GOVERNMENT POLICY MULTIPLIER, INFLATION AND FINANCIAL INTERMEDIATION: TESTING THE NEW KEYNESIAN THEORY

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Resumen: En un número reciente del *American Economic Review*, prominentes economistas presentan su visión sobre qué constituye el núcleo central de la teoría macroeconómica. Entre otros aspectos, coinciden en la existencia de un conflicto de corto plazo entre la inflación y el desempleo. Aunque no hay consenso respecto a su origen. Este trabajo examina la validez de una de las teorías que buscan explicar el origen de dicho conflicto: la nueva teoría keynesiana. Para ello, se utiliza la evidencia empírica de 18 países de 1964 a 1996. Los resultados no rechazan la proposición que se deriva de la nueva teoría keynesiana. Así, se muestra que el valor del multiplicador del gasto público diminuye conforme aumenta la inflación y se reduce la intermediación financiera. Una consecuencia de esto es que la efectividad del gasto público para estabilizar el producto, depende de manera importante de la salud del sistema bancario del país.

Abstract: In a recent issue of the *American Economic Review*, several authors presented their views regarding what they believe constitute the core of macroeconomics. All of these authors agree that there is a short-run trade-off between inflation and unemployment. Yet there is a lack of consensus as for why this happens. The purpose of this paper is to test the validity of one of these possible explanations: the new Keynesian theory. For this purpose, we use evidence from 18 countries for the period 1964-1996, on the relation between inflation, output supply elasticity and government-policy multipliers. Empirical evidence seems to support the proposition derived from the new Keynesian school: the value of the fiscal multiplier will be smaller as the average inflation increases and the degree of financial intermediation declines. One consequence of this result is that the effectiveness of government expenditure as a mean to stabilize output depends to a large extent on the soundness of the domestic banking system.

Fecha de recepción: 21 de noviembre de 1999
Fecha de aceptación: 12 de junio del 2000

1. Introduction

In a recent issue of the *American Economic Review*[1] five well-known economists presented their views regarding what they believe constitutes the core of macroeconomics. Several principles were considered, among them that aggregate nominal demand fluctuations may have a short-term real impact.

While all of these authors agree that there is a short-run trade-off between inflation and unemployment, there is widespread disagreement as to why this happens. Just to mention some arguments we have Lucas'(1973) information-based theory, articles -such as Aiyagari, Christiano and Eichenbaum (1992)- belonging to the real business cycle school and others -such as Ball, Mankiw and Romer (1988)- belonging to the new Keynesian school. In this regard, the purpose of this paper is to put to an empirical test the validity of one of these possible explanations: the new Keynesian theory.

According to the new Keynesian theory, a nominal demand disturbance may modify real output because prices are endogenously rigid. Such endogeneity is explained by two factors. First, by the existence of menu costs of price adjustment and second, by the existence of relative-price rigidities in a context of overlapping multiperiod nominal price contracts.

With regard to the first factor, basic microeconomics suggests that a change in aggregate demand may alter a firm's maximizing price choice. However, if cost adjustments do exist, the incentives to alter such prices may be smaller. Hence, as menu costs increases, the likelihood that a nominal demand fluctuation may generate real effects also increases.

If menu costs were exogenous, price stickiness would only depend upon a comparison between gains from adjusting prices and the technological cost of altering such prices. However, following McCallum (1986), menu costs should be considered endogenous since they include the costs associated with explaining -to the customers- the pricing policy followed by the firm. Such cost will decline in an inflationary environment since all firms will adjust their prices more often and individuals will thus attach less importance to the behavior followed by nominal prices. Thus, menu costs will be smaller as average inflation increases. Hence, the likelihood that changes in nominal demand may lead to a variation in real output depends upon the

[1] May 1997, the authors were O. Blanchard, A. Blinder, M. Eichenbaum, R. Solow and J. Taylor.

macroeconomic environment; specifically, it depends on the average inflation rate. Consequently, one possible way to test the validity of the new Keynesian theory consists in examining whether the size of the change in real output -arising from a change in nominal demand- is inversely related to the average inflation rate. In this regard, Defina (1991) and Koelln, Rush and Waldo (1996) provide empirical evidence that support and reject respectively, this theory.

