	1871017	1913704	1684839	1770528	2667020	4707568	3370433	5298797
Electrical, electronic equipment (HS85)	712685	763183	877323	1135749	1219803	1383168	1586221	2107334	1837337	2563177
Mineral fuels, oils, distillation products, etc. (HS27)	380432	329041	480275	662437	885345	1525331	1713865	2112611	1862637	1800277
Machinery, nuclear reactors, boilers, etc. (HS84)	466182	544472	630906	878433	980194	1141086	1470820	1598578	1454631	1533770
Pearls, precious stones, metals, coins, etc. (HS71)	288094	218233	267141	534304	723483	778782	1031985	1078868	1054151	1175948
Plastics and articles thereof (HS39)	157300	175377	254208	345962	434163	486802	647406	883193	751053	1016623

Source: Trade Map, International Trade Centre (www.trademap.org).

Rajapakse and Arunatilake (1997) and Hassan (2001) investigate the South Asian Association for Regional Cooperation (SAARC). They find that the SAARC needed trade reformation to enhance trade among them (Rajapakse and Arunatilake, 1997) because volume of trade between each other is small compared to trade with others (Hassan, 2001). This situation happened due to (1) production of similar products, (2) small scale of production, and (3) political confrontation among country members (Rajapakse and Arunatilake, 1997). Hassan (2001) concludes that the main factor contributed to this situation is the low level of industrialization in most country members. Therefore, he argues that the SAARC would gain intra-bloc increase if all country members gave much focus on industries.

In term of trade arrangements, Ceglowski (2000) and Okubo (2004) demonstrate that implementation of PTA will decrease effects of common border variable. Clarete *et al.* (2003) argue that different PTA gave different intra-bloc trade effect. They also find that there are PTAs that give effect contrary to the theory. Martinez-Zarzoso *et al.* (2009), on contrary, find that regionalism (PTA and other types of regionalism) has positive impact on both intra- and extra-bloc trade where the impact is larger for developed nations than developing ones. A study by Ghani (2007) on OIC membership impact of trade shows the negative relationship between OIC membership and trade. This finding implies that OIC reduces trade. In addition, all previous studies mentioned here, except one, are based on static gravity model specification. This model ignores the persistence effect of trade such that last year trade arrangements affect current trade. Therefore, following Martinez-Zarzoso *et al.* (2009), we consider the lagged dependent variable of export in the model specification.

4. Methodology

This research will adopt the gravity model to examine the impact of OIC membership on Malaysian exports. The literatures show that this model is widely used in order to examine the flows of trade. The model explained the volume of trade flows in terms of the ratio of the product of the gross domestic product (GDP) of countries i and j to the distance between them multiplied by a parameter A .

$$\text{Trade}_{ij} = A \frac{(GDP_i \cdot GDP_j)}{\text{Distance}}$$

By taking the logarithm we get the following:

$$\ln(\text{Trade}_{ij}) = A + \beta_1 \ln(GDP_i \cdot GDP_j) - \beta_2 \ln(\text{Distance}_{ij}) + \varepsilon_{ij}$$

Taking into account other important determinants, the static gravity model is rewritten as follows:

$$\begin{aligned} \ln X_{mjt} = & \alpha_0 + \alpha_t + \alpha_j + \beta_1 \ln GDP_{mt} + \beta_2 \ln GDP_{jt} + \beta_3 \ln ENDOW_t + \beta_4 \ln FDI_{mt} + \beta_5 \ln FDI_{jt} \\ & + \beta_6 \ln POP_{mt} + \beta_7 \ln POP_{jt} + \beta_8 \ln EX_{jmt} + \beta_9 \ln P_{jmt} + \beta_{10} \ln DISTANCE_{mj} \\ & + \beta_{11} BORDER_{mj} + \beta_{12} OIC_j + \varepsilon_{jt} \end{aligned}$$

where α_0 is constant; α_t is year-specific effect but common to all countries; α_j is country-specific effect which is common to all years; ε_{jt} error term in log assumed to normally distributed; β_k are estimated parameters, for all $k=1,2,...,12$; GDP is Gross Domestic Product (GDP); $ENDOW$ is absolute difference between GDP_{mt} and GDP_{jt} ; FDI is inward flows of foreign direct investment (FDI); POP is number of population, EX is average-of-period exchange rate of national currencies per a ringgit; P is the relative average consumer price of foreign price to Malaysian price; $DISTANCE$ is distance between exporting and importing countries; $BORDER$ is dummy for common border; and OIC is dummy for OIC membership.

All variables are in log form except for dummies. If the coefficient on OIC dummy is positive and significant, then the trading activities between Malaysia and OIC members are judged to expand. Given the log linear specification of the gravity model regression equation, the impact of trade between Malaysia and OIC member countries can be computed in percentage terms as $100 \times [\exp(\beta_{12}) - 1.00]$. The dependent variable is the total export of merchandise. The subscript m indicates the exporting country. In this model, Malaysia is the exporting country, and the subscript j indicates the Malaysia trading partners.

Martinez-Zarzoso *et al.* (2009) argue that businesses among trading countries are not set up in a one day or year, but have been developed in many years where the distribution channels and service networks have involved sunk costs. In addition, customers in partner countries may already have accustomed to certain products produced in exporting countries. Another reason for the existence of persistence effects is the presence of long-term supplying contract between the exporters and importers. This has led that, exports are high. In that case, we consider the lagged dependent variable as another determinant in the gravity model. This new model is called the dynamic gravity model:

$$\begin{aligned} \ln X_{mjt} = & \alpha_0 + \alpha_t + \alpha_j + \phi X_{mjt-1} + \beta_1 \ln GDP_{mt} + \beta_2 \ln GDP_{jt} + \beta_3 \ln ENDOW_t + \beta_4 \ln FDI_{mt} \\ & + \beta_5 \ln FDI_{jt} + \beta_6 \ln POP_{mt} + \beta_7 \ln POP_{jt} + \beta_8 \ln EX_{jmt} + \beta_9 \ln P_{jmt} \\ & + \beta_{10} \ln DISTANCE_{mj} + \beta_{11} BORDER_{mj} + \beta_{12} OIC_j + \varepsilon_{jt} \end{aligned}$$

5. Data

The data set consists of a panel of observations for a group of 127 Malaysian trading partners and the sample period is covering from 1980-2010. Within these sample countries, there are 31 OIC member countries⁸. Some OIC member countries are excluded from the sample in order to avoid outliers in the dataset because they are categorized as least developing OIC countries as the trade occurred might not indicate the real demand in their domestic markets. Iraq, Palestine and Kyrgyz are not included due to data inconsistency and unavailability.

The Malaysian exports dataset to these trading partners are obtained from Direction of Trade Statistics (DOTS), International Monetary Fund (IMF). Annual GDP and population are obtained from World Economic Outlook Database, IMF's website. FDI dataset are gathered from World Investment Report. Exchange rate and price index datasets are collected from International Financial Statistics, IMF. Distance is taken from Jon

⁸ These countries are Albania, Algeria, Azerbaijan, Bahrain, Brunei, Cameroon, Cote D'Ivoire, Egypt, Gabon, Guyana, Indonesia, Iran, Jordan, Kazakhstan, Kuwait, Lebanon, Libya, Morocco, Nigeria, Oman, Pakistan, Qatar, Saudi Arabia, Suriname, Syria, Tajikistan, Tunisia, Turkey, Turkmenistan, UAE, and Uzbekistan.

Haveman's and CEPII's websites. The OIC membership information is taken from OIC's website.⁹

Export, GDP, FDI and exchange rates are in nominal terms. These nominal terms are used instead of real terms because the terms can show current demand on goods. This has been argued by Jakab *et al.* (2001) and Sapir (2001). The coefficients of Malaysian GDP are assumed to be positive to indicate the economy with larger size trades more. On the other hand, the GDP of partners indicates the demand for foreign goods as discussed in international trade text books. The difference of GDP between the exporter and the trading partners indicate the relative effect of endowment on export. The effect of endowment is expected to be negative which demonstrates that one country prefers trading with those which are as rich as it is.

FDI is expected to be positively affects the export to show that FDI drives trade activities. The positive sign also represents that FDI promotes export-orientation activities. Population is an indicator of market size. The sign of its coefficients can either be positive to show the economies of scale where the economies with large population exports more; or negative to indicate the absorption capacity where 'demand creates its own supply' applies because the large population absorb the supply of goods domestically. On the other hand, the coefficients of exchange rate are assumed to be negative where the depreciation of ringgit makes the price of export to be cheaper and increase the demand on its goods. On contrary, for the importing countries, the depreciation of their currencies means the import is more expensive which thus reduces the demand on import.

To control for changes in price between exporter and importer countries, we use average price index. We take ratios of foreign price (importers' price indices) to Malaysian price. If the price increases in Malaysian domestic market, holding foreign prices constant, the price of its exports will also increase. This increase reduces demands from foreign consumers. In contrast, if the price of foreign countries increases relatively higher than Malaysia's, it makes Malaysian goods relatively

⁹ http://www.oic-oci.org/member_states.asp (15 October 2011).

cheaper. Thus, it increases demand on Malaysian goods. Therefore, we expect the price ratios to affect exports negatively.

