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**Working Paper 0105**

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## **EXCHANGE RATE AND DOMESTIC PRICES IN THE GCC COUNTRIES\***

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**Working Paper 0105**

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## **Abstract**

This research aims at studying the effect of changes in the exchange rate on domestic prices in the GCC countries. The methodology is based on specifying and estimating domestic price equations where the exchange rate is included as a major explanatory variable. We also consider the wage-price spiral in order to investigate how inflation rates rise following a given devaluation. The results of the research suggest that the a rise in import prices, following a given devaluation, has a significant effect on domestic prices in the GCC countries. In this respect, it is found that a 10 per cent devaluation would cause a 2.1 – 7.4 per cent rise in domestic prices. Policy makers must take this into account when they design different economic policies.

## 1. Introduction

This research attempts to evaluate the effects of changes in the exchange rate, as a policy measure, on domestic prices in the GCC countries. The importance of such an attempt stems from two relevant economic facts regarding the GCC economies:

The relatively high import propensities in the GCC countries which imply that domestic prices are more sensitive to changes in import prices than to domestic economic conditions. Given this fact, it follows that any fluctuation in the exchange rate will be fully reflected in domestic prices, as long as the price elasticity of the demand for imports is low.

Most Exchange rates in the GCC countries are pegged either to a single currency or to a basket. However, trends in the world economy work in the direction of freeing exchange rates in developing countries including the GCC countries.

Given these two facts, it is necessary to consider (or simulate) the possible impact of changes in the exchange rate on domestic inflation in the GCC economies. In an effort to consider both the direct and indirect effects of changes in the exchange rate, we employ a methodology that is based on what is known as the "Wage-Price Spiral" model. The distinguishing feature of this method is that it allows the integration of changes in the exchange rate into the model. Specifically, the model developed in this study considers three main effects of the changes in the exchange rate in the GCC countries: (a) the initial effects of changes in the exchange rate on import prices, (b) the subsequent effects on domestic prices, and (c) the round effects on wages and, hence domestic prices.

The general hypothesis we seek to test in this study is that: "the effectiveness of devaluation as a policy means to cure external imbalances (or restore external balances) is likely to be reduced (or offset) by the unfavorable effects of changes in the exchange rate on domestic prices. For the GCC economies, in particular, it is hypothesized that the ultimate effect of a higher exchange rate (devaluation) will be higher domestic inflation.

Specifically, the paper aims to estimate the possible effects of changes in the exchange rate on domestic prices in the GCC countries. Therefore, the following objectives are pursued:

To estimate the initial effect of a rise in the exchange rate (real or simulated) on import prices in the GCC countries.

To identify the major variables affecting the domestic price level in the GCC countries, or simply specify and estimate a domestic price equation for each country in the GCC.

To identify the major variables that affect money wages in the GCC countries, i.e. to specify and estimate a money-wage equation for each GCC economy.

To consider the simultaneous relationship between domestic prices and money wages in the GCC countries in an attempt to investigate whether there is a wage-price spiral.

To integrate changes in import prices arising from changes in the exchange rate into the wage-price model. Then, to calculate the overall effects of changes in the exchange rate on domestic prices in the GCC countries.

To provide policy recommendations that could help decision makers in shaping economic policies related to money wages, exchange rates, and domestic inflation.

## 2. The Theoretical Framework

In developing economies there are many distortions that create external and internal disequilibria. In this respect, developing countries often experience balance-of-payment difficulties, unemployment and/or inflation. These distortions reflect the economic difficulties faced by these countries. For example, it is common in developing countries to find that the level of national expenditure (absorption) is always higher than what is desired in order to realize equilibrium. One of the major policy tools that is almost always recommended in order to cure an external and/or an internal disequilibrium (e.g. the budget deficit) is the exchange rate. In this respect, intended changes in the exchange rate will be expected to reduce and/or switch domestic expenditure into other directions. In order for this to happen in any economy three conditions must be satisfied:

- Changes in the exchange rate must cause domestic expenditure to shift towards goods and services with low cost of imports.
- The price elasticity of the domestic demand for imports must be high enough in order to ensure a reduction in the share of imports in total domestic expenditure. Otherwise, changes in the exchange rate would result in an increase in the cost of imports causing higher internal and external deficits.
- Imported goods (intermediate goods in particular) must be competitive.