Applying ordinary least squares, Defina estimated -separately for 43 countries- the following equation:

$$Y_t = a_1 + [b_1 + b_2\pi_t + b_3 \text{ Vol } \pi_t](\Delta X_t) + a_3 Y_{t-1} + a_4 S_t + a_5 T_t + \varepsilon_t$$

Where Y_t represents the logarithm of real output in time t, ΔX_t is the change in the logarithm of nominal demand, π_t is the inflation rate, Volπ_t is the volatility of the inflation rate, S_t describes the price of oil and T_t is a time trend variable. According to Defina, for the new Keynesian theory to hold, the estimated parameter b_2 ought to be negative. He finds that in thirteen countries this parameter is negative and statistically significant. However, in three of these countries, the parameter b_3 is also negative, a result that supports Lucas misperception theory. Finally, in another fourteen countries the sign of b_2 is not-negative but the sign of b_3 is negative. Accordingly, Definas findings appear to provide relatively more support for Luca's theory than for the new Keynesian theory. Thus, contrary to the statement made by Defina, his results do not provide a convincing support of the new Keynesian theory.

In the procedure followed by Defina, it is implicitly assumed that the magnitude of the change in real output that arises from a variation in nominal demand is independent of the source that brought about this change in demand. This implies for example, that the variation -on real output- produced by an exogenous change in nominal government expenditure is similar to that arising from a shift in the nominal monetary base. According to Koelln, Rush and Waldo this assumption is inaccurate since the size and timing of these changes are not identical. Thus, it is necessary to distinguish whether the change in nominal demand comes from a shift in government expenditure or from an exogenous change in monetary aggregates.

Koelln, Rush and Waldo's methodology for testing the new Keynesian theory consists of two steps. In the first one, they calculate the size of the government consumption multiplier (i.e., the impact on real output of a change in nominal government consumption). For this purpose, they estimate -separately for 35 countries- a semilogarithmic equation that has as a dependent variable the logarithm of

real output. Within the set of independent variables they include the change in nominal government consumption and the change in the nominal monetary base. Once the value of this multiplier has been computed for each of the 35 countries, then in a second stage they test whether the vector of these multipliers is negatively correlated with a vector constituted by the average inflation rates experienced by these countries. With these methodological changes, Koelln Rush and Waldo show that the size of the government consumption multiplier does not depend on average inflation. Thus, their results reject the validity of the new Keynesian theory.

However, as mentioned before, the rigidity of prices is halfway explained -according to the new Keynesian theory- by the average inflation rate. Therefore, Defina's and Koelln's results may be biased. According to Ball and Romer (1990), in an economy with overlapping multiperiod nominal price contracts, the incentives for a firm to modify its relative price -when facing a change in demand- also depends on its output supply elasticity. Specifically, Ball and Romer show that there exists a positive correlation between output supply elasticity and the willingness to modify -when facing a variation in demand- their relative price. Using a dynamic model these authors show that an increase in output supply elasticity will reduce the firm's incentive to modify its relative price. In this context, all other firms that in the near future are capable of changing their nominal price will also be reluctant to do such a thing -if they care about their own relative price position. Hence, an increase in the output supply elasticity will lead to a higher probability of aggregate price rigidities. Thus, the elasticity of output supply will also affect the size -and length- of the real effects caused by a nominal demand fluctuation: the more elastic output supply, the larger the size of the government consumption multiplier. Therefore, by not including this explanatory variable, Defina and Koelln, Rush and Waldos' papers provide results that may be biased.

In sum, menu costs of price adjustment and overlapping multiperiod nominal price contracts are important ingredients of the new Keynesian theory. Since both arguments depend on the value taken by the average inflation rate and by the output supply elasticity, the size of the real effects of a nominal demand fluctuation will also depend on these two factors. Consequently, one way of examining the validity of the new Keynesian theory consists in testing the statistical significance of the average inflation rate and of the output supply elasticity as determinants of the size of the government consumption multiplier.