The distance between the exporter and its trading partners is measured in kilometres. The variable is used as a proxy of transportation costs. The farther is the distance the more the cost to export goods. On the other hand, the closer is the distance the more to trade. This is measured by a dummy variable of value one if Malaysia, as the exporting country shares a common border with its trading partners and zero, otherwise. Finally, another dummy is used to measure the effect of OIC membership on Malaysian exports. The dummy takes value of one if importing countries are OIC member countries, or zero otherwise. This dummy is assumed to be positive as being an OIC member it will encourage trading between members of country.

6. Empirical results

The static gravity model is estimated using ordinary least squares (OLS), generalized least squares (GLS) and panel corrected standard error (PCSE) OLS. The ordinary OLS estimates are usually biased as it assumes constant variance across time and countries. As alternatives, the model is again estimated using GLS and PCSE. However, the GLS estimates and their associated standard errors are calculated using inverse of ratio of variance matrix to number of time periods, $\hat{\Sigma}_{i,j} = \frac{\hat{\epsilon}_i' \hat{\epsilon}_j}{T}$ and $\Omega = \Sigma_{m \times m} \otimes I_{T_i \times T_i}$, as estimator's weight¹⁰. Beck and Katz (1995) show that the variance matrix is of rank at most $\min(T, m)$. Therefore, in order to obtain valid GLS results T must be at least as large as m (number of panels). Beck and Katz (1995) suggest using OLS estimates with asymptotic standard errors that are corrected for correlation between the panels i.e. PCSE. The PCSE allows the panel to be balanced or unbalanced as it does not need similar requirement as T must be at least as large as m as GLS needs.

Furthermore, the inclusion of lagged dependent variable in the dynamic gravity model causes least squares estimates to be biased and inconsistent. This is due to serial correlation between the error term and

¹⁰ where i and j are panels; I is an identity matrix; m is the number of panel.

the lagged export or among the determinants. This happens since the determinants (including the errors except the lagged export) are correlated with export, the dependent variable. Hence, the inclusion of its lag as independent variable triggers the correlation between the determinants. Therefore, we propose using instrumental variable estimation to handle the situation. The estimator takes into account that the instruments adopted must be highly correlated with the lag but strictly uncorrelated with the error term. The unobserved effects are assumed random and i.i.d across panels so that we can use two-stage least squares random effect GLS transformation¹¹.

Table 3 shows the results of OLS, GLS and PCSE estimations. The results reveal that there is similarity in the coefficient parameters, significance and sign among these three estimators except the errors. The errors show that OLS produces upward standard error biases. Time trend is not significant which indicates the time specific effects are unimportant because the time specifics affect the countries in the data similarly. On the other hand, the country specific effects are significant for the PCSE estimation. This indicates the country's specific characteristics are important in affecting Malaysian trade flows. The specific characteristics include legal, tradition, historical, language differences and so on, to name a few. To understand the characteristics, further institutional research is needed to be done, as part of future research.

The results also demonstrate that GDP of Malaysia has positive sign such that it Malaysian exports positively. However, the coefficient is insignificant. On the other hand, the partners' GDP is significant. This result is as expected the theory that the exports are determined by the foreign GDP as a measure of foreign demands, which has been widely discussed in many international trade textbooks. Also, the differences between GDP, or endowment is insignificant. The result implies that endowment does not affect export where Malaysia does not prefer those who are as rich as it is as major export destinations. Malaysian inward

¹¹ We prefer IV to GMM (generalized method of moments) due to two reasons. First, GMM involves too many instruments that may reduce degree of freedom. Second, GMM eliminates the unobserved effects using first differencing techniques which can cause time-invariant variable to be excluded due to multicollinearity.

FDI does not affect export, rejecting the hypothesis that inward FDI increases exports i.e. export-orientation FDI. However, the foreign countries' FDI has positive impact on Malaysian exports. This is a reasonable relationship because Malaysia exports more intermediate products such as vegetable oils, semi-conductors and other raw materials (Table 2).

Table 3 Estimation results of static gravity model

	<i>OLS</i>	<i>GLS</i>	<i>PCSE</i>
α_0	169.936*(95.065)	169.936*(94.801)	169.936*(96.113)
α_t	-0.078(0.050)	-0.078(0.050)	-0.078(0.051)
α_j	0.001(0.001)	0.001(0.001)	0.001*(0.001)
$\ln GDP_{mt}$	0.177(0.259)	0.177(0.258)	0.177(0.261)
$\ln GDP_{jt}$	0.976*** (0.028)	0.976*** (0.028)	0.976*** (0.029)
$\ln ENDOW_t$	0.006(0.024)	0.006(0.024)	0.006(0.020)
$\ln FDI_{mt}$	0.024(0.052)	0.024(0.052)	0.024(0.052)
$\ln FDI_{jt}$	0.107*** (0.019)	0.107*** (0.019)	0.107*** (0.018)
$\ln POP_{mt}$	3.591** (1.662)	3.591** (1.657)	3.591** (1.683)
$\ln POP_{jt}$	-0.033(0.023)	-0.033(0.023)	-0.033(0.021)
$\ln EX_{jmt}$	-0.132*** (0.026)	-0.132*** (0.026)	-0.132*** (0.025)
$\ln P_{jmt}$	1.113*** (0.141)	1.113*** (0.141)	1.113*** (0.142)
$\ln DISTANCE_{mj}$	-1.635*** (0.059)	-1.635*** (0.059)	-1.635*** (0.054)
$BORDER_{mj}$	0.345* (0.182)	0.345* (0.181)	0.345*** (0.133)
OIC_j	0.078(0.068)	0.078(0.068)	0.078(0.069)
<i>R-squared</i>	0.813		0.813

Note: Standard errors are in parentheses. For panel-corrected standard errors (PCSE) model, the errors are hetero-corrected standard errors. *** and ** indicate 1% and 5% levels of significance.

The number of Malaysian population affects exports positively. The significance of the coefficient shows the positive effect of the economies of scale on trade. The size of population measures the market size of an economy. Hence, the larger the size of Malaysian population the more

exports go abroad. The exchange rate also affects exports significantly. The sign shown is negative as expected. The result shows that if the ringgit depreciates the ratios become smaller, *ceteris paribus*, which indicates that the depreciation of ringgit affects Malaysian exports positively. Conversely, this also indicates that the appreciation of the importers' currencies affects Malaysian exports positively since Malaysian exports become relatively cheaper. The price ratios are also significant and positively signed. A relatively higher increase in foreign domestic prices as compared to Malaysian domestic price will increase Malaysia goods competitiveness. The demand on its products will also increase.

Distance is measured in kilometres. It represents the cost of commuting goods from a place to another. The result shows a negative sign that trading with farther countries will incur more costs as compared to trading with close countries. The border dummy justifies this argument that trading with neighbour is the cheapest way.

In order to capture the effect of OIC membership, the OIC dummy is positive but statistically insignificant determinant of Malaysian exports. This result contradicts previous finding by Ghani (2007) that OIC membership empirically reduce trade. However, Ghani (2007) used the bilateral trade data, which in his study he finds that the OIC member countries, in average, tend to trade less among members. His empirical finding undermines the spirit of OIC Charter. In contrast, using more restrictive approach as the data reduced to Malaysian exports only, we find that the OIC membership affects Malaysian export. Though the coefficient is insignificant, the sign gives considerable rooms for trade improvement between Malaysia and the OIC.

Table 4 Estimation results of dynamic gravity model

	<i>Panel IV (two-stage least squares random-effects)</i>
α_0	87.319(93.302)
α_t	-0.051(0.050)
α_j	0.000(0.000)
$\ln X_{mjt-1}$	0.914*** (0.012)
$\ln GDP_{mt}$	0.050(0.361)
$\ln GDP_{jt}$	0.062*** (0.019)
$\ln ENDOW_t$	-0.004(0.012)
$\ln FDI_{mt}$	0.246*** (0.053)
$\ln FDI_{jt}$	0.012(0.010)
$\ln POP_{mt}$	5.598** (2.211)
$\ln POP_{jt}$	0.015(0.012)
$\ln EX_{jmt}$	-0.010(0.014)
$\ln P_{jmt}$	0.086(0.076)
$\ln DISTANCE_{mj}$	-0.143*** (0.036)
$BORDER_{mj}$	-0.030 (0.094)
OIC_j	0.001(0.035)

Note: Standard errors are in parentheses. *** and ** indicate 1% and 5% levels of significance. Time dummies of year 1987 – 2007 are included in the estimation. The instrumented variable is $\ln X_{mjt-1}$. The remaining independent variables at levels are used as instruments including second lag of export variable and time dummies.

The dynamic model's results produce quite interesting results. Using instrumental variables (IV) technique, endogeneity problem due to the lagged dependent variable is handled with the application of a set of instruments.¹² Also, the IV method is able to overcome weakly exogenous independent variables, in which the latter problem was raised by Jafari *et al.* (2011) in their study. As shown in Table 4, the lagged

¹² The IV method is preferred to a generalized method of moments (GMM) because it can prevent the too-many instruments problem.

export is positively signed and highly significant. As argued above, last year exports affect current exports. This persistence effects also suggest the existence of export hysteresis. Other variables namely Malaysian GDP, Malaysian population, Malaysian FDI and distance are also significant and have a sign as expected. On contrary, the exchange rate, price ratios and border dummy are insignificant but have expected signs. Lastly, the OIC dummy is still insignificant but positively signed. Overall, the results are consistent with static model's results. Ghani (2007) in his article argues that OIC membership supposed to be positive theoretically, even though it might be insignificant. In this paper, we successfully find out his argument empirically to be true.