If these three conditions are not satisfied one would expect a rise in the exchange rate (i.e. devaluation) to raise the domestic inflation rate thereby increasing internal and external deficits.

The model developed in this paper to systematically consider the full effects of changes in the exchange rate on domestic prices in the GCC countries is an elaboration of the work by Lipsey and Parkin (1970) and Wilson (1976). The model includes two basic equations (a price equation and a money-wage equation) that will be estimated simultaneously.

Following Parkin (1970) and Wilson (1976) the average price of a final output can be expressed as the sum of cost items plus profit per unit:

$$p = \frac{W + R + M + H}{Q} \quad (1)$$

$$p = w + r + m + h \quad (1')$$

Where:

$p$  = the average price per unit of output

$W$  = wage cost;  $M$  = import cost;  $R$  = profit;  $H$  = other costs;

$Q$  = real output.

Note: Lower case letters refer to the variables that are weighted by the level of output.

Equation (1') can be rewritten in terms of rates of change as follows:

$$\frac{dp}{p} = \frac{dw}{w} + \frac{dr}{r} + \frac{dm}{m} + \frac{dh}{h} \quad (2)$$

Equation (2) implies that the effect of changes in the exchange rate on the rate of change in domestic prices (i.e.  $dp/p$ ) will be passed indirectly through the effects of changes in the exchange rate on the rate of change in import cost (i.e.  $dm/m$ ).

### **Changes in the Exchange Rate and Import Cost**

If the price elasticity of the demand for imports is equal to zero (or if it is very low), changes in import prices will be fully reflected in import costs. This is equivalent to saying that the two terms, import prices and import costs, can be used interchangeably. In other words, in a price equation the import cost variable can be replaced by an import price variable. But this will be true only if the price elasticity of the demand for imports is very low. In this respect, the price elasticity of the demand for imports in the GCC countries will be estimated and compared to estimates of other countries.

The rate of change in import prices (i.e.  $dp_m/p_m$ ) can be broken down into two components in order to distinguish between two different sources of change:

$$\frac{dp_m}{p_m} = \frac{de}{e} + \frac{dp_m^*}{p_m^*} \quad (3)$$

where  $dp_m/p_m$  is the total rate of change in import prices,  $de/e$  is the rate of change in import prices due to changes in the exchange rate, and  $dp_m^*/p_m^*$  is the rate of change in import prices due to exogenous factors.

If the relationship between changes in the exchange rate and changes in import prices is not equi-proportional, then equation (3) will be:

$$\frac{dp_m}{p_m} = K \frac{de}{e} + \frac{dp_m^*}{p_m^*} \quad (4)$$

and

$$\partial \left( \frac{dp_m}{p_m} \right) / \partial \left( \frac{de}{e} \right) = K \quad (5)$$

where  $0 < K < 1$ . Here,  $K$  is simply the elasticity of import prices to changes in the exchange rate. Alternatively, it is the relative change in import prices ( $dp_m/p_m$ ) in relation to the relative change in the exchange rate ( $de/e$ ). It can be shown that one possible estimate of  $K$  would be the following:

$$K = \frac{\partial p_m}{\partial e} \quad \text{or} \quad K = \left( 1 - \frac{h_m}{s_m} \right) \quad (6)$$

$h_m$  is the price elasticity of the domestic demand for imports.

$s_m$  is the price elasticity of the foreign supply of imports.

The Wage-Price Spiral:

The wage-price spiral is presented by a two-equation model that is commonly used in forecasting (e.g. Lipsey and Parkin 1970 and Goldstien 1974). To ensure proper results, the price and wage equations are estimated simultaneously.