2. The Empirical Evidence

To proceed with the test we need a proxy for output supply elasticity. To derive such proxy, consider a profit-maximizing firm whose production function $F(\cdot)$ depends on its capital stock, K_t at time t. Further, assume that this representative firm finances its capital expenditure by means of a bank credit. Finally, assume that this representative firm faces a perfectly competitive output market but an imperfect credit market. Then, the problem faced by the firm consists of finding the capital stock level that maximizes the following Lagrangian:

$$L = P_t F(K_t) - r_t K_t - \lambda[K_t - K_{t-1} - C_t]$$

Where P_t is the price of the good being produced at time t, r_t is the rental price of capital at time t and C_t measures the amount of credit the firm has access to at time t. The solution to this problem implies that capital demand, K_t^d, and credit demand, C_t^d, will depend on the behavior followed by both the price of output and the rental price of capital. Specifically, $C_t^d = K_t^d = G(P_t, r_t)$ with partial derivatives $(\delta G/\delta P) > 0$ and $(\delta G/\delta r) < 0$. In turn, this implies that output supply may be characterized by $Y_t^s = H(P_t, r_t)$ and have partial derivatives whose signs are similar to those of the $G(\cdot)$ function. If all firms in the economy behave in a similar fashion, then a change in the output price will bring about the following change in the output supply:

$$(\delta Y^s/\delta P) = (\delta H/\delta P) + (\delta H/\delta r)(\delta r/\delta C^d)(\delta C^d/\delta P). \qquad (1)$$

Equation (1) suggests that the effect that prices have on the output supply depends -among other things- on what happens in the credit market. Thus, as the second term on the right hand side describes, an increase in the output price will raise capital demand and thereby increase credit demand. However, such an increase will raise the market interest rate and thereby reduce the incentives to expand output.

If we define θ as the interest-rate elasticity of credit supply, then the equilibrium size of $(\delta r/\delta C^d)$ will be negatively correlated with θ. Put differently, $(\delta r/\delta C^d) = E(\theta)$ such that $E'(\theta) < 0$. Thereby, equation (1) may be transformed into:

$$(\delta Y^s/\delta P) = (\delta H/\delta P) + (\delta H/\delta r)(E(\theta))(\delta C^d/\delta P). \qquad (2)$$

Hence, the interest-rate elasticity of credit supply will determine how elastic output supply is. Specifically, the more elastic credit supply is, the more elastic output supply will be.

Now consider a bank whose assets are credit, C, voluntary reserves, R, and treasury bills, B. In this scenario, credit supply, C^s, will depend on the interest rate paid by creditors, r, on the interest rate paid by treasury bills, i and on the amount deposited, D, in the bank -which constitutes the only liability of banks. Thus, $C^s = c(r,i)D$ such that $(\delta c/\delta r) > 0$ and $(\delta c/\delta i) < 0$. From this simple behavioral expression it follows that credit supply elasticity, θ, will equal:

$$\theta = (r/c)(\delta c/\delta r) + (i/c)(\delta c/\delta i)(r/i)(\delta i/\delta r) + (r/D)(\delta D/\delta r). \quad (3)$$

Thus, credit supply elasticity will depend on the behavior of three factors. First, it will depend on the elasticity of the credit share, c, to changes in the interest-rate paid on loans. Second, it will depend on the elasticity of this credit share to changes in the treasury bill interest-rate. Multiplying this last term we have the elasticity of the treasury bill interest-rate to changes in the loan interest-rate. Since it is more likely for the treasury bill interest-rate to affect the loan interest-rate, we will assume that the elasticity of the treasury bill interest-rate to changes in the loan interest-rate is negligible. Thus this factor may be discarded. Finally, we have the deposit interest-rate elasticity -which several studies[2] have shown is very low. Therefore, it follows from this description that the most important determinant of the credit supply elasticity is the elasticity of the credit share to changes in the interest-rate paid on loans: $\theta \approx (r/c)(\delta c/\delta r)$. Substituting this last expression into equation (2) we obtain:

$$(\delta Y^s/\delta P) = (\delta H/\delta P) + (\delta H/\delta r)(r/c)(\delta c/\delta r)(\delta C^d/\delta P). \quad (4)$$

Therefore, the size of output supply elasticity depends on the elasticity of the credit share to changes in the interest-rate paid by loans. If we take the banking multiplier as a proxy for this latter elasticity, then an increase in the banking multiplier will enlarge the size of the elasticity of output supply.