7. Conclusion

This study examines the impact of OIC membership on Malaysian exports for the period 1980 – 2010 using the gravity model. To investigate the issue, we employ static and dynamic gravity models. From a basic gravity equation, empirical models are developed. This study identifies mix of results between the static and dynamic gravity models. Overall, the empirical results show that the GDP of OIC member countries, FDI of Malaysia, local population size, exchange rate, price ratios, distance and border are the main determinants of Malaysian exports. The empirical results also show that there is also considerable room for improvement trade between Malaysia and OIC membership countries.

The empirical finding suggest that in order to encourage trade among OIC members, Muslim countries should actively promote and integrate markets and reduce tariff and non-tariff barriers' promote free trade agreements (FTA) among member countries while working towards an Islamic Common Market. They should actively work on trade matching of buyers and sellers by working closely with relevant trade bodies, government and non-governmental organizations, commercial and financial institutions. Lastly, they should also promote out-sourcing of goods and services from Muslim countries while not compromising on quality.

For future researches, the use of disaggregate data may be useful to further the study on the impact of OIC trade relationship from a

perspective of particular goods. In addition, this study covers 31 years of data period. In this long period of data, certain OIC member countries were not stable due to war. Besides, many OIC member countries are oil-exporting countries which may divert their trades into developed countries. Therefore, dummy variables can be used to represent the effects.

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Macro and Socioeconomic Determinants of Turkish Private Savings

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This study investigates the effects on private saving rates of a number of macroeconomic and socio economic variables, by estimating an empirical private savings model for Turkey over the period 1975-2008. The following variables are found to increase savings: inflation, income level, terms of trade, real interest rates, credits, young dependency ratio, urbanization rate, economic crisis and political instability and the following variables are found to decrease it: financial depth, income growth, current account deficit, old dependency ratio and life expectations. Last but not least, we find that the private savings have strong inertia, and government savings tends to partially crowd out them. On the other hand, we also find that the female labor participation rate, the rate of self-employed employment and the rate of employment having university education decrease savings in Turkey after 1988.

1. Introduction

Notwithstanding the importance of international flows of capital, one of the most important determinants of a country's investment rate is its own saving rate. Therefore, understanding the savings behavior of an economy is very important for understanding economic growth.

Savings behavior has been the focus of many theoretical and empirical studies. The two major theories proposed to explain savings are "the permanent income hypothesis" (Friedman (1957)) and "the life-cycle hypothesis" (Ando and Modigliani (1963)). The permanent income hypothesis differentiates permanent and transitory components of income as determinants of savings. Permanent income is defined in

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terms of the long time income expectation over a planning period, and transitory income is the difference between actual and permanent income. The idea here is that transitory changes in income will not have a significant effect on consumption and savings. According to the life-cycle hypothesis, on the other hand, individuals spread their lifetime consumption over their lives by accumulating savings during earning years and maintaining consumption levels during retirement. The theory highlights the effects of demographic factors, such as the age profile of the population, on savings.

Empirical studies on savings behavior have tested the permanent income hypothesis (e.g. Kelley and Williamson (1968), Gupta (1970 a, b)), the life-cycle theory (Ando and Modigliani(1963)), and have explored the effects of many variables on the saving rate, including demographic factors such as age groups (Kelley and Williamson (1968)), birth rates (Leff (1969 and 1971)) and dependency ratios (Gupta (1971)), as well as financial variables such as interest rates (Ouliaris (1981)) and inflation rates (Koskela and Viren (1985)). Many studies have focused on analyzing savings behavior for groups of countries and regions (see, for instance, Edwards (1996), Dayal-Gulhati & Thimann (1997) and Metin-Ozcan and Ozcan (2000)), whereas some papers have focused on the determinants of savings in a single country (Ortmeyer (1985), Aron and Muellbauer (2000)). This latter approach is useful for providing a fuller picture of the determinants of the savings rate when a country has relatively strong data. Among developing countries, Turkey can be considered as a reasonably good choice in this respect, since it is one of the few countries for which the available data span a relatively longer time period and are more reliable. Moreover, understanding private savings in a developing country such as Turkey is particularly useful, since developing countries need to create the funds necessary for investment and to mobilize public and private savings for speedy development. In this respect, the current paper can provide some policy implications.

Tansel (1992) and Celasun and Tansel (1993) present two empirical models related to savings behavior in Turkey.² The former study

² Among the other empirical studies related to Turkey are Rittenberg (1988), which investigates financial liberalization and savings in Turkey, and Kumcu (1989) which analyzes the savings behavior of immigrant Turkish workers in W. Germany.

examines the relationship between household saving, income, and the number of children, and finds that at least in urban settings in Turkey (the data come from two major cities), children exert no significant influence on saving. Celasun and Tansel (1993) present econometric estimates for Turkish saving-investment behavior in the period 1972-88. Their estimation results highlight the significant impact of functional income distribution on private as well as on total domestic savings. They also find that financial liberalization affects private savings positively. In addition, the paper estimates models for private saving surplus and current (external) account deficit. In addition, IMF (2007) presents key determinants of private saving in Turkey for the 1980-2006 period, which used inflation-adjusted private and public saving rates from World Bank Saving Database. In addition, Rijckeghem and Ucer (2009) look into the evaluation and determinants of saving rate in Turkey, with particular focus on private saving, using both micro and macro level data. Also, Cilasun and Kirdar (2009), Yilmazer (2010) and Uysal *et al.* (2012) investigate Turkish households saving behavior. Lastly, World Bank (2011) lists determinants of saving in Turkey by using new annual series for savings, which were produced by The Ministry of Development.

Building on the previous literature, this paper investigates the effects on private saving rates of a number of policy and non-policy variables, including government policies, macroeconomic stability, income and financial variables as well as several life-cycle variables, for the period 1975-2008 in Turkey. The current study broadens Metin-Ozcan, Gunay and Ertac (2003), using a different dataset that spans a longer time frame. Metin-Ozcan, Gunay and Ertac (2003) studied the period 1968-1994, and used private and public saving rates given in the World Saving Database (WSD), which is the largest data set on aggregate saving measures assembled to date (see Loayza *et al.*, 1998a for a detailed description of WSD). The current study uses private and public saving rates obtained from State Planning Organization (SPO) database, and is different in the time aspect as well. In addition, the effects on savings of a number of new socioeconomic and education variables are explored.

The organization of the paper is as follows: Section 2 gives a brief overview of the policy environment and saving behavior in Turkey.

Section 3 summarizes the potential determinants of private savings and the related literature. Section 4 introduces the data, presents the empirical specification and the estimation results. Section 5 concludes.

2. Policy Environment and Savings Behavior in Turkey: 1975-2008

We first present a brief overview of the evolution of the Turkish economy in the focus period, to provide context for the analysis of savings. Turkey experienced a foreign-financed boom in the mid-1970s, and grappled with a severe debt crisis in 1978-80. The 1978-80 debt crisis mainly affected investment rather than saving, and the aggregate saving rate only fell from 20.9% to 17.3% (see Metin-Ozcan, Voyvoda and Yeldan (2001)). After the crisis, Turkey started to undertake some new economic policies, the basic characteristic of which was that market mechanisms and market prices governed the processes of economic decision. Starting from the 1980s, Turkey started to shift to free market conditions in the financial and external markets, as well as in the production factors (labor and capital) markets. During this period, the main policy goal was to decrease the external trade deficit. Therefore, governments placed considerable emphasis on increasing exports, adjusting exchange rates and macroeconomic policies accordingly.

The post-1980 reform caused a substantial rise in aggregate saving, which served two main purposes in this period: to reduce inflation and to lower domestic absorption, in order to make room for export expansion from existing productive capabilities. During the post-1980 period, the rise in aggregate saving was because of the public saving component, which overrode the decline in the private saving rate in this period. However, as the annual growth rate of the Turkish economy increased after 1985, public saving began to worsen and private savings recovered (see Figure 1). Public saving gap and domestic inflation increased in this era. Turkey faced huge external debt service, which widened fiscal deficits. Moreover, domestic borrowing resulted in higher interest rates, and hence larger volumes of interest payments by the public sector were observed. As a result, public saving started to decline and private investment began to rise, as is usually the case in response to increasing interest rates in countries like Turkey, where the amount of public debt is high. Interest rate and domestic inflation therefore became instrumental in boosting private savings (see Celasun

and Tansel (1993)). This process was one of the main reasons for the 1994 economic crisis in Turkey. In general, it is possible to state that Turkey showed an increasing trend in private savings during the 1980-1994 period (see Figure 1).

The 1994 crisis caused a significant shift in income distribution in Turkey. As real wages continued to decline, foreign capital inflows enabled the financing of the fiscal gap and the current account deficit. The cost of these adjustments to the Treasury, however, was the acceleration of the interest burden on its borrowing instruments. The interest rate and inflation rose more than 30% in real terms. Therefore, aggregate saving rate, especially private saving rate increased in 1994 (see Metin-Ozcan, Voyvoda and Yeldan (2001)). Hence, total domestic saving in Turkey has declined since 1988 and the decline in the saving rate was driven by the public sector during the period of 1988-2001 (World Bank, 2011).

