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Does the Effectiveness of Monetary Policy on Output Depend on Openness?

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Abstract. The question of how openness influences the effectiveness of monetary policy on output has captured some attention among researchers in recent years. But the number of studies which have explored this question empirically is very limited. In this context, this paper investigates the relationship between openness and the effectiveness of monetary policy on output by using annual data for the period 1990-2000 for a panel of 42 countries. The paper's empirical results support the theoretical expectations that the more open the economy, the smaller the output effects of a given change in the money supply. Moreover, the ability of monetary expansion to influence output is more limited in developing open economies than in developed ones.

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1. Introduction

As economies have become more open and integrated since the early 1980s, it has become a relevant question to explore whether the effects of monetary policy on output depend on the degree of openness of a given economy. Both theoretical and empirical literature has focused so far on the effect of changes in money supply on output. There have been many studies in the literature investigating the effects of monetary policy on output, and most of

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them have found a positive relationship.[1] However, there are not as many studies looking at the relationship between openness and monetary policy. Similarly, only a few studies have so far investigated the relationship between openness and inflation (Romer, 1993; Terra, 1997; Rane 1997), and openness and inflationary and output effects of monetary policy.[2]

In this context, Karras (1999) found that as an economy becomes more open, the effect of monetary policy on output decreases. This finding suggests that openness reduces the ability of money supply to affect output.

Theoretical intuition behind this difference between more open and less open economies can be explained as follows. A monetary expansion creates similar effects on demand in both economies,[3] but it is likely to cause quite different results on aggregate supply. As pointed out by Karras (1999:14), compared to a relatively closed economy, wage demands increase more in a highly open economy in response to the depreciation following an increase in money supply. This is because changes in the value of domestic currency will more seriously influence the economic agents in a highly open economy. The consequent more vigorous demand for wage increases will result in a steeper aggregate supply curve. As a result, the consequences of the monetary expansion will be reflected more on prices and less on output. The opposite will be true for the less open economy.[4]

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[1] See Bryant et al. (1988), Taylor (1993), Dornbush and Giovannini (1990), Taylor, (1995); Bernanke and Gertler (1995); Meltzer, (1995). For example, using more than ten macroeconometric model simulations, Bryant et al. (1988), showed that monetary expansions increase output while monetary contractions reduce it.

[2] Romer (1993) discussed the relationship between openness and inflation ($\partial\Delta p/\partial OPEN$), but he did not looked into openness and inflationary effects of monetary expansion [$(\partial\Delta p/\Delta m)/\partial OPEN$)]. Obstfeld and Rogoff (1996) pointed out that Romer's result in fact depended on [$(\partial\Delta p/\Delta m)/\partial OPEN$)] being negative. Karras (1999) went one step further and looked into the inflationary effects [$(\partial\Delta p/\Delta m)/\partial OPEN$)] and output effects [$(\partial\Delta y/\Delta m)/\partial OPEN$)] of openness.

[3] Normally monetary expansion increases aggregate demand in two ways: first by decreasing interest rates, hence stimulating investment expenditures. Second, it increases demand through exchange rate depreciation (Berument and Dogan, 2003). Depreciation makes domestic goods cheaper and imported goods more expensive, thereby improving net exports, hence output. See also Romer (1993) for the theoretical reasoning behind the difference between more and less open economies in terms of inflationary effects.

[4] See Karras (1999), Appendix A, for a formal derivation on how openness is likely to influence the inflationary and output effects of monetary policy.

In a broader context, among the basic transmission mechanisms through which monetary expansion affects output are the interest rate channel, exchange rate channel, asset price channel, and credit channel (Mishkin, 1995). The exchange rate channel can be thought of as a more critical factor in the context of openness. As Dennis (2001) puts it, on the financial side, exchange rates are key variables in small open economies. Exchange rate changes directly influence the prices of tradable goods. As domestic currency depreciates,[5] the prices of imported consumer goods increase hence raise the Consumer Price Index (CPI). Also prices of imported intermediates rise, increasing firms' output costs. Higher production costs tend to increase prices of consumer goods once again as firms try to pass on higher costs to consumers. On the real side, changes in the real value of domestic currency influences world demand for domestically produced goods, leading to an improvement in net exports in the case of real depreciation.[6]

Karras (1999), using data for a panel of 38 countries for 1953-1990, found empirical support for the aforementioned theoretical expectations regarding the role of openness on output effects of monetary policy. Berument and Dogan (2003) also found similar results for Turkey.