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[2] Among the many papers written on this subject we may cite Giovannini (1983).

As explained in the first section, one way of examining the validity of the new Keynesian theory consists in testing the statistical significance of the average inflation rate and of the output supply elasticity as determinants of the size of the government consumption multiplier. As a consequence of equation (4), our null hypothesis will be that the value of the government consumption multiplier depends on the average inflation rate and on the value of the banking multiplier. Specifically, the value of this multiplier will be smaller as the average inflation increases and will be larger as the size of the banking multiplier increases.

To test this hypothesis, we follow Koelln 's two-step methodology. In the first step we derive the value of the government consumption multiplier. For this purpose, we estimate an equation that has for dependent variable the growth rate of real GDP and for independent variables -besides a time trend variable- the growth rates of nominal government consumption and the growth rate of the nominal monetary base.[3] Furthermore, we include the price of oil as proxy for output supply shocks. Finally, to avoid the possibility of country effects, we do estimations per country[4] and derive for each one the value of the government consumption multiplier.

Put differently, in the first step we regress -for each country- output growth rate, Δy_t, against a matrix of independent variables, X_t, that include the growth rate of nominal public consumption and the growth rate of the nominal monetary base. Thus, for each of the 47 countries considered the estimation equation is:

$$\Delta y_t = \phi X_t + \varepsilon_t \text{ where } \varepsilon_t \sim N(0, \sigma_\varepsilon^2)...t = \{1964, ...1996\}. \quad (5)$$

In this first stage, we must assume -as Defina and Koelln, Rush and Waldo also did- that changes in nominal government consumption

[3] While Koelln, Rush and Waldo correlated the logarithm of real GDP with the level of nominal government consumption, we correlated the growth rate of real GDP with the growth rate of nominal government consumption. In this regard, we believe our methodology is more precise in trying to capture the value of the government consumption multiplier.

[4] The countries considered were: Bolivia, Brazil, Canada, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, United States of America, Uruguay, Venezuela; Austria, Belgium, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom; Australia, Japan, Malaysia, New Zealand, Niger, Philippines Singapore, South Korea, Thailand; South Africa, Ghana, India, Morocco and Pakistan.

are exogenous to the path followed by real output. This exogeneity is reflected by the fact that in 83% of the countries considered, the rate of growth of the nominal government consumption shows a positive sign year after year -notwithstanding the volatility of the growth rate of real GDP. It is also worth noting that among fiscal aggregates, nominal government consumption is less likely -compared, for example, to government capital expenditures- to be affected by the business cycle.

In order to test the new Keynesian theory we need -as independent variables- positive government consumption multipliers. In this regard, for the 18 countries the value of the estimated multiplier was positive, statistically significant and stable -according to the Cusum test.[5] Table 1 describes the main statistics of these 18 countries. Among these statistics, in column 1 we report the value of the estimated government consumption multiplier and in parenthesis we show its p-test.

For the null hypothesis to hold, the vector of government consumption multipliers -denoted as 'ALFA- must be negatively correlated with average inflation and positively correlated with the value of the banking multiplier. To test this hypothesis, in the second stage we regress the vector 'ALFA against a matrix of independent variables, Z, that describe different statistical moments of the inflationary process of the countries considered and the value taken by the banking multiplier -measured as the ratio of $M4$ to the monetary base. Thus, the estimation equation in this second stage is:

$$\text{ALFA} = \lambda Z + \eta \text{ where } \eta \sim N(0, \sigma_\eta^2). \tag{6}$$

[5] Thirteen countries reported a statistically negative government consumption multiplier and other seven countries reported a multiplier that was not statistically different from zero. Such results imply that the conventional wisdom -regarding the existence of a positive multiplier- may not be necessarily correct. Further, within the 18 countries that reported positive government consumption multipliers, in 35% of them the impact that nominal government spending has over real output did not disappear -according to Wald's test- after three years. This result, however, is not surprising since the dynamic impact of nominal government spending on output should also be followed by the dynamic effect that changes in the monetary base have on output.