After 1998, public disposable income could not offset the public spending and the inevitable need for public investments, consequently public savings turned to negative again. This rise in the public deficit was one of the main reasons for the instability in the Turkish economy, with adverse effects on the monetary balance and inflation. Private savings, on the other hand, increased during these years, and especially beginning from 2002, more than half of the private savings were transformed to investment (see Figure 1).

Turkey started to apply a new stabilization program to eliminate economic instability by making structural reforms in 2000. In the beginning, interest rates fell more than expected due to the high rate of exchange inflows, due to the fact that the Central Bank did not give any credit to the public. Decreasing interest rates and the Central Bank decision not to intervene led to a decline in individuals' saving trends. Hence, consumption increased and demand encouraged inflation. The decrease in private savings had positive effects on the public accounts and the public debts, but this situation also had some negative effects on the economy. For example, consumption and external debt increased. With this program, the goal was to increase the investment by decreasing the interest rates. Nevertheless, the investment of many

sectors did not increase, and the increasing consumption of individuals resulted in the decrease of individual's private saving rate.

Turkey faced another crisis in February 2001, which resulted in an immense capital outflows. Consequently, interest rates increased and while private savings reached its maximum level, public savings declined to a minimum in 2001. Beginning from June 2001, Turkey implemented an International Monetary Fund-led (IMF) Standby Program, which involved structural reforms. Nonetheless, the high consumption trend continued to be a basic problem for the Turkish economy due to the current account deficits caused by high exchange rates. After 2001, as private savings declined, public savings started to rise, going from negative to positive values in 2004. However, private savings fell drastically between 2004 and 2005 (see Figure 1), and the gap between them was almost closed in 2006. In sum, after 2001, the decline in the saving rate was driven by the fall in private saving, since this fall was greater than the increase in public saving. Mainly a rise in credit flows with reduced interest rates and inflation caused an increase in consumption; therefore, private saving declined (World Bank, 2011). Also, the Global Financial Inclusion Database announced its survey about 148 countries' saving tendency for 2010. According to this database, only 9.5% of people participating in the survey saved in Turkey, while this ratio is nearly 34% in the upper-middle income countries (Acar, 2012).

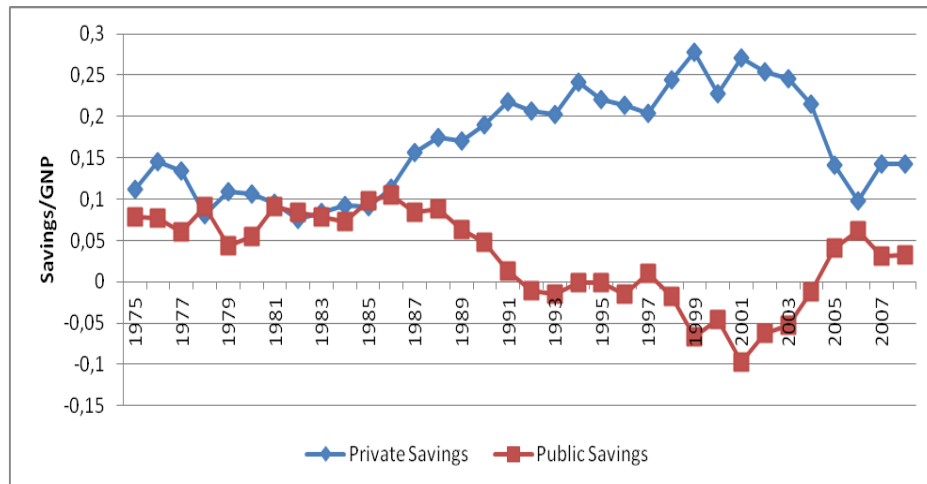


Figure 1. Trends in Private and Public Savings in Turkey over the period 1975-2008

3. Potential Determinants of Private Savings

Based on the theoretical and empirical literature on savings, the main potential determinants of savings can be grouped loosely under the headings of government policy variables, financial variables, income and growth variables, demographic variables, uncertainty variables and external variables, socioeconomic variables, and education and employment variables. In this section, we provide a summary of the theoretically-predicted effects of these variables on private savings, as well as presenting the results from previous empirical work that has studied these factors.

Economic theory models savings choice as an outcome of intertemporal utility-maximization by rational agents. The aforementioned “life-cycle approach” (Modigliani (1970)), which is the main model used in studies of savings behavior, posits that individuals seek to smooth out consumption over time; saving in “good times” to consume in “bad times”. This precautionary motive for savings fundamentally affects saving behavior in the economy through a number of channels, which we discuss in detail in the following subsections, where a variety of policy and non-policy variables relevant to saving are outlined.

Inertia:

It is an empirical fact that saving rates generally show inertia, which means that they are serially correlated, even after controlling for other factors (Nola (2008)). The implication of inertia is that factors that affect saving rates will have larger impact in the long-term than in the short-term. In order to capture inertia, we include the lagged private saving rate in our empirical analyses.

Government Policies:

The actions of the government can influence the private savings rate through a multitude of channels. The effects of fiscal policy and especially public savings have been the foci of different theoretical approaches, predicting different outcomes. The neoclassical life-cycle model predicts that a decline in government savings will tend to raise consumption and lower national savings by shifting the tax burden from present to future generations. The Keynesian model, on the other hand, suggests that higher savings will result from a temporary reduction in public savings. The well-known Ricardian theory argues that an increase in government savings should have no effect on national savings, since it would be offset by a decline of equal magnitude in private saving (“Ricardian equivalence”).

There is also a considerable amount of empirical work that has studied the relationship between public and private savings. For example, Nicholas (2007) finds that higher government expenditure is associated with lower domestic savings in South Africa, while Pradeep and Pravakar (2009) show that the private savings rate is affected by the public saving rate in Bangladesh. Similarly, Bhandari *et al.* (2007) find that government expenditures have a negative impact on private saving. Empirical studies generally find that the Ricardian equivalence hypothesis does not hold fully, although some offsetting exists—that is, the crowding out is only partial³. If there is only partial crowding out, an increase in government savings can help raise national saving (Dayal-Gulati and Thimann (1997)). IMF (2005) and IMF (2007) show that an increase in government saving is associated with lower private saving,

³ See Corbo and Schmidt-Hebbel (1991) for a detailed survey.

but offsets are far from complete for developing countries. In the particular case of Turkey, IMF (2007) and Metin-Ozcan, Gunay and Ertac (2003) both find evidence for crowding out. IMF (2007) places this offset at -0.7, suggesting that an increase in government saving would fail to rise overall saving by a large amount in Turkey. Also, World Bank (2011) implies that there is no empirical evidence for full Ricardian equivalence in Turkey. Moreover, Holmes (2006) finds low levels of substitutability for the entire Organisation for Economic Co-operation and Development (OECD) panel. On the other hand, Kelly and Mavrotas (2003) investigate the determinants of private saving in Sri Lanka and they find some evidence in support of the Ricardian equivalence hypothesis.

Since precautionary motives are primary determinants of savings, government-run social security programs can also influence private savings decisions. World Bank (2011) states that Turkish households have a strong precautionary motive for savings. The life-cycle model predicts that high social security benefits will tend to lower private saving rates, primarily via the weakened motive for retirement and precautionary savings (see Evans (1983)). Empirically, Feldstein (1980, 1995) finds a significant negative impact of pensions systems on private savings, and Edwards (1995) finds social security schemes to have a significant impact on private saving in developing countries.

Income and Growth Variables:

The relationship between savings and income as well as savings and growth is frequently discussed in the macroeconomics literature. According to subsistence-consumption theories, countries with higher income levels tend to have a higher saving rate, which is a prediction that has been strongly supported empirically (Edwards (1996), Dayal-Ghulati and Thimann (1997), Loayza, Schmidt-Hebbel and Serven (2000), Metin-Ozcan and Ozcan (2000), Metin-Ozcan, Gunay and Ertac (2003), Ismihan *et al.* (2005), World Bank (2011)). Rijckeghem and Ucer (2009) show that income has statistically significant positive effects for both 2004 and 2005 in Turkey. Moreover, Carroll *et al.* (1993) and Carroll and Weil (1994) indicate that incomes have often risen before savings rates rather than after, suggesting a causality that runs from income to savings.

Regarding the effect of income growth, however, the theory is less clear: The life-cycle approach suggests that savings of active workers relative to the dissavings of people out of the labor force will increase in response to an increase in income growth, causing a rise in aggregate savings. On the other hand, according to the permanent income hypothesis, increased growth would also imply higher anticipated future income, creating incentives to dissave against future earnings. Empirically, the study of growth and savings involves an endogeneity problem, since saving affects growth via its impact on investment and capital accumulation and in turn, growth affects savings through the above-mentioned channels. Many studies have found evidence for a “virtuous circle” going from higher growth to higher savings and to even higher growth (Modigliani (1986), Collins (1989)). In studies employing instrumental variable techniques and various causality tests to overcome the endogeneity problem, the result has been maintained (see Edwards (1996)). Carroll *et al.* (1993) and Carroll and Weil (1994), for example, find that income and savings growth are highly correlated and growth indeed drives savings rather than the other way around. Similarly, Nicholas (2007), Attanasio *et al.* (2000) and Bhandari *et al.* (2007) find that growth and savings are positively related. Growth was also found to have a positive and significant effect for East Asian countries in the pre-crisis period of 1970-1995 (see Thanoon and Baharumshah, 2005). In the case of Turkey, IMF (2007) finds that Turkey has a statistically significant and large positive growth coefficient on savings, but Metin-Ozcan, Gunay and Ertac (2003) did not find a statistically significant effect. We explore this issue for Turkey again with the new dataset in this paper.