The wage equation:

$$\frac{dw}{w} = a_0 + a_1 U + a_2 \frac{dp}{p} + a_3 z \quad (7)$$

The price equation:

$$\frac{dp}{p} = \beta_0 + \beta_1 \frac{dw}{w} + \beta_2 \frac{dp_m}{p_m} + \beta_3 y + \beta_4 n \quad (8)$$

where:

p = the domestic price level.

w = money wages.

p<sub>m</sub> = import prices.

U = the rate of unemployment.

z = a set of other variable (country specific) that affect money wages.

y = a set of other variables that affect the domestic price level.

n = a set of other country-specific variables that affect the domestic price level (e.g. government expenditure).

### **The Overall Effect of Changes in The Exchange Rate:**

The overall effect of changes in the exchange rate on domestic prices will depend on a number of parameters in the model:

The extent to which changes in the exchange rate affect import prices (i.e. the magnitude of K).

The initial effects of changes in import prices (arising from the changes in the exchange rate) on the rate of change in domestic prices (i.e. the value of  $\beta_2$  in equation 8).

The effects of the change in the rate of change in domestic prices (due to the change in import prices) on the rate of change in money wages (i.e. the value of  $a_2$  in equation 7).

The changes in domestic prices arising from the changes in money wages (i.e. the value of  $\beta_1$  in equation 8).

The last three effects can be combined together by solving equations (7) and (8) simultaneously for dp/p, and differentiating with respect to dp<sub>m</sub>/p<sub>m</sub> as follows:

$$\partial\left(\frac{dp}{p}\right)/\partial\left(\frac{dP_m}{P_m}\right) = \frac{\beta_2}{(1-a_2\beta_1)} \quad (9)$$

where, (dp/p) and (dP<sub>m</sub>/P<sub>m</sub>) are the rates of change in domestic prices and import prices, respectively.

Equation (9) together with equation (6) give the overall effects of a rise in the exchange rate (i.e. a devaluation) on domestic prices as follows:

Equation (10) can be re-written as follows:

$$\partial\left(\frac{dp}{p}\right)/\partial\left(\frac{de}{e}\right) = \frac{\partial\left(\frac{dp}{p}\right)}{\partial\left(\frac{dp_m}{p_m}\right)} \cdot \frac{\partial\left(\frac{P_m}{P_m}\right)}{\partial\left(\frac{de}{e}\right)} = \frac{\beta_2}{1-a_2\beta_1} \cdot K \quad (10)$$

$$Z = X \cdot Y \quad (11)$$

$$X = \frac{\partial\left(\frac{dp}{p}\right)}{\partial\left(\frac{dp_m}{p_m}\right)}$$

$$Y = \frac{\partial \left( \frac{P_m}{e} \right)}{\partial \left( \frac{de}{e} \right)}$$

Where: X = the change in domestic prices arising from changes in import prices.

and Y = the change in import prices arising from changes in the exchange rate.

The model outlined above is useful in considering empirically a number of hypotheses. First, the traditional hypothesis of devaluation predicts that if the well-known Marshall-Lerner condition is satisfied, devaluation (i.e. the reduction in the value of the home currency or the rise in the exchange rate) will create a competitive price advantage for the home economy. In our model if  $(Y-X)/Y = 1$ , the entire competitive price advantages of devaluation will be retained. In other words, devaluation will be fully reflected in import prices, making domestic production more competitive. That is, no effects of devaluation are passed on to domestic prices. In this case the value of  $B_2$  must be zero. In other words, devaluation will be effective if subsequent rises in domestic prices do not follow.

Second, the argument against successful devaluation depends on two relationships in our model: (a) the relationship between import prices and domestic prices (i.e. the coefficient  $B_2$ ) and (b) the relationship between domestic prices and wages (i.e. the coefficients  $a_2$  and  $B_1$ ). The hypothesis that can be tested here is that even if the Marshall-Lerner condition is fully satisfied, very little of the price competitive advantages arising from devaluation will be retained if: (a) the relationship between import prices and domestic prices is strong (i.e. the value of  $B_2$  is significantly high), and (b) the relationship between domestic prices and domestic wages is strong (i.e. the existence of a wage-price spiral or the value of  $a_2.B_1$  is significantly high).