Table 1

Selected Statistics for 18 Countries Between 1964-1996

	Estimated Government Consumption Multiplier p-test	*Banking Multiplier*	*Average Inflation*	*Inflation Volatility*	*GDP Growth Rate Volatility*
Average Developed	*0.171*	*7.228*	*8.307*	*0.697*	*0.898*
Austria	0.159 (0.10)	6.701	4.288	0.474	0.645
Iceland	0.054 (0.10)	4.588	24.193	0.822	1.015
Japan	0.250 (0.005)	9.611	4.742	0.965	0.688
Netherlands	0.167 (0.03)	8.716	4.530	0.618	0.768
Switzerland	0.225 (0.03)	6.524	3.785	0.607	1.373
Average Less Developed	*0.162*	*3.731*	*17.131*	*0.786*	*1.115*
Ecuador	0.177 (0.01)	2.653	23.247	0.858	1.153
El Salvador	0.159 (0.04)	3.774	10.631	0.834	1.264
Ghana	0.089 (0.06)	1.895	35.662	0.929	1.977
Guatemala	0.073 (0.10)	2.462	10.246	1.087	0.726
India	0.290 (0.08)	2.824	8.544	0.678	0.778
Morocco	0.151 (0.03)	2.755	6.129	0.671	1.370

Table 1
(*continued*)

	Estimated Government Consumption Multiplier p-test	*Banking Multiplier*	*Average Inflation*	*Inflation Volatility*	*GDP Growth Rate Volatility*
Pakistan	0.138 (0.03)	2.376	8.658	0.653	0.587
Panama	0.451 (0.009)	9.505	3.562	0.916	1.00
Paraguay	0.104 (0.06)	1.615	14.934	0.713	0.690
Philippines	0.142 (0.09)	3.244	11.932	0.810	0.865
South Africa	0.108 (0.10)	10.034	10.026	0.484	0.674
Uruguay	0.068 (0.01)	2.339	59.715	0.460	2.079
Venezuela	0.155 (0.01)	3.034	19.418	1.131	1.331

As table 2 shows, when average inflation, *Inflap*, is the only independent variable (see estimation 1), its estimated coefficient has the right sign -according to the new Keynesian theory- and is statistically significant -the value in parenthesis is the t-statistic. Even though the size of this estimate appears small, it should not be dismissed since it implies a sharp decline in the value of the government consumption multiplier. Using the average inflation data, for the sample of less developed countries the decline in the government consumption multiplier would equal 32% while for developed countries the reduction would be 15%.

If average inflation and aggregate demand volatility were correlated, it would be possible to explain the negative correlation between average inflation and the dependent variable with the use of Lucas' misperception theory. Consequently, we need to know whether the significance of the inflationary process is grounded on Lucas' information-based theory or for the new Keynesian theory. This distinction is relevant since Defina's results provided relatively more support for Lucas' misperception theory than it did for the new Keynesian theory.

To answer this question, we utilize three variables that may capture aggregate demand volatility. First, we use the variability coefficient -measured as the ratio of the standard deviation to the mean- of the inflation rate, *Inflacv*. Second, we use the volatility of the annual growth rate of real GDP, *Volgdp* and finally, we followed Koelln, Rush and Waldo and used the square of average inflation, *Inflap2*.

Estimations 2 to 4 describes what happens if these proxies for aggregate demand variability are used as independent variables: the estimated parameters are not statistically significant different from zero. Furthermore, the removal of average inflation as one of the independent variables, provokes a sharp decline of the R^2. Thus, the empirical evidence does not support Lucas' misperception theory. In addition, once average inflation is included in the set of independent variables -as described in estimations 5 to 7- the estimated parameter for this variable is the only statistically significant one. Thus, these preliminary results suggest that the inflationary process affects the sign and value of the government consumption multiplier through the impact that average inflation has over this multiplier. Put differently, our results -contrary to Defina's and Koelln, Rush and Waldo's - do not reject the new Keynesian theory.