In a similar fashion, we explore in this article how openness affects the ability of monetary policy to affect output and whether it will differ for developed countries (DCs) and developing countries (LDCs). In order to investigate the relationship between openness and the effects of monetary policy on output, pooled data for a panel of 42 countries[7] for the period 1990-2000 is used.

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[5] In this study, exchange rate is defined as the number of units of domestic currency one has to pay for 1 unit of foreign currency. In this definition an increase in exchange rate indicates a decrease in the value of domestic currency.

[6] Obviously the discussion on transmission mechanism and the monetary policy is not limited to the arguments we mention here. One can find several studies on anticipated vs. unanticipated monetary policy and whether they affect real variables. Among others, see Barro (1977), Mishkin (1982).

[7] The following countries are included in this study: US, Germany, Australia, Austria, Belgium, Denmark, Finland, France, Holland, England, Ireland, Spain, Sweden, Switzerland, Italy, Iceland, Japan, Canada, Norway, Portugal, New Zealand, Greece, Turkey, New Zealand, Argentina, Brazil, El Salvador, Honduras, Panama, Paraguay, Uruguay, Venezuela, S.Africa, Egypt, Tunisia, Indonesia, India, Philippines, Israel, S.Korea, Hungary, Mexico, Poland.

2. The Model, the Data and Methodology

The following model is estimated in order to demonstrate the relationship between output and money growth rate.

$$y_{j,t} = \beta_0 + \sum_{i=0}^{s} \beta_{i,j,t}^{m} m_{j,t-i} + \varepsilon_{j,t}^{y} \quad (1.1)$$

Where, subscripts j and t refer to countries and years, respectively. β denotes coefficients. Error terms are modelled as fixed effects. Variable change rates have been used to provide good comparison opportunity amongst the countries. The rate of change in output rates and the money supply are defined as follows, respectively:

$y_{j,t}=(GDP_{j,t}-GDP_{j,t-1})/GDP_{j,t-1}$

$m_{j,t}=(M2Y_{j,t}-M2Y_{j,t-1})/M2Y_{j,t-1}$

Following Karras (1999), depending on the degree of openness, the following definition has been used for money supply and openness to show the effects of monetary policies on output.

$$\beta_{i,j,t}^{m} = \theta_i^{m} + \theta_i^{\delta} \delta_{j,t} \quad (1.2)$$

Here, θs are parameters, and $\delta_{j,t}$ measures the degree of openness in country j at time t. If the equation (1.2) is plugged into equation (1.1), the following equation will be obtained[8]:

$$y_{j,t} = \beta_0 + \sum_{i=0}^{s} \left(\theta_i^{m} m_{j,t-i} + \theta_i^{\delta} \delta_{j,t} m_{j,t-i} \right) + \varepsilon_{j,t}^{y} \quad (1.3)$$

Equation (1.3) is estimated in order to evaluate the role of openness on the ability of monetary expansions to affect output. Where the dependent variable $y_{j,t}$ denotes the rate of change in the output of country j in period t, $m_{j,t}$ denotes the rate of change in M2Y of country j in period t. $\delta_{j,t} m_{j,t}$ is

[8] See Karras (1999) for a formal derivation on how openness is likely to influence the output effects of monetary policy.

the interaction term and shows the effect of monetary policy on output depending on the degree of openness.

Openness is defined in three different ways. δ1 is defined as (imports+exports)/GDP, δ2 as imports/GDP and δ3 as proxy for trade orientation following Balassa and Bauwens (1988). The last measure, which, to the best of our knowledge, has not been used in this field yet, is used to define openness in a broader sense. This third openness measure is suggested by Balassa and Bauwens (1988), and calculated as the residuals obtained from regressing logarithmic values of per capita imports on logarithmic values of per capita gross domestic product. These residuals—regarded as proxies for trade orientation—represent those variables affecting imports, except for income and population. The residuals can be positive, negative or zero. Positive (negative) residuals indicate that the value of imports for a given country is above (below) the average. Accordingly, if imports are above (below) the average, this implies that protection in that country is relatively lower (higher). Therefore, when the residuals are sorted in a descending order, the country with the highest residual will be the most open one.