Financial Variables:

One major financial variable that can influence savings is the real interest rate. Theoretically, the effect is ambiguous, since a change in the interest rate entails opposing substitution and income effects. Specifically, the income effect will cause an incentive to dissave, whereas the intertemporal substitution effect will lead to higher savings, since it increases the opportunity cost of consumption. Empirically, the majority of studies have found only a weak interest elasticity of private savings (Boskin (1978), Giovannini (1983), McKinnon (1991), Metin-Ozcan and Ozcan (2000)), suggesting that the two effects neutralize

each other. There are some studies that find a positive effect of real interest rates for both developed and developing countries (Koskela and Viren (1982), Balassa (1992), Masson et al. (1998), Nicholas (2007)), whereas some find a small negative effect (Thanoon and Baharumshah (2005) for East Asian countries) and some find no effect (Bhandari *et al.* (2007) for South Asia). Although IMF (2007) and Metin-Ozcan, Gunay and Ertac (2003) find no statistically significant effect of the real interest rate for Turkey, World Bank (2011) implies that the fall in the interest rate decreased private saving.

Variables that capture the degree of development of the financial sector can also be relevant for savings, especially for a developing country like Turkey, which has experienced a process of financial liberalization.⁴

One such variable is financial development/depth, proxied by the degree of monetization of the economy, i.e. the M2/GNP ratio, where M2 represents money plus quasi-money. The sign of this variable has been found to be positive across empirical studies (see Edwards (1996), Dayal-Gulhati & Thimann (1997), Loayza, Schmidt-Hebbel and Serven (2000), Metin-Ozcan and Ozcan (2000), Thanoon and Baharumshah (2005), Metin, Gunay and Ertac (2003)). World Bank (2011) refers that financial markets are critical in channeling private savings and policies should target both improvements in the saving rate and financial deepening for Turkey to benefit from saving in the economy. Another important factor is borrowing constraints, which can increase the motive for precautionary savings and savings for purchases such as houses/cars.⁵ Rijckeghem and Ucer (2009) imply that an increase in consumer credit has caused a reduction in savings in Turkey after 2001. We would therefore expect a relaxation of the borrowing constraint to

⁴ Aron and Muellbauer (2000) show the importance of financial liberalization in private saving behaviour. Similarly, Bhandari *et al.* (2007) find that the level of financial development have a positive effect on private saving in South Asia. Indirectly, financial liberalization could also affect savings through its effect on growth. If savings and growth are highly positively correlated in the long run, financial liberalization can have an indirect long-run impact on savings. Ucal *et al.* (2010) analyzes whether and to what extent the inflow of FDI is affected before and after the occurrence of a financial crisis in developing countries.

⁵ Akkoyunlu (1998) thoroughly discusses the effects of housing wealth on Turkish consumption and saving.

have a negative impact on savings (see Metin-Ozcan, Gunay and Ertac (2003)).

Stock market development can also be used as a proxy for financial development, since it provides an alternative means for increasing capital and it gives individuals the opportunity to diversify their risks and potentially increase their savings. Levine and Zervos (1998) and Bonser and Dewenter (1999) used the market size (the ratio of market liberalization to nominal GDP), the ratio of the liquidity of the market to the size of the economy (Value Traded/GDP) and the turnover ratio (Value Traded/Market Capitalization), in order to measure the development of the stock market.⁶ Levine and Zervos (1998) found that there is a positive relation between the size of the stock markets and private savings. Bonser and Dewenter (1999) obtained the same result, but they also stated that neither the growth of the stock market nor the shrinking of the stock market has a one-to-one relation with the saving rate. We use all of the above measures for financial development in our analyses.

Demographic Variables:

Life cycle and precautionary saving theories emphasize the effects on savings of “demographic variables”, such as the urbanization ratio, the age distribution of the population and life expectancy.⁷

Since individuals aim to smooth out consumption over their lifetime, they will save when they expect future income to be low and dissave when they anticipate it to be high. This implies that people who are out of the labor force will dissave, either against future earnings (as in the case of the very young) or against previously accumulated savings (as in the case of the old), whereas active, productive workers will have positive savings (Modigliani (1970)). Therefore, the age composition of the population is expected to influence private savings.

These insights have been captured in empirical work with different variables. It has been shown that savings rates increase in response to an

⁶ Here, the market values of firms were defined as market capitalization.

⁷ In fact, these variables are sometimes termed life-cycle variables.

increase in the share of the working population relative to that of retired persons (see Lahiri (1989), Edwards (1996), Dayal-Gulati and Thimann (1997), Loayza, Schmidt-Hebbel and Serven (2000)). Many studies have used the young and old dependency ratios (YD and OD, respectively), where a decline in savings would be expected in response to an increase in the value of either of these variables. In fact, many researchers have projected a downward trend in the saving rate, as populations age, birth rates decline and life expectancy increases (see, for instance, Masson, Bayoumi and Samiei, 1995). However, an increase in life expectancy can also lead individuals to increase precautionary savings, since they expect a longer retirement period (Doshi (1994)). In general, it is well-documented in the literature that demographics can significantly affect savings (see, Rossi (1989), Attanasio and Browning (1995)). Pradeep and Pravakar (2009), for example, find that dependency ratio is one of the main determinants of the total savings rate in Bangladesh. Thanoon and Baharumshah (2005) find that the dependency ratio for East Asian economies has a negative influence on the saving ratio, but that demographics explain only the longer-term trends in savings and not short-term fluctuations. On the other hand, Bhandari *et al.* (2007) cite that dependency ratio has no noticeable impact on private saving in South Asia. Also, IMF (2007) and Metin-Ozcan, Gunay and Ertac (2003) state that YD and OD has a negative relation with saving rate in many studies, but they emphasize these variables were not significant in the Turkey-specific studies due to the lack of variance in the series. The current study addresses this issue with the new dataset. Moreover, in Turkey, although World Bank (2011) emphasizes that higher YD ratios decreases savings, households with higher OD ratios save more because old people have higher health risks and consequently higher health expenditure.

Another relevant demographic variable is the urbanization ratio, defined as the percentage of the total population living in urban areas. This variable is also expected to have a negative impact on saving, since rural societies face greater volatility of income, and urbanization reduces the need for precautionary saving. However, Bhandari *et al.* (2007) and Metin-Ozcan, Gunay and Ertac (2003) find no significant effect of this variable on private saving in South Asia and Turkey, respectively.

Uncertainty Variables:

Uncertainty about the future influences savings rates, since it creates a motive for precautionary savings for hedging risk.

Macroeconomic uncertainty is usually proxied by the inflation rate in empirical studies. Using different groups of countries, Koskela and Viren (1985), Masson, Bayoumi and Samiei (1998), and Gupta (1987) find that savings increase as the inflation rate increases. Nicholas (2007) finds a positive but statistically insignificant effect for South Africa, whereas IMF (2005) and Metin-Ozcan, Gunay and Ertac (2003) find a significant effect for Turkey. Both World Bank (2011) and Rijckeghem and Ucer (2009) imply that the large decline in inflation in Turkey after the 2000s led to a drop in private saving in Turkey. Political instability, which creates an uncertain economic environment for agents, would also be expected to influence savings positively. We capture this effect in our analyses by controlling for changes in government. It is also possible to obtain a proxy for uncertainty at the individual level by the extent of government-run social security and insurance programs and/or the urbanization ratio –implying decreased volatility of income.⁸

External Variables:

External variables such as terms of trade and the current account deficit might be relevant for savings for an open economy. Terms of trade is a critical variable, particularly for the oil exporters (Ostry and Reinhart (1992), Dayal-Gulati and Thimann (1997), Loayza, Schmidt-Hebbel and Serven (2000)). Improvements in the terms of trade increase saving through their positive effect on wealth and income (Fry (1986), Masson, Bayoumi and Samiei (1995), Nicholas (2007)). For Turkey, Metin-Ozcan, Gunay and Sertac (2003) find a similar effect but IMF (2007) does not. World Bank (2011) implies that terms of trade are expected to increase private savings, potentially through promoting exports and a subsequent positive impact on income and growth. In fact, deterioration in terms of trade was one of the reasons of declining in the Turkish

⁸ Note that these variables were discussed under different headings above. Since many variables have multiple effects, the same variable could be categorized in multiple headings and a strict categorization is not possible.

private saving rate between 2003 and 2007, due to the sharp increase in energy prices (Rijckeghem and Ucer (2009)). As for the current account deficit, the standard view is that an increase in the current account deficit would be met by a partial decline in private saving, since external saving may tend to act as a substitute for domestic private saving (Loayza, Schmidt-Hebbel & Serven (2000)). Thanoon and Baharumshah (2005) also showed a significant negative effect of foreign savings on domestic savings rate.

Socioeconomic Variables:

Brenner, Dagenais and Montmarquette (1994) find that the increasing divorce rate, the rise in women's participation in the labor force and the increases in investment in women's education led to a decline in the saving rate during the 1970s and the 1980s in the US. Hence, private savings might fall, but women's investment on human capital is going up. However, World Bank (2011) and Uysal *et al.* (2012) imply that households in which more women work save more in Turkey, therefore, the female labor force participation rate has positive and significant effects on saving rates.