Since our sample included developed and less developed countries, we tested whether the size of the government consumption multiplier could be explained -besides by the aforementioned inflation-

related variable- by a *dummy* that describes whether the country was developed or not. Our results indicate that the estimated parameter of this *dummy* was not significant from a statistically point of view. Thus, estimations with this variable are not reported.

As explained in the introduction, according to the new Keynesian theory, the size of the government consumption multiplier depends on average inflation and on the size of output supply elasticity. Therefore, the estimated parameters reported in table 2 might be biased. For this reason, we included in our regressions the size of the banking multiplier, *Mult* -as proxy for output supply elasticity- as another independent variable.

For the new Keynesian theory to hold, the government consumption multiplier and the size of the banking multiplier must be positively correlated. Thus, a higher banking multiplier may bring about a more elastic output supply and thereby increase the size of the government consumption multiplier. In this regard, estimation 1 of table 3 supports this view: the estimated parameter of *Multp* is statistically significant and has a positive sign. However, the size of this correlation is not exogenous: it depends on the average inflation. Thus, if we denote *Multinfp* as the product of average inflation times the banking multiplier, estimation 2 suggests that the size of the correlation between the government consumption multiplier, *Alfa*, and the banking multiplier diminishes as inflation increases.

Similar to the results reported in table 2, all the estimated parameters of the proxies for aggregate demand volatility are statistically equal to zero. Thus as estimations 3 to 5 of table 3 show, the empirical evidence keeps rejecting Lucas' misperception theory. At the same time, the results shown in these columns are unable to reject the new Keynesian theory -since the estimated parameter for the banking multiplier, *Mult*, is statistically significant and its sign is consistent with this latter theory.

Table 2

Dependent Variable: Government Policy Multiplier (Alfa)

	Estimation						
	1	2	3	4	5	6	7
Constant	0.213 (7.29)	0.118 (1.28)	0.208 (3.49)	0.181 (7.65)	0.177 (2.03)	0.153 (2.82)	0.263 (5.98)
Inflap	-0.003 (2.28)	—	—	—	-0.003 (2.19)	-0.005 (2.46)	-0.01 (2.12)
Inflacv	—	0.06 (0.52)	—	—	0.046 (0.43)	—	—
Volgdp	—	—	-0.04 (0.79)	—	—	0.00 (1.23)	—
Inflap2	—	—	—	-4E-05 (1.64)	—	—	0.001 (1.48)
R^2	0.24	0.002	0.04	0.14	0.25	0.31	0.34
F	5.19	0.27	0.63	2.68	2.56	3.43	3.88

Table 3
Dependent Variable: Government Policy Multiplier (Alfa)

	Estimation					
	1	2	3	4	5	6
C	0.091	0.150	0.003	0.097	0.115	0.149
	(2.38)	(3.52)	(0.03)	(1.2)	(2.59)	(2.69)
Multp	0.016	0.016	0.017	0.015	0.013	0.010
	(2.24)	(2.60)	(2.38)	(1.98)	(1.74)	(1.34)
Inflap	—	—	—	—	—	-0.002
						(1.41)
Inflacv	—	—	0.107	—	—	—
			(1.02)			
Vol	—	—	—	0.004	—	—
				(0.08)		
Inflap2	—	—	—	—	-2.7E-05	—
					(1.04)	
Multinfp	—	-0.001	—	—	—	—
		(2.30)				
R^2	0.24	0.44	0.28	0.24	0.29	0.32
F	4.95	5.79	3.00	2.30	3.03	3.62

However, the results of estimation 6 of this table suggests that the inclusion of both the banking multiplier, *Mult*, and the average inflation, *Inflap*, as explanatory variables causes their estimated parameters to become statistically insignificant.[6] This result may signal

[6] We did similar regressions as those shown in table 3 but including a *dummy* variable that measured whether the country was developed or not and excluding the constant. Contrary to what happened in table 2, the estimated parameters of the *dummy* variable were statistically significant. However all the results -with the exception of one- are similar to those shown in table 3. Given this similarity, for the sake of comparing estimations of table 3 with those of table 2, we decided not to report those that included the dummy variable. The only estimation that changed in a important manner -once the dummy was included- was estimation

the existence of multicolinearity and therefore the estimators shown there shown may be biased.