Interactions between openness measures (δ_1, δ_2, δ_3) and money growth (m) are denoted by ϕ_1, ϕ_2 and ϕ_3, and defined in the following way:

$$\phi_1=(\delta_1*m), \qquad \phi_2=(\delta_2*m), \qquad \phi_3=(\delta_3*m)$$

In light of the arguments stated in the first section over the role of openness on the effect of monetary policy, the coefficient θ_i^{δ} in the model specified in equation (1.3) is expected to take a statistically significantly negative value, indicating that the effectiveness of monetary policy on output is weakened with openness.

Since openness is a critical variable for the sake of this study, it might be useful to take a look at the trends during the period in question. Table 1 summarizes the degree of openness of the developed and developing countries in 1990, 1995, 2000 and 1990-2000 average.

From Table 1 one can see that in general countries became more open during the last decade of the 20th century; hence the degree of openness has improved in the 1990-2000 period for both DCs and LDCs.

Based on the first openness criterion (as measured by exports plus imports as a percent of GDP), the least open developed countries were US and Japan (1990-2000 averages are 23% and 19%, respectively), whereas the least open developing countries in the same period were Argentina, Brazil (both 19%) and India (22%). 14 out of 20 developing countries (70%) had a degree of openness higher than 50%, while 16 out of 22 developed countries (72%) were in the same situation. The degree of openness deteriorated in the 1990s for six developing (Egypt, Panama, Paraguay, Tunisia, Uruguay, and Venezuela) and three developed (Germany, Japan, and Greece) countries so that they became less open in 2000 than in 1990, while all other countries in both groups became more open. In other words, there was no qualitative difference between DCs and LDCs in terms of the degree of openness as well as trends in the 1990s.

Table 1: Degree of openness, developed and developing countries in the 1990s

Countries	**1990**		**1995**		**2000**		**1990-2000 (Average)**	
Developed Countries	δ_1^*(%)	δ_2^{**}(%)	δ_1(%)	δ_2(%)	δ_1(%)	δ_2(%)	δ_1(%)	δ_2(%)
USA	0.20	0.11	0.23	0.12	0.26	0.15	0.23	0.12
Germany	0.62	0.29	0.48	0.24	0.60	0.29	0.53	0.26
Austria	0.33	0.17	0.39	0.20	0.45	0.23	0.38	0.2
Australia	0.79	0.39	0.77	0.39	0.92	0.46	0.81	0.41
Belgium	1.41	0.69	1.36	0.66	1.55	0.72	1.41	0.68
Denmark	0.67	0.31	0.67	0.31	0.70	0.33	0.67	0.31
Finland	0.47	0.24	0.66	0.29	0.71	0.3	0.62	0.28
France	0.43	0.22	0.44	0.21	0.50	0.24	0.45	0.22
Netherland	1.04	0.5	0.99	0.47	1.17	0.56	1.04	0.49
England	0.51	0.27	0.58	0.29	0.56	0.29	0.54	0.28
Ireland	1.09	0.52	1.42	0.65	1.65	0.75	1.37	0.63
Spain	0.38	0.2	0.48	0.24	0.59	0.29	0.47	0.24
Sweden	0.59	0.3	0.74	0.34	0.89	0.42	0.70	0.33
Switzerland	0.72	0.36	0.66	0.31	0.85	0.4	0.72	0.34
Italy	0.39	0.20	0.50	0.23	0.50	0.24	0.45	0.21
Iceland	0.66	0.33	0.68	0.32	0.76	0.42	0.69	0.35
Japan	0.21	0.1	0.17	0.08	0.19	0.09	0.19	0.09
Canada	0.51	0.26	0.71	0.34	0.86	0.4	0.68	0.33
Norway	0.75	0.34	0.7	0.32	0.77	0.31	0.73	0.33