It is anticipated that this paper will shed light and provide support for the hypothesis that the unfavorable effects of changes in the exchange rate on domestic prices in the GCC countries reduce the effectiveness of this important policy tool to realize internal and/or external balance. It is also expected that changes in the exchange rate have little, if any, impact on the price competitive advantage of non-oil exports of the GCC countries.

If these two expected results hold, then the recent exchange rate policies of individual GCC countries will be questioned taking into consideration attempts by international

organizations (i.e. the IMF and WB) to push developing countries to devalue domestic currencies.

### 3. Results:

Now we are in a position to test the different relationships in the model that we developed above using data from the GCC countries. Our attention will be directed to the following two specific questions: (a) To what extent are domestic prices (consumer prices) affected by changes in import prices? (b) To what extent is there a wage-price spiral in the GCC countries? (c) What conclusions can be drawn from these relationships, and what are their policy implications?

#### (a) *The Exchange Rate and Import Prices*

Equation (6) suggests that the effects of changes in the exchange rate on import prices depend mainly on exogenous factors, mainly production costs to foreign producers. It is, however, argued that in the presence of a well-established import-substitution sector, the domestic prices of import-competing goods will have certain effects on import prices. If, however, imports are non-competitive, changes in import prices will be entirely explained by changes in production costs to foreign producers and changes in the exchange rate.

In the literature, there is extensive work on what is called “Exchange Rate Path-Through”, that is, the degree to which changes in the exchange rate are reflected in import prices (Menon, 1996). For small open economies, such as those of the GCC countries, a complete path-through is expected so that changes in the exchange rate are fully reflected in import prices. This is based on the notion that foreign suppliers (producers) set their prices (import prices for the GCC countries) at a constant mark-up over costs. According to this mark-up model, an import price equation for the GCC countries can be derived.

According to the mark-up model, producers abroad are assumed to set their foreign currency export prices (X) as follows:

$$X = \mu C \tag{12}$$

Where C represents production cost in the foreign currency and  $\mu$  is the mark-up. Therefore, the domestic prices of imports in GCC currencies is given by:

$$P_m = Xe = \{\mu C\}e \tag{13}$$

Where, e is the exchange rate in the GCC (the home price of one unit of foreign currency).

The mark-up set by the exporter is expected to depend on the price of import competing goods in the importing countries (the GCC countries) as well as the exporters' production cost. One possible way to express this mark-up is as follows:

(Kenny and McGettigan 1998, p. 1149)

$$\mu = \{P_d/(Ce)\}^s \quad (14)$$

Substituting equation (14) into equation (13) yields:

$$P_m = [(P_d/Ce)^s Ce] \quad (15)$$

Taking logarithms of both side gives the following:

$$p_m = sp_d + (1 - s) c + (1 - s) \acute{e} \quad (16)$$

Where, the lower case letters refer to the natural logarithms of the variables, and  $\acute{e} = \ln e$ .

Equation (16) implies that if the coefficient ( $s$ ) is equal to zero, domestic prices of import-competing goods will have no significant effects on import prices. Therefore, import prices will ultimately depend on production costs  $p_d$  (to foreign producers) and the exchange rate  $e$ . The exchange rate will have no impact on import prices if  $s$  is unity, that is, domestic prices of import-competing goods will dominate domestic prices of imports.

For the GCC countries one would expect the value of  $s$  to approach zero for two main reasons:

Import-competing production in the GCC countries is not significantly large to affect domestic prices. If we exclude the production of non-traded goods (mainly services and electricity) and the production of crude oil, the production of traded goods (mainly agriculture and manufacturing goods) will be marginal. Available information reveals that the output of traded goods over the period 1985-1995 was 12% of GDP on average in the GCC countries. This would imply that imports in these countries are non-competitive, and one can hence safely conclude that domestic prices of import-competing goods have insignificant, if any, effects on import prices. In other words, it is more likely that the value of the coefficient  $s$  in equation (16) approaches zero as far as the GCC economies are concerned.