Education and Employment Variables:

Denizer, Wolf and Ying (2002) have analyzed the effect of educational attainment and occupation on savings rates. Their idea was that individuals with higher educational attainment should have lower saving rates because they are more likely to be wage earners than individuals with lower educational attainment. Similarly, individuals with lower educational attainment might be more likely to be self-employed, so they should save more. Similarly, Morisset and Revoredo (1995) argue that education and saving would be negatively correlated with less need for precautionary saving among the more educated in the short run. However, in the long run positive relations between education and savings might be seen. They showed that for each percentage point increase in education stock, the saving rate increases 0.37 percent, but it takes more than five years for this positive effect for 74 countries panel model. World Bank (2011) finds positive relationship between education levels and saving rates. Contrary to Yilmazer (2010) and Cilasun and Kirdar (2009), Rijckeghem and Ucer (2009) show saving rates and

education level have a negative relation in Turkey.⁹ On the other hand, households in which the head is an employer or is self-employed save more in Turkey (World Bank, 2011). Similarly, Rijckeghem and Ucer (2009), Yilmazer (2010) and Uysal *et al.* (2012) find that being self-employed and saving rates have positive relation in Turkey.

4. Empirical Analysis

Data:

We start by describing the variables in our dataset and the notation we use in our empirical analysis. *S* is defined as the private saving rate ($S = \text{Private Savings/GNP}$), while *GS* represents the public saving rate ($GS = \text{Public Savings/GNP}$). *M2* indicates the ratio of money plus quasi-money to GNP, REALTD^{10} is the real interest rate on savings deposits. *CR* denotes credit to the private sector (end of period), expressed as a percentage of GDP. *TT* stands for the terms of trade, proxied by the ratio of nominal exports to nominal imports. *CAD* represents the current account deficit ratio, calculated as the difference between imports and exports over GNP. Data on private savings, public savings, *M2* and GNP were taken from the Turkish State Planning Organization (SPO), data for credit and trade data were obtained from the database of the World Bank (WB).

LY and *DLY* are income and growth variables respectively, the former representing the level and the latter the growth rate of GNP. *LY* was calculated by the logarithm of the GNP. *INF* is the inflation rate, measured by the annual change in the GDP deflator, which was obtained from the WB database. In addition, we constructed two dummy variables, one to represent political instability and the other to capture the effects of Turkish crisis years on the private saving rate. The political instability variable, *POLINS*, is a dummy that takes on the value of 0 if there has been no government change in a given year, 1 if there has been one government change, and 2 if there has been more

⁹ Yilmazer (2010) and Cilasun and Kirdar (2009) find that savings increase with education.

¹⁰ REALTD was calculated by $r = (n+1)/(i+1) - 1$ formula. *n* is nominal interest rate on saving deposits, taken from SPO and *i* is the inflation rate, measured by the annual change in the GDP deflator, taken from WB.

than one change. The crisis dummy, DUMMY, on the other hand, takes on the value of 1 in the years of economic crisis and zero otherwise.

Among the demographic/life-cycle variables, YD and OD are age dependency ratios, the former defined as the ratio of the population younger than 15 to the total population, and the latter defined as the ratio of the population older than 65 to the total population. UR is the urbanization ratio, which expresses the percentage of the population living in urban areas. LEX denotes life expectancy at birth. All data for the demographic/life-cycle variables were obtained from the United Nations (UN) database.

Among the socioeconomic variables, FLP is the female labor participation rate, defined as the ratio of the total female labor force to the female non-institutional civilian population. WUDR is the rate of women having a university degree, defined as the ratio of the total number of women having university degree to the female non-institutional civilian population and DR is divorce rate. These variables were obtained from the Turkish Statistical Institute (TSI).

The data for the stock market are only available from 1988 on for Turkey. MC represents the capitalization rate of the listed firms, defined as the ratio of the market capitalization to the GDP (the market values of firms capture market capitalization). In addition, ST shows the total stock value traded rate that is the ratio of total value traded to GDP, and SM is the turnover ratio, defined as the ratio of total value traded relative to market capitalization. All data for the stock market variables were obtained from the World Bank database.

All data for the education and employment variables also start from the year 1988 (taken from the TSI database). Here, PE represents the rate of employment having primary education, defined as the ratio of working population having primary education to the non-institutional civilian population. SE, HE, and UE are the rates of employment having secondary, high school and university education, respectively, all defined as ratios to the non-institutional civilian population. On the other hand, WE, SEMP and EMP denote the rates of wage earner employment, self-employed employment and employer employment

respectively, again defined with respect to the non-institutional civilian population.

Unit Root Tests

The Augmented Dickey-Fuller (ADF) (1981) tests are applied to study the unit roots in the variables. For a given variable and null order, two values are reported in each cell. The first value is the ADF statistics and the second value in the parenthesis is the longest significant lag with significant t-value. Four lags are allowed in each variable's ADF regression. All regressions include a constant term. 'C' denotes the constant term, 'C,T' denotes the constant term and time trend, and 'N' implies that the constant term and time trend are not included. If variables are in their log levels, the sample is 1975-2008 ($t = 34$). If variables are in their first differences, the sample is 1976-2008 ($t = 33$). If variables are in their second differences, the sample is 1977-2008 ($t = 32$). The ADF tests suggest that UR, M2 and LY variables are $I(2)$; S, GS, INF, DLY, CR, REALTD, YD, OD, DR, WUDR, ST, SE, HE, UE, WE, EMP, variables are $I(1)$ and LEX, TT, CAD, DUMMY, POLINS, FLP, MC, SM, PE, SEMP are $I(0)$.

Table 1. Augmented Dickey-Fuller (ADF) Test Statistics

<i>Variables</i>	<i>I(0)</i>	<i>I(1)</i>	<i>I (2)</i>
<i>S</i>	-1.51(0) ^C	-5.55(0) ^{*C}	
<i>GS</i>	-1.55(0) ^C	-5.78(0) ^{*C}	
<i>M2</i>	1.26 (0) ^{C,T}	-0.19 (1) ^C	-11.78(0) ^{*C}
<i>INF</i>	-2.42(0) ^{C,T}	-5.22(1) ^{*C}	
<i>LY</i>	-2.64(4) ^{C,T}	-1.79(0) ^{C,T}	-5.07(0) ^{*C}
<i>DLY</i>	-1.59(0) ^{C,T}	-5.16(0) ^{*C}	
<i>CR</i>	-1.07(0) ^{C,T}	-4.47(0) ^{*C}	
<i>REALTD</i>	-2.09(0) ^{C,T}	-5.86(0) ^{*C}	
<i>YD</i>	-1.49(0) ^C	-5.20(0) ^{*C}	
<i>OD</i>	1.12(0) ^N	-6.67(0) ^{*C}	
<i>LEX</i>	-4.51(0) ^{*C,T}		
<i>UR</i>	-2.17(1) ^{C,T}	-2.20(0) ^{C,T}	-5.15(0) ^{*C}
<i>TT</i>	-3.30(0) ^{**C}		
<i>CAD</i>	-3.82(0) ^{*C}		
<i>DUMMY</i>	-4.52(0) ^{*C}		
<i>POLINS</i>	-6.57(0) ^{*C}		
<i>DR</i>	-1.82(0) ^{C,T}	-5.34(0) ^{*C}	
<i>FLP</i>	-3.93(0) ^{**C,T}		
<i>WUDR</i>	-1.34(4) ^{C,T}	-6.26(1) ^{*C,T}	
<i>MC</i>	-3.42(0) ^{**C}		
<i>ST</i>	-2.83(0) ^{C,T}	-5.47(0) ^{*C}	
<i>SM</i>	-2.76(0) ^{***C}		
<i>PE</i>	-2.56(0) ^{**N}		
<i>SE</i>	-2.19(0) ^C	-3.72(0) ^{**C}	
<i>HE</i>	-1.75(0) ^{C,T}	-5.56(0) ^{*C}	
<i>UE</i>	0.30(2) ^{C,T}	-5.33(1) ^{*C,T}	
<i>WE</i>	-1.03(0) ^{C,T}	-4.44(0) ^{*C}	
<i>EMP</i>	-2.52 (0) ^{C,T}	-3.91(0) ^{*C}	
<i>SEMP</i>	-3.80(1) ^{*N}		

Note: The critical values are from MacKinnon (1991, Table 1). Here and elsewhere in this article, *, ** and *** denoterejection at the 1%, 5% and 10% level critical values respectively.

The Empirical Specification for Private Savings:

In line with the potential savings determinants outlined in Section 3, the general private saving equation including all relevant variables is constructed as follows:

$$S_t = C + \beta_0 S_{t-1} + \beta_i X_t \quad i = 1, 2, \dots, i$$

In this setting, the subscript ' t ' and C denote time and the constant term respectively, whereas X denotes all variables stated in Section 3. Our dependent variable for the private saving equation is S , which represents the private saving rate and S_{t-1} denotes the lagged dependent variable.