Portugal	0.68	0.4	0.62	0.36	0.68	0.41	0.63	0.37
New Zealand	0.54	0.27	0.58	0.29	0.65	0.33	0.59	0.29
Greece	1.88	0.9	1.51	0.88	1.32	1.22	1.55	0.91
Developing Countries								
Argentina	0.15	0.05	0.2	0.1	0.23	0.12	0.19	0.1
Brazil	0.15	0.07	0.17	0.09	0.25	0.13	0.19	0.09
El Salvador	0.50	0.31	0.59	0.38	0.70	0.42	0.57	0.35
Indonesia	0.52	0.26	0.54	0.28	0.69	0.31	0.60	0.28
Philippines	0.61	0.33	0.81	0.44	1.06	0.51	0.84	0.45
South Africa	0.43	0.19	0.45	0.22	0.55	0.26	0.45	0.21
South Korea	0.59	0.3	0.62	0.32	0.87	0.42	0.67	0.33
India	0.16	0.09	0.23	0.12	0.28	0.14	0.22	0.11
Honduras	0.77	0.40	0.92	0.48	0.98	0.56	0.88	0.48
Israel	0.80	0.45	0.77	0.46	0.87	0.47	0.78	0.45
Hungary	0.60	0.29	0.75	0.38	1.29	0.67	0.82	0.42
Mexico	0.38	0.2	0.58	0.28	0.65	0.33	0.50	0.26
Egypt	0.53	0.33	0.46	0.24	0.39	0.24	0.50	0.28
Panama	1.66	0.79	1.99	0.98	1.56	0.81	1.83	0.91
Paraguay	0.73	0.39	0.86	0.51	0.66	0.41	0.74	0.44
Poland	0.50	0.22	0.48	0.23	0.63	0.36	0.52	0.27
Tunisia	0.94	0.51	0.94	0.49	0.90	0.47	0.89	0.47
Turkey	0.31	0.17	0.44	0.24	0.54	0.31	0.42	0.23
Uruguay	0.42	0.18	0.38	0.19	0.40	0.21	0.40	0.20
Venezuela	0.60	0.20	0.49	0.22	0.46	0.17	0.51	0.22

* δ_1 = (Exports + Imports)/GDP; ** δ_2 = Imports/GDP

To explore whether the results depend on the level of development, equation (1.3) is estimated in two different ways. In the first method, all countries are pooled together in a single group, whereas in the second they are divided into two groups, developed and developing countries, based on IMF country classification.[9]

[9] Developed countries: US, Germany, Australia, Austria, Belgium, Denmark, Finland, France, Holland, England, Ireland, Spain, Sweden, Switzerland, Italy, Iceland, Japan, Canada, Norway, Portugal, New Zealand, Greece. The rest of the countries mentioned in footnote 1 are included in developing countries.

3. Empirical Results

In an analysis based on pooled data, coefficients can be estimated by using either fixed or random effect models. The main difference between fixed and random effect procedures is whether or not fixed-time effect is correlated with independent variables. In order to test if such a correlation exists, an identification test developed by Hausman (1978) was employed. Under the null hypothesis "random effects estimator is true" Hausman test statistic shows asymptotic $\chi 2$ distribution with K degrees of freedom.

Hausman tests conducted for each model in this study indicated that fixed effect procedure is more appropriate for the analysis.[10] Chi-square table values for 5 percent significance level with 3, 5 and 6 degrees of freedom are 7.81, 11.07 and 12.59, respectively. Table 2 and Table 3, show Hausman test results are higher than chi-square values for all models, indicating that fixed effect estimation procedure is the appropriate one. In Table 2 and Table 3 random effect and pooled least squares estimation results are also reported in addition to fixed effect results, however, the discussions are based on the results obtained from fixed effects, which were found to be a more appropriate method of estimation.

Table 2: Estimation results: all countries (1990-2000)

Sample: 1992-2000; n: 378

Dependent variable	**Estimation Method**			
GDP growth rate (y)	**Fixed Effects***		**Random Effects**	**Pooled Least Squares**
Model I: (openness measure: δ_1)	**Coefficient**		**Coefficient**	**Coefficient**
Constant			0.002 (0.24)	-0.002 (-0.26)
Φ_1	-0.24 (-3.43)	-0.18 (-2.53)	-0.45 (-5.74)	-0.52 (-5.50)
m	1.05 (21)	1.04 (17.93)	1.14 (15.38)	1.21 (15.03)

[10] It is also worth noting that Judge et al. (1985) showed that estimations obtained by using fixed effect procedures would be more plausible under more general assumptions.