The structure of import tariffs in the GCC countries is not protective. This would directly imply that the domestic prices of imports hardly deviate from world prices.

Following the above reasoning, equation (16) means that the coefficient on the foreign production cost ( $c$ ) and exchange rate ( $e$ ) will be unity. This would also imply that the "Path-Through" will be almost complete, that is, most of the changes in the exchange rates in the GCC countries will be reflected in the domestic prices of imported goods. It is reasonable, therefore, to accept the notion that the value of  $K$  (equation 6) is unity. However, alternative values will be used in our calculation in order to test for the sensitivity of the results to the value of  $K$ .

### **(b) Import Prices and Domestic Prices**

There are two main methods to estimate the effects of a change in import prices on the changes in domestic prices (Barker 1968): the input-output method and the regression method. In the input-output method, import price changes are multiplied by direct plus indirect content (requirements) of consumption to obtain the estimated changes in domestic prices. This approach is deterministic and requires data on input-output relationships that does not exist in a comparable manner for the GCC countries. The second approach is the regression approach which is based on the estimation of a price equation (such as equation 10) that includes import prices as an explanatory variable.

The effect of import prices on domestic prices is expected to reflect a number of underlying effects:

If the price elasticity of the demand for imports is very low, changes in import prices will be fully reflected in the cost of intermediate imports. In other words, an increase in import prices will not be accompanied by a reduction in the quantity demanded of imports (import demand is price inelastic, and therefore the value of imports (import cost) will rise. In this case, domestic prices of domestically produced goods and services will be highly associated with changes in import prices. If, however, the demand for intermediate imports is price elastic, for example, because of the coexistence of import substitutes, the response of domestic prices to changes in import prices will be weaker.

In the case of final goods and services one would expect the effects of import prices on domestic prices to be even stronger if the demand for imports of final goods and services was found to be price inelastic. In other words, if the price elasticity of the demand for imported final goods and services is very low, changes in import prices will be fully reflected in domestic prices of final goods and services.

Before estimating the domestic price equation (i.e. equation 8), it is necessary to test for the values of the price elasticities of the demand for imports in the GCC countries. These elasticities have been recently estimated for the GCC countries by Mohammad

and El-Sakka (2001). Their best estimates are shown in table (1) below. As the table shows, the price elasticities of the demand for imports in the GCC countries are relatively low (i.e. smaller than one in most cases), both in the short and the long runs. This supports the notion that the imports of the GCC countries are mostly non-competitive. This would also imply that changes in import prices arising from changes in the exchange rate will cause immediate changes in the cost of imports.

The wage-price relationship in our specification is a simultaneous relationship. This implies that the OLS estimation of equations 7 (i.e. the wage equation) and equation 8 (i.e. the domestic price equation) will be biased. Therefore, the 2SLS method was employed in order to estimate both equations simultaneously.

#### *The Price Equation (equation 8)*

The domestic-price equation (equation 8) includes three explanatory variables: money wages, import prices, and government expenditure. The three variables in addition to the dependent variable (i.e. domestic prices) are expressed in terms of rates of change. The full description of these variables is presented in the appendix.

The 2SLS estimation of equation (8) for the six GCC countries is shown in table (2). The results indicate that the relationship between the import price variable ( $dp_m/p_m$ ) and the domestic price variable ( $dp/p$ ) is not a one-to-one relationship. This would imply that other variables such as the money wage rate and government expenditure have a significant impact on domestic prices. However, the effects of these last two variables are still less significant as compared to the effects of import prices.