Estimation Results for the Private Saving Rate:

We have a set of annual data covering 1975 through 2008, and also another set of annual data covering only 1988 through 2008. Our estimation framework can be traced from the following regression results. The first column of Table 2 shows the estimates for the 1975-2008 period. In this estimation we include all the saving determinants that are available in this period as well as a dummy variable capturing the years of economic crisis in Turkey in the same period. The second column of Table 2 uses the same variables as column one, but the 1988-2008 time period. Then a set of new explanatory variables, that are available only in the 1988-2008 sample period, is added one after the other to the regression. The estimation results obtained with each addition are shown on the columns of Table 3 and 4. The results for the newly added variables are written on the bottom of the columns that are added.

The OLS estimation results of the full model in which we include all savings determinants as well as a dummy variable capturing the years of economic crisis in Turkey for the 1975-2008 periods and 1988-2008 periods are presented in Table 2.

Table 3 and Table 4 in the Appendix show the OLS estimation results for the 1988-2008 period because we do not have data for the stock market variables, socioeconomic variables and education and employment variables for the pre-1988 years. When we analyze the basic private savings estimation results presented in the tables, we can get some insight into the determination of private saving rates in Turkey, and about whether they fit the theoretical predictions that were discussed earlier. The results outlined below sometimes go against what was found in our previous work (Metin-Ozcan, Gunay and Ertac (2003)), which is due to the use of the different savings dataset with a longer time span in this paper. We mention these differences below, for comparison.

Table 2. Estimation Results of the Private Saving Model with the Economic and Demographic Variables

	1975-2008	1988-2008
<i>C</i>	-0.116 (-0.226)	-0.747 (-1.284)
<i>S(-1)</i>	0.612* (4.157)	1.051** (4.394)
<i>M2</i>	-0.431** (-2.349)	-0.967** (-4.181)
<i>INF</i>	0.044*** (1.781)	0.068** (3.486)
<i>GS</i>	-0.531* (-3.255)	-0.304 (-1.961)
<i>LY</i>	0.092*** (1.958)	0.211** (3.706)
<i>DLY</i>	-0.344*** (-2.058)	-0.893** (-4.219)
<i>CAD</i>	-0.666* (-3.495)	-0.987** (-3.708)
<i>TT</i>	0.002 (0.055)	0.027 (0.433)
<i>REALTD</i>	0.419 (1.316)	0.655*** (2.142)
<i>CR</i>	0.274*** (1.819)	0.751** (2.966)
<i>DUMMY</i>	0.017 (1.476)	0.033** (2.971)
<i>POLINS</i>	0.011*** (1.935)	0.015** (3.184)
<i>YD</i>	2.992* (2.234)	6.006** (3.597)
<i>OD</i>	-3.743 (-1.366)	-7.957*** (-2.632)
<i>LEX</i>	-0.017* (-3.312)	-0.021** (-3.961)
<i>UR</i>	0.249 (0.751)	-1.162 (-1.682)
<i>R²</i>	0.969	0.992

Note: t-statistics in parentheses. (*) indicates statistical significance. Here and elsewhere in this article, *, ** and *** denote rejection at the 1%, 5% and 10% level critical values respectively.

Inertia:

The presence of inertia in private saving rates in Turkey is clearly evident in the empirical results given in Table 2, as the coefficient of the lagged private saving rate is positive and statistically significant. The coefficients of the lagged saving rate are 0.612 and 1.051 for the 1975-2008 period and the 1988-2008 period respectively, implying that the long-term impact of the factors that affect the private saving rate is greater than the short-term impact. This result on persistence is consistent with the findings of previous research (Loayza *et al.*, (2000) and Metin-Ozcan, Gunay and Ertac (2003)).

Government Policies:

Table 2 shows that although there is a negative relation between the public saving rates (GS) and the private saving rates as expected, offsets are not complete. Therefore, this result indicates that the “Ricardian Equivalence” hypothesis does not hold fully (see Metin-Ozcan, Gunay and Ertac (2003) and World Bank (2011)).

Income and Growth Variable:

Our analysis in Table 2 reveals that the level of income and private savings have a positive relationship as expected (Edwards (1996), Dayal-Ghulati and Thimann (1997), Loayza *et al.*, (2000), Metin-Ozcan and Ozcan (2000), Metin-Ozcan, Gunay and Ertac (2003), Rijckeghem and Ucer (2009), World Bank (2011)). However, the growth rate of income is negative and statistically significant (see Table 2)¹¹. This indicates that, the “virtuous circle” prediction discussed earlier does not seem to hold for Turkey, possibly due to the lack of a sustained and stable phenomenon of growth in the economy.

Financial Variables:

The coefficient for the money to GNP ratio is negative and statistically significant. This finding does not confirm the prediction that an increase

¹¹ Metin-Ozcan, Gunay and Ozcan (2003) had found insignificant and different signs of coefficients for the growth rate of income.

in “financial depth”, as proxied by the increase in the M2/GNP ratio, is likely to be very important in a country like Turkey, which is undergoing a financial liberalization process.

The coefficient for the real interest rate (on saving deposits) is insignificant with positive sign for the 1975-2008 period, but significant and positive for the pre-1988 period (Table 2). This finding fits the results of many previous empirical studies mentioned earlier and our previous research (Metin-Ozcan, Gunay and Ertac (2003)), which found an insignificant but positive impact of the real interest rate.

We find significantly positive coefficients for the borrowing constraint in Table 2. These results suggest that the relaxation of credit constraints does not lead to a significant decrease in the private saving rate in Turkey. This result is not consistent with Metin-Ozcan, Gunay and Ertac (2003). Also, the estimation results in Table 3 show that although financial development, as measured by stock market development, does not show a positive effect on the private savings in Turkey, only turnover ratio leads to an increase in private savings, with a statistically insignificant coefficient.

Demographic Variables:

According to Table 2 results, only two of the demographic variables (OD and LEX) have negative coefficients, as expected, but only the coefficient of life expectancy is statistically significant for the 1975-2008 period. However, three of the demographic variables (OD, LEX and UR) reduce private savings in Turkey after 1988, but the coefficient of urbanization rate is statistically insignificant.¹²

Uncertainty Variables:

The estimation results in Table 2 show that, as expected, inflation has a significant positive coefficient, as in our previous finding (Metin-Ozcan, Gunay and Ertac (2003)). This result is not surprising because Turkey

¹² Metin-Ozcan, Gunay and Ertac (2003) had found insignificant and negative coefficients for the YD and UR, a negative and significant coefficient for LEX, and insignificant positive coefficients for private savings and OD.

has struggled with high inflation for decades. World Bank (2011) and Rijckeghem and Ucer (2009) show that the large decline in inflation during the 2000s was important for the drop in private saving in Turkey. On the other hand, the coefficient for the crisis dummy and the coefficient of political instability are positive, which supports our expectations about the impact of these variables.

External Variables:

Among the external variables, we observe that although the terms of trade (TT) is insignificant, it increases the private savings in Turkey (see Table 2), in line with the results of Metin-Ozcan, Gunay and Ertac (2003) and World Bank (2011). On the other hand, the regression results in Table 2 show that CAD has statistically significant negative effect on the private saving, in contradiction with the result of Metin-Ozcan, Gunay and Ertac (2003).

Socio-Economic Variables:

The results in Table 3 show that the rise in the rate of women having a university degree and the divorce rate decreases private savings insignificantly in Turkey after 1988. The female labor participation rate also has a negative relation with private savings in Turkey, unlike in World Bank (2011) and Uysal *et al.* (2012).

Education and Employment Variables:

Table 4 shows that the increase in the rate of self-employed employment leads to a significant decrease in private savings in Turkey for the post-1988 period contrary to the findings of Rijckeghem and Ucer (2009), Yilmazer (2010), Uysal *et al.* (2012) and World Bank (2011). On the other hand, the rate of employment having university education and private savings have negative relations, as in Rijckeghem and Ucer (2009).

6. CONCLUSION

This paper examines the empirical determinants of private savings for Turkey. The current study broadens Metin-Ozcan, Gunay and Ertac (2003), using a different savings dataset that spans a longer time period. One main conclusion of our analysis is that in Turkey, private saving rates display strong inertia and they are highly serially correlated. Therefore, the effects of a change in any given saving determinant are fully realized in the longer term than the short-term (less than a year period).

Another main finding is that the government savings-to-GNP ratio has a negative impact on the saving rate, confirming the hypothesis that government savings will tend to crowd out private savings.

Income level has a positive and significant impact on the private saving rate, which supports some evidence that more advanced countries will tend to save a higher percentage of their GDP. The growth rate of income, however, is statistically significant but negative. Therefore, we do not find support for the hypothesis that there is a virtuous circle going from faster growth to increased saving to even higher growth. Our result using the degree of monetization of the economy as a financial depth/development measure for Turkey does not suggest that countries with deeper financial systems will tend to have higher private saving rates. The hypothesis that inflation would capture macroeconomic volatility and create a precautionary motive for saving is supported by our analysis, where inflation has a significant effect. Turkish economy has started to liberalize beginning from 1988 and accordingly stock market has started to develop. This situation has not led to a big positive impact on the private savings in Turkey as expected in our analysis. On the other hand, the loosening of the borrowing constraints, as measured by the credit to the private sector, has led to a rise in private savings in Turkey.

We have also investigated whether external factors influence private saving or not, since Turkey is an open economy. The first potential external factor influencing private saving is terms of trade and we found that terms of trade shocks have a positive but insignificant effect on

private savings in Turkey. Also, the current account deficit seems to have a significantly negative effect on savings in Turkey.