m(-1)	-0.04 (-4.44)	-0.03 (-2.49)	-0.15 (-3.29)	-0.12 (-2.73)
m(-2)		-0.04 (-3.64)		
R^2	0.85	0.87	0.47	0.50
Adj. R^2	0.83	0.85	0.46	0.49
d-w	1.91	1.97	1.96	2.06
Hausman test	15.9 3			
Model II: **(openness measure: δ_2)**				
Constant			0.002 (0.31)	-0.002 (-0.18)
Φ_2	-0.49 (-3.5)	-0.39 (-2.91)	-0.90 (-5.30)	-1.03 (-5.32)
m	1.05 (26.25)	1.05 (18.78)	1.13 (15.20)	1.20 (14.83)
m(-1)	-0.04 (-4.44)	-0.03 (-2.66)	-0.14 (-3.11)	-0.12 (-2.55)
m(-2)		-0.04 (-3.30)		
R^2	0.85	0.86	0.47	0.50
Adj. R^2	0.83	0.84	0.46	0.49
d-w	1.93	1.97	1.97	2.07
Hausman test	15.23			
Model III: **(openness measure: δ_3)**				
Constant			0.001 (0.16)	-0.002 (-0.23)
Φ_3	-0.23 (-2.87)	-0.19 (-1.78)	-0.36 (-5.98)	-0.43 (-6.38)
m	1.25 (8.93)	1.19 (5.81)	1.44 (12.75)	1.58 (12.79)
m(-1)	-0.04 (-4.44)	-0.02 (-2.00)	-0.136 (-3.07)	-0.12 (-2.69)
m(-2)		-0.04 (-3.85)		
R^2	0.84	0.86	0.48	0.52
Adj. R^2	0.82	0.84	0.47	0.51
d-w	1.92	2.00	1.89	1.95
Hausman test	27.84			

* All estimated values obtained from fixed effects method are statistically significant at 5%. Values in parentheses are t-values.

Estimated values for coefficients Φ1, Φ2 and Φ3, which represent the interaction between openness and money supply, are found to be negative and significant. These results indicate that the more open the economy, the weaker the effect of monetary policy on output. These findings are in conformity with the theoretical expectations discussed above in the first section.

The coefficient m included in the models to represent the rate of growth of money are found to be positive and significant for current changes in money supply, whereas they are negative and significant for 1 and 2-year lagged changes. These results indicate that monetary expansions positively affects output for the current period, but is reversed in the following period. These results support the monetarist view that monetary variables can affect real variables (including output) in the short run, but not in the long run.

One question that has not been explored yet is whether the results differ considerably between developed and developing countries. Theoretically one can think of several differences between these two groups of countries in terms of smooth functioning of the goods and financial markets, which might affect the functioning of the transmission mechanism. This possibility is discussed in section 3. In an effort to see if the results are sensitive to the level of development of the countries in question, regressions are repeated for different groups of countries. Table 3 shows the regression results when countries are grouped, based on IMF's country classification, into two as developed and developing countries.

For each model d values under each variable indicate a slope-dummy of the corresponding variable. The sum of values for the variable and its dummy gives a coefficient value for the developed countries. Hence for example, in the fourth model that appears in Table 3, the value for Φ1 (-0.47) shows an estimated value for developing countries, while the sum of this value and the value of d1 variable (Φ1's slope-dummy, 0.35) gives the estimated value for the developed countries (-0.47+0.35 = -0.12). The same applies to all variables appearing in Table 3.

Table 3: Estimation results: developed and developing countries separated (1990-2000)