The estimated equation is:

$$\frac{dp}{p} = \beta_0 + \beta_1 \frac{dw}{w} + \beta_2 \frac{dp_m}{p_m} + \beta_3 \frac{dG}{G}$$

where,  $dG/G$  refers to the rate of change in government expenditure.

Overall, the estimated coefficient on import prices reflects the short-run effects of a change in import prices on the change in domestic prices in the GCC countries over the period 1970-1995. These estimated coefficients for individual countries are as follows:

Bahrain 0.6272

Kuwait 0.4689

Oman 0.4601

Qatar 0.5231

Saudi Arabia 0.3069

UAE 0.4856

#### *The Wage Equation (equation 7)*

The wage equation (equation 7) is described by the well-known Phillips curve that predicts a negative association between the rate of change in money wages and the size of the excess supply of labor, or the rate of unemployment. However, since the GCC economies did not experience significant unemployment over the period of the study (less than 5 per cent on average), one would expect that unemployment rates would not have a significant impact on money wages. Nevertheless, the coefficient on unemployment rate (i.e.  $a_1$  in equation 7) is expected to have a negative sign.

The rate of change in domestic prices is expected to have a positive impact on money wages. Theoretically, this positive relationship is specified by the interaction among money wages, labor productivity and domestic prices. For example, if money wages and labor productivity grew at the same rate, there would be no changes in the equilibrium price level. However, if domestic prices rise as a result of changes in import prices or any other exogenous forces, a rise in money wages is expected to follow. This implies that the coefficient  $a_2$  is expected to have a positive sign. On the other hand, if money wages increase at a higher rate than labor productivity (i.e. due to exogenous factors such as trade unions) domestic prices will have to increase. Again this confirms the two-way relationship between domestic prices and money wages.

For the GCC countries as a special case, one would expect government expenditure to have a significant positive impact on the rate of change in money wages. Government expenditure in this sense would capture the expected effects on money wages of oil revenues and the government employment policies (i.e. offering all citizens employment opportunities in the public sector at relatively high money wage rates).

Table (3) presents our best estimates of the money-wage equation for the GCC countries. As expected, the results suggest that money wages in the GCC countries do not respond to changes in labor supply. In fact, the regression coefficient of the rate of unemployment ( $a_1$ ) has the wrong sign (a positive sign), but it never proved to be significantly different from zero.

The estimated equation is:

$$\frac{dw}{w} = \alpha_0 + \alpha_1 U + \alpha_2 \frac{dp}{p} + \alpha_3 \frac{dG}{G}$$

where, U is the rate of unemployment and dG/G refers to the rate of change in government expenditure.

The results in table (3) also show that changes in domestic prices have significant positive impact on money wages. As far as the GCC economies are concerned, this is an interesting result. From a theoretical point of view, when domestic prices rise, wage adjustments are expected to follow. Exogenous forces of which trade unions are the most important will cause these wage adjustments. This will be always the case if the increase in domestic prices is not accompanied by an increase in labor productivity. In the GCC countries, however, the role of trade unions and of improvements in labor productivity is almost negligible. Alternatively, the government wage and employment policies represent the exogenous forces that cause money wage adjustments. This conclusion is supported by the significant effects of government expenditure on money wages as it is shown in table (3). The coefficient on the rate of change in government expenditure ( $\alpha_3$ ) is positive and statistically significant.

The significance of the impact of changes in domestic prices on changes in money wages is represented by the coefficient  $\alpha_2$  in table (3). The value of this coefficient for individual GCC countries is as follows:

Bahrain	0.5120
Kuwait	0.6551
Oman	0.7701
Qatar	0.8001
Saudi Arabia	0.9036
UAE	0.9285

***(c) The Overall Effects of Import Prices on Domestic Prices***

Once an import price change has led to initial changes in domestic prices, economic theory predicts that a series of induced wage and price responses will follow. This is known as the wage-price spiral and it depends on the underlying relationship between domestic prices and money wages. In industrial economies such a relationship is well established: an increase in domestic prices (exogenous or endogenous) will lead to an increase in the money wage rate through non-economic factors such as trade unions

and/or government policy (e.g. government expenditure). The increase in money wages will induce producers to raise prices in an attempt to avoid the fall in their real income following a wage increase. Consequently, the wage-price spiral will take place. In the model developed above, the wage-price spiral will depend on the magnitude and significance of the two coefficients  $\alpha_2$  and  $\beta_2$  in the wage equation (i.e. equation 7) and the domestic price equation (i.e. equation 8).