As for demographic variables, the old dependency ratio and life expectancy has a negative impact on the private savings in Turkey.

Furthermore, it is important to investigate how socioeconomic, education and employment variables influence private savings in Turkey. The data provide some results that support our predictions and some that do not. The increase in the rate of self-employed employment and the rate of employment having university education, for example, decrease private savings. Also, the rise in the female labor participation rate leads to a decrease in private savings contrary to our predictions in Turkey since 1988.

The empirical findings presented here indicate a number of variables that are crucial in affecting private savings in Turkey. They clearly indicate the role of policies pursued by the country and the complexity of the relationship between saving and other variables that affect saving.

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APPENDIX

Table 3. Estimation Results of the Private Saving Model with the Economic, Demographic, Financial and Socio-Economic Variables for the 1988-2008 period

		MC	SM	ST	DR	WUDR	FLP
C	-0.747 (-1.284)	-0.645 (-0.985)	-0.774 (-1.176)	-0.613 (-0.962)	0.237 (0.272)	-1.352 (-1.651)	-0.872 (-1.754)
S(-1)	1.051** (4.394)	1.200** (3.343)	1.100** (3.709)	1.042** (4.123)	-0.025 (-0.032)	0.947** (3.683)	1.161** (5.444)
M2	-0.967** (-4.181)	-1.090** (-3.368)	-1.016** (-3.527)	-0.918** (-3.637)	-0.779*** (-3.160)	-0.858** (-3.406)	-1.001** (-5.090)
INF	0.068** (3.486)	0.073** (3.189)	0.070*** (3.119)	0.065*** (3.059)	-0.046 (-0.559)	0.043 (1.416)	0.069** (4.177)
GS	-0.304 (-1.961)	-0.353 (-1.883)	-0.307 (-1.756)	-0.333 (-1.982)	-0.090 (-0.439)	-0.143 (-0.656)	-0.401*** (-2.779)
LY	0.211** (3.706)	0.277 (2.195)	0.224*** (3.061)	0.239** (3.387)	-0.124 (-0.513)	0.206** (3.667)	0.218** (4.525)
DLY	-0.893** (-4.219)	-1.012** (-3.334)	-0.959** (-3.287)	-0.844** (-3.635)	-0.371 (-0.893)	-0.824** (-3.754)	-0.939** (-5.187)
CAD	-0.987** (-3.708)	-1.004** (-3.443)	-1.056*** (-3.045)	-0.846*** (-2.521)	-1.498** (-3.461)	-1.015** (-3.830)	-1.541** (-3.756)
TT	0.027 (0.433)	0.066 (0.706)	0.040 (0.520)	0.030 (0.458)	-0.075 (-0.823)	0.011 (0.178)	-0.085 (-0.979)
REALTD	0.655*** (2.142)	1.036 (1.453)	0.736 (1.836)	0.783 (2.157)	-1.109 (-0.867)	0.421 (1.112)	0.771*** (2.875)
CR	0.751** (2.966)	0.931 (2.293)	0.856 (2.198)	0.658 (2.243)	0.356 (0.991)	0.630 (2.278)	0.824** (3.767)
DUMMY	0.033** (2.971)	0.044 (2.028)	0.035*** (2.583)	0.041*** (2.599)	-0.013 (-0.381)	0.027 (2.130)	0.031** (3.217)
POLINS	0.015** (3.184)	0.018*** (2.372)	0.015*** (2.846)	0.014*** (2.951)	0.009 (1.781)	0.012*** (2.456)	0.016** (4.051)
YD	6.006** (3.597)	7.454*** (2.477)	6.466*** (2.923)	6.288** (3.494)	-3.157 (-0.474)	5.658** (3.355)	7.246** (4.511)
OD	-7.957*** (-2.632)	-10.669 (-1.916)	-8.798 (-2.191)	-8.817*** (-2.609)	11.712 (0.825)	-7.349*** (-2.410)	-10.383** (-3.504)
LEX	-0.021** (-3.961)	-0.025*** (-2.657)	-0.021** (-3.319)	-0.020** (-3.603)	-0.011 (-1.334)	-0.016*** (-2.632)	-0.026** (-4.656)
UR	-1.162 (-1.682)	-1.933 (-1.304)	-1.309 (-1.517)	-1.786 (-1.638)	2.878 (0.983)	-0.596 (-0.682)	-0.336 (-0.434)
Related Variable		-0.046 (-0.604)	0.005 (0.394)	-0.044 (-0.769)	-0.143 (-1.412)	-2.255 (-1.039)	-0.514 (-1.613)
R ²	0.992	0.993	0.993	0.994	0.995	0.994	0.996

Note: t-statistics in parentheses. (*) indicates statistical significance. Here and elsewhere in this article, *, ** and *** denote rejection at the 1%, 5% and 10% level critical values respectively.

Table 4. Estimation Results of the Private Saving Model with the Economic, Demographic, Education and Employment Variables for the 1988-2008 period

		PE	SE	HE	UE	WE	SEMP	EMP
C	-0.747 (-1.284)	-0.677 (-1.081)	-0.716 (-1.052)	-0.868 (-1.695)	-1.089 (-1.636)	-0.708 (-1.046)	0.077 (0.285)	-0.379 (-0.508)
S(-1)	1.051** (4.394)	1.335*** (2.853)	1.091** (3.321)	1.243** (5.101)	0.884*** (3.075)	0.989*** (2.826)	1.109* (12.262)	0.995** (3.864)
M2	-0.967** (-4.181)	-1.182*** (-3.062)	-0.942** (-3.265)	-1.207** (-4.714)	-0.817*** (-3.002)	-0.891*** (-2.367)	-1.015* (-11.627)	-0.961** (-3.995)
INF	0.068** (3.486)	0.100 (2.063)	0.077 (1.693)	0.069** (4.064)	0.045 (1.525)	0.062 (1.925)	0.075* (10.072)	0.056 (2.222)
GS	-0.304 (-1.961)	-0.511 (-1.550)	-0.349 (-1.297)	-0.262 (-1.897)	-0.135 (-0.598)	-0.260 (-1.099)	-0.452* (-6.934)	-0.208 (-1.049)
LY	0.211** (3.706)	0.267*** (2.699)	0.226*** (2.353)	0.221** (4.437)	0.193** (3.280)	0.201*** (2.779)	0.222* (10.380)	0.210** (3.572)
DLY	-0.893** (-4.219)	-1.073** (-3.191)	-0.893** (-3.686)	-1.107** (-4.767)	-0.791** (-3.407)	-0.838*** (-2.714)	-0.952* (-11.866)	-0.933** (-4.144)
CAD	-0.987** (-3.708)	-1.224*** (-2.827)	-1.009*** (-3.155)	-1.134** (-4.518)	-0.948** (-3.549)	-0.951*** (-2.875)	-1.217* (-11.089)	-1.011** (-3.634)
TT	0.027 (0.433)	0.016 (0.250)	0.016 (0.185)	0.062 (1.052)	0.017 (0.280)	0.028 (0.394)	-0.043 (-1.595)	-0.002 (-0.033)
REALTD	0.655*** (2.142)	1.039 (1.669)	0.751 (1.344)	0.739*** (2.721)	0.374 (0.916)	0.595 (1.463)	0.741* (6.386)	0.477 (1.246)
CR	0.751** (2.966)	1.074 (2.060)	0.753*** (2.594)	0.941** (3.713)	0.601 (2.070)	0.689 (1.900)	0.810* (8.464)	0.674*** (2.416)
DUMMY	0.033** (2.971)	0.044 (2.288)	0.031 (1.837)	0.043** (3.662)	0.027 (2.170)	0.030 (1.807)	0.039* (8.975)	0.034*** (2.921)
POLINS	0.015** (3.184)	0.018*** (2.579)	0.015*** (2.706)	0.018** (3.936)	0.013*** (2.737)	0.013 (1.997)	0.014* (8.382)	0.014*** (3.057)
YD	6.006** (3.597)	8.095*** (2.387)	6.325*** (2.639)	7.188** (4.361)	5.173*** (2.806)	5.686*** (2.570)	6.439* (10.188)	5.472*** (2.960)
OD	-7.957*** (-2.632)	-11.848 (-1.890)	-8.828 (-1.683)	-9.496** (-3.370)	-6.412 (-1.912)	-7.484 (-1.955)	-8.673* (-7.592)	-6.605 (-1.870)
LEX	-0.021** (-3.961)	-0.026*** (-2.633)	-0.022*** (-2.357)	-0.025** (-4.598)	-0.017*** (-3.006)	-0.019*** (-2.922)	-0.028* (-11.413)	-0.021** (-3.901)
UR	-1.162 (-1.682)	-1.526 (-1.712)	-1.173 (-1.480)	-1.290 (-2.127)	-0.524 (-0.568)	-1.036 (-1.147)	-1.439** (-5.434)	-1.722 (-1.755)
Related Variable		-0.624 (-0.723)	-1.157 (-0.221)	2.630 (1.513)	-3.315 (-1.030)	-0.352 (-0.283)	-1.675** (-5.043)	2.387 (0.837)
R ²	0.992	0.993	0.993	0.995	0.994	0.993	0.999	0.994

Note: t-statistics in parentheses. (*) indicates statistical significance. Here and elsewhere in this article, *, ** and *** denote rejection at the 1%, 5% and 10% level critical values respectively.