Sample: 1992-2000; n: 378

Dependent variable	**Estimation Method**			
GDP growth rate (y)	**Fixed Effects***		**Random Effects**	**Pooled Least Squares**
Model IV : (Openness measure: δ_1)	**Coefficient**		**Coefficient**	**Coefficient**
Constant			**0.01** **(0.22)**	-0.002 (-0.21)
Φ_1	-0.47 (-3.13)	-0.948 (-3.28)	-0.46 (-3.97)	-0.62 (-4.37)
d1	0.35 (2.06)	0.947 (3.24)	0.06 (0.33)	0.223 (1.09)
m	1.09 (9.08)	1.43 (5.96)	1.17 (13.46)	1.28 (13.07)
d4	-0.21 (-1.75)	-0.54 (-2.22)	-0.11 (-0.62)	-0.20 (-1.07)
m(-1)	-0.088 (-2.93)	-0.07 (-2.82)	-0.18 (-3.32)	-0.159 (-2.89)
d5	0.087 (-2.17)	0.06 (2.64)	0.08 (0.97)	0.10 (1.10)
m(-2)		-0.04 (-2.07)		
d6		0.02 (0.69)		
R^2	0.88	0.89	0.47	0.51
Adj. R^2	0.86	0.88	0.46	0.50
d-w	1.97	2.05	1.94	2.01
Hausman test	13.36			
Model V : (Openness measure: δ_2)				
Constant			0.002 (0.29)	-0.001 (-0.17)
Φ_2	-0.74 (-2.74)	-1.434 (-2.64)	-0.86 (-3.76)	-1.14 (-4.07)
d2	0.53 (1.71)	1.433 (2.61)	0.04 (0.11)	0.33 (0.78)

m	1.04 (9.45)	1.27 (5.45)	1.15 (13.36)	1.25 (12.89)
d4	-0.08 (-0.72)	-0.38 (-1.61)	-0.10 (-0.54)	-0.17 (-0.92)
m(-1)	-0.09 (-3.00)	-0.07 (-2.20)	-0.17 (-3.15)	-0.15 (-2.65)
d5	0.09 (2.25)	0.07 (2.07)	0.07 (0.86)	0.09 (0.96)
m(-2)		-0.04 (-1.51)		
d6		0.01 (0.44)		
R^2	0.88	0.89	0.47	0.50
Adj. R^2	0.86	0.88	0.76	0.49
d-w	1.99	2.05	1.94	2.03
Hausman test	13.17			
Model VI : (Openness measure: δ_3)				
Constant			**0.0007 (0.11)**	-0.002 (-0.29)
Φ_3	-0.23 (-4.6)	-0.18 (-1.64)	-0.33 (-5.05)	-0.41 (-5.62)
d3	0.04 (2.00)	0.06 (2.82)	-0.061 (-1.35)	-0.04 (-0.79)
m	1.21 (12.1)	1.12 (4.81)	1.43 (12.60)	1.58 (12.67)
m(-1)	-0.08 (-2.66)	-0.07 (2.33)	-0.18 (-3.36)	-0.16 (-2.94)
d5	0.08 (2.00)	0.08 (2.62)	0.10 (1.15)	0.11 (1.27)
m(-2)		-0.05 (-2.63)		
d6		0.04 (2.00)		
R^2	0.85	0.87	0.48	0.52
Adj. R^2	0.83	0.85	0.47	0.51
d-w	1.94	2.06	1.86	1.93
Hausman test	15.74			

* All values generated by fixed effects method are statistically significant at 5%, except for d4 and d6 in model IV and model V. Values in parentheses are t-values.

As can be seen from Table 3, values for coefficients Φ1, Φ2 and Φ3 which represent the interaction between openness and money supply are

estimated to be -0.47, -0.74 and -0.23, respectively, and they are all statistically significant. Adding Φ1, Φ2 and Φ3 values to the values of their corresponding slope-dummies provides coefficient values for developed countries. These values were calculated to be -0.12, -0.21 and -0.19, respectively. As in the previous case, these results indicate that for all models the effect of monetary policy on output becomes less as an economy becomes more open. Moreover, the fact that these values are greater—in absolute value terms—for developing countries than those found for developed countries indicate that as an economy becomes more open, the effect of monetary policy on output decreases more in developing countries than the developed ones. In other words, monetary expansion becomes less effective on output in developing countries. One can think of several possible reasons as to why this could be the case.

Among the possible causes contributing to this result are differences in terms of economic and political stability, availability of credit and other financial tools, power of labour unions, legal regulations, independence of monetary authorities (i.e. Central Bank) from political decision making, formation of expectations, duration or speed of transmission mechanism, as well as the degree of openness. The fact that developed countries have deeper and more stable money and capital markets seems to make monetary policy relatively more effective in these countries. On the contrary, unstable and vulnerable money and capital markets cause economic agents in developing countries to behave in such a way to make monetary policy implementations less effective. Political and economic instability leads to a higher risk premium for less developed countries, which increases the cost of borrowing, and hence negatively affect investments. Moreover, given the instability and high risk premium, as a developing country becomes more open, the possibility for capital flight increases when interest rates fall following a monetary expansion, which reduces the amount of available credit for investments to expand output.