Equation (9) combines all of the above simultaneous effects that result mainly from an exogenous change in import prices (i.e. due to changes in the exchange rates). The results obtained from estimating equation (9) for individual GCC countries are presented in table (4).

Estimated Equation:

$$\partial \left( \frac{dp}{p} \right) / \partial \left( \frac{dP_m}{P_m} \right) = \frac{\beta_2}{(1 - \alpha_2 \beta_1)}$$

The results in table (4) suggest that if import prices in the GCC countries rose by 100 per cent of a certain devaluation, that is, a complete Path-Through, then domestic prices in these countries would rise by the following percentages of the rise in imports prices:

Country	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
(%)	98.1	90.4	85.7	98.7	84.8	84.6

For example if there was a complete Path-Through (i.e. 100 percent of the changes in the exchange rate is reflected in import prices) devaluation in Kuwait would cause domestic prices to increase by 90.4 per cent of the rise in import prices.

These results also imply that if the Path-Through is not complete (i.e. the value of K in equation 10 is less than unity), a 10 per cent devaluation in individual GCC countries would result in a rise in domestic prices as it is shown in table (5). Generally speaking and based on the assumptions that underline our estimation of different equations in the model developed above, a 10 per cent devaluation would cause domestic prices to rise by 2.1 - 7.4 per cent in the GCC countries. The range of domestic price changes will depend on the magnitude of the Path-Through (i.e. the value of K). It should be noted however, that these percentage changes in domestic prices will require a certain time span in order to fully take place. In other words, these devaluation effects on domestic prices are not expected to take place immediately following the initial devaluation.

The estimated equation is equation 10:

$$\frac{\beta_2 (0.1) K}{1 - a_2 \beta_1}$$

#### 4. Conclusions

The main concern of this research was to consider the overall effects of possible changes in the exchange rates in the GCC countries on domestic prices. The model employed is a simple two-equation model of the wage-price spiral. The results suggest that the rise in import prices following any possible devaluation in the GCC countries (we applied a 10 per cent devaluation as an example) is expected to have a significant impact on domestic prices.

To cope with this, policy makers in the GCC countries must consider different policy instruments that are necessary to control the wage-price spiral. This would require the policy maker to reconsider money wages in the government sector (i.e. the minimum wage rate) and pursue relevant policies to improve productivity outside the oil sector, as well as establish a relevant tie between productivity growth and money wages. Policy makers also should be aware of the strong association between changes in the exchange rates and domestic prices before considering any devaluation.

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### **Appendix: Variables and Data Sources**

1) Import prices ( $P_m$ ): is an index of import prices.

Source: World tables (various issues)

2) Unemployment rate (U): is the rate of unemployment calculated as the number of unemployed persons as a proportion of the labor force. For missing data (i.e. Saudi Arabia) the mean values were used as an approximation.

Sources: Country-specific sources (unpublished); ILO Statistical Yearbook.

3) Domestic prices (P): is the consumer price index.

Sources: IMF, International Financial Statistics (various issues); Central Banks (Yearbooks); World Bank: World Tables (various issues).

4) Money wages (w): an index of weekly wages.

Sources: we tried data from different sources in individual countries. Best estimates were obtained by employing the one single wage rate for all GCC countries. This is the weekly wage rate published by the ILO, Statistical Year Book (various issues).