Another factor might be related with Tobin's q theory:[11] Monetary expansion leads to an increase in equity prices, which raises q, which means

[11] Tobin's q theory of investment links market value of firms with replacement cost of capital as follows: q=(market value of firms)/replacement of capital. This theory provides a mechanism through which monetary policy effects the economy through its effects on the valuation of equities. In a monetarist story, in the case of monetary expansion the public will have more money (M) than it wants and so will try to get rid of it by increasing its spending. One place the public can spend more is in the

the replacement cost of capital becomes cheaper relative to the market value of firms. Firms can borrow more easily and expand output. However, if there is no smoothly functioning, stable capital or stock exchange market, this mechanism fails to operate.

For developing countries, coefficients for variable m representing the rate of growth of money supply in the three models employed are found to be positive and statistically significant, indicating that monetary expansions increase output. In models IV, V, and VI one can find money coefficients for developed countries by summing up m values with values of corresponding dummy variables, which gives 0.97, 0.96, and 1.21 respectively. This result indicates that for developed countries, money supply expansion leads to larger output as well. These results are consistent with theoretical expectations.[12]

In order to determine whether there is autocorrelation, calculated d-w values are compared with table values calculated by Bhargava et al. (1982). When the number of years is 10 and the cross section is 50, the d-w table value at 5 percent significance level is 1.842. Calculated d-w values are given in Table 1 and 2. Given these values there seems to be no autocorrelation.

As far as the explanatory power of the models is concerned, there is no considerable difference among models. R2 and Adjusted R2 values are found to be between 0.83-0.88, which could be regarded as quite satisfactory.

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stock market, increasing the demand for equities, hence increasing their prices (P_e). A more Keynesian story comes to a similar conclusion because falling interest rates due to monetary expansion will make bonds less attractive relative to equities, thereby causing the price of equities to rise. In short, combining these views with the fact that lower equity prices will lead to lower q, hence lower investment spending (I) and output (Y) generates the following transmission mechanism: $M\uparrow \Rightarrow P_e\uparrow \Rightarrow q\uparrow \Rightarrow I\uparrow \Rightarrow Y\uparrow$ (Mishkin, 1995:6).

[12] Regressions were repeated with several different specifications of the models including different lag structures of both openness interaction terms and money, and overall results were not altered significantly.

4. Conclusion

This paper investigates how the power of monetary policy to influence output is affected by the degree of openness. In particular, by using an open economy model we tested empirically if the theoretical expectation that as an economy becomes more open the effect of monetary policy on output gets weaker is supported or not by real life observations. Pooled data for a panel of 42 countries (22 developed, 20 developing) for the period of 1990-2000 were used to estimate the coefficient values in a fixed effect procedure. The results confirmed the expectations that openness reduces the ability of monetary policy to influence output.

In addition to this general result for all countries, the results also indicate that for developing countries, the effect of monetary policy on output decreases more with openness, as compared to developed countries. In other words, the negative relationship between the power monetary policy has to influence output and openness is strengthened for developing countries.

Among the factors that can be thought of to explain this difference between developed and developing countries are the fact that developed countries have deeper and more stable, hence better functioning, money and capital markets than developing countries; lower risk premium and lower possibility of capital flight in developed countries due partly to political and economic stability and more independent central banks; and availability of alternative financial tools to direct money to increase output in these countries. Therefore, it can be argued that it is crucial for the developing countries to take necessary steps to ensure political and economic stability, deepen capital markets and create a positive atmosphere for investments in order to minimize the risks and maximize the benefits of opening up the economy to the outside world.

In order to prevent a possible misunderstanding, we would like to stress that we are not arguing that the difference between developed and developing countries comes from the gap in terms of the degree of openness, or from the difference in openness trends during the 1990s. We argue that openness makes monetary policy less effective, more so in the case of developing countries. To put it differently, for a given level of openness, monetary expansions are likely to affect output less in developing countries than developing countries. We think that this is related to structural

differences (market deepening, Central Bank autonomy, transmission mechanisms, etc.) that exist between developed and developing countries. An interesting area of future research in the context of this discussion would be to explore more deeply the interaction between these structural differences, the effectiveness of monetary policy and openness.

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