The research covers the period 1970-1996

**Table 1: Price and Income Elasticities of Imports in the GCC Countries**

Country	Price Elasticity		Income Elasticity	
	Short Run	Long Run	Short Run	Long Run
Bahrain	- 0.198	- 0.212	1.857	1.986
Kuwait	- 0.663	- 1.905	0.592	1.701
Oman	- 0.209	- 0.302	0.928	1.339
Qatar	- 1.840	- 2.901	0.594	0.932
Saudi Arabia	- 0.070	- 0.395	0.237	1.339
UAE	- 0.233	- 0.490	0.477	1.006

Source: Mohammad, YHJ and MIT El-Sakka, "Demand for Imports in the GCC Countries," Journal of the Gulf and Arabian Peninsula Studies, Vol. XXVII, No. 100, 2001, page 68, table 6. Published by Academic Publication Council at Kuwait University.

**Table 2: The Domestic Price Equation for Each GCC Country**

Country	B <sub>0</sub>	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	R <sup>2</sup>	D.W.
Bahrain	90.8 (1.93)	0.5892 (2.98)	0.6272 (3.47)	0.3462 (2.84)	0.935	2.22
Kuwait	51.7 (9.78)	0.7348 (1.99)	0.4689 (3.85)	0.5487 (5.65)	0.874	2.21
Oman	23.2 (5.02)	0.6012 (2.98)	0.4601 (12.57)	0.8211 (7.58)	0.886	1.95
Qatar	80.3 (2.32)	0.5871 (2.64)	0.5231 (15.42)	0.6541 (3.21)	0.984	2.24
Saudi Arabia	-149.3 (-0.08)	0.7061 (6.21)	0.3069 (17.07)	0.5874 (4.12)	0.949	1.52
UAE	44.1 (3.59)	0.4585 (2.50)	0.4856 (10.48)	0.4871 (1.97)	0.946	1.81

Notes: All coefficients are significant at the 10% level or less. t statistics are presented in parentheses.

**Table 3: The Money-Wage Equation**

Country	a <sub>0</sub>	a <sub>1</sub>	a <sub>2</sub>	a <sub>3</sub>	R <sup>2</sup>	D.W
Bahrain	-58.21 (-0.23)	0.002 (0.01)	0.5120 (3.78)	0.649 (6.15)	0.789	1.91
Kuwait	32.55 (1.11)	0.192 (0.54)	0.6551 (4.49)	0.662 (8.55)	0.800	1.74
Oman	3.52 (5.02)	0.091 (0.25)	0.7701 (5.44)	0.611 (5.25)	0.795	1.68
Qatar	0.85 (0.08)	0.050 (1.02)	0.8001 (9.12)	0.752 (3.89)	0.654	2.01
Saudi Arabia	-1.23 (-1.11)	0.004 (0.02)	0.9036 (8.07)	0.711 (7.68)	0.874	1.89
UAE	9.21 (2.25)	0.001 (0.48)	0.9285 (6.58)	0.654 (9.14)	0.842	2.42

Notes: All estimates of a<sub>1</sub> and a<sub>2</sub> are significant at the 10% level or less. t statistics are presented in parentheses.

**Table 4: The Overall Effects of Changes in Import Prices**

Country	a <sub>2</sub>	B <sub>1</sub>	B <sub>2</sub>	Overall effect on domestic prices
Bahrain	0.5120	0.5892	0.6272	0.9819
Kuwait	0.6551	0.7348	0.4689	0.9041
Qatar	0.7701	0.6012	0.4601	0.8568
Oman	0.8001	0.5871	0.5231	0.9865
Saudi Arabia	0.9036	0.7061	0.3069	0.8478
UEA	0.9285	0.4585	0.4856	0.8456

**Table 5: The Overall Lasting Effect of a 10 Percent Devaluation on Domestic Prices (% increase in domestic prices)**

Country	K = 0.75	K = 0.5	K = 0.25
Bahrain	7.4	4.9	2.4
Kuwait	6.8	4.5	2.3
Oman	6.4	4.3	2.1
Qatar	7.4	4.9	2.4
Saudi Arabia	6.4	4.2	2.1
UEA	6.3	4.2	2.1