To avoid the bias produced by the possible multicolinearity we did two experiments. In the first one, we assumed that the size of the banking multiplier depends on the development stage of the country. For this purpose we built a *dummy* variable -denoted by *Du-* that amounts to one if the country is less developed and to zero otherwise. In this regard, the first column of table 4 reports the existence of a negative correlation between underdevelopment and the size of the banking multiplier. If we correlate the country's development stage to how well developed, for example, is the judicial system, the existence of a negative relationship between underdevelopment and the size of the banking multiplier is not too difficult to understand.

If the banking multiplier depends only on the development stage, the errors resulting from estimation 1 may be labeled as the exogenous banking multiplier. We denote this vector of errors by *Res*1. With this at hand, estimations 2 to 4 show -relative to our findings in table 3- an increase in the statistical significance of both the banking multiplier, *Res*1, and the average inflation. Furthermore, they also show that the signs of the estimated parameters of both variables are consistent with the new Keynesian theory. Finally, similar to what we reported in table 3, the size of the correlation between the government consumption multiplier and the banking multiplier diminishes as average inflation increases -as the estimated sign of *Multinfp* suggests.

However, as the work of Boyd, Levine and Smith (1997) suggests, the banking multiplier may not only depend on how developed the country might be; it may also depend on the average size of inflation. Specifically, as average inflation increases, lending risks may also increase. As estimation 1 of table 5 reports, this hypothesis can not be discarded. Therefore, the estimates shown in table 3 may be biased. In this context, the errors resulting from estimation 1 of table 5 may be considered the new exogenous banking multiplier. We denote this vector of errors as *Res*2. With this at hand, the other estimations shown in table 5 lack multicolinearity problems that could bias our estimates.

Estimations 2 to 4 show the statistical significance of the exogenous banking multiplier, *Res*2, and of the average inflation rate. They also show that the estimated parameters of these two variables have signs that are consistent with the new Keynesian theory. With regard to those variables used as proxies for aggregate demand variability, their estimated parameters were not statistically significant -which is

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6. In that case results were as follows:

Alfa=0.023(*Mult*) - 0.001 (*Inflap*) + 0.10 (*Dummy*) with R^2=0.36 and F=4.21
(5.49) (1.16) (2.90).

why the estimations that included these variables are not reported.

Finally, to complete the analysis we used Leamer's (1985) extreme-bounds test to examine how robust our results are. As is well known, with this test we examine whether the explanatory variables are systematically correlated -and with the same sign- with the dependent variable. Even though this test may be too strong -since no degree of confidence is allowed- it may provide some clues regarding the explanatory power of the variables used. In this regard, we find that among all variables considered, the estimated parameters for the banking multiplier are the only parameters robust to all specifications considered. The estimated parameters for average inflation are also robust -with the exception of estimates reported in table 4- and the proxies used for aggregate demand volatility were not robust at all. Thus, contrary to the findings of Defina and Koelln Rush and Waldo we can not reject the hypothesis behind the new Keynesian theory.

Table 4

	Estimation			
	1	2	3	4
	MULT	ALFA	ALFA	ALFA
C	7.22	0.164	0.197	0.227
	(6.3)	(8.56)	(7.00)	(7.61)
Resl	—	0.021	0.016	0.022
		(2.64)	(1.95)	(3.18)
Inflap	—	—	-0.002	—
			(1.53)	
Multinfp	—	—	—	-0.001
				(2.52)
Du	-3.49	—	—	—
	(2.55)			
R^2	0.29	0.30	0.40	0.51
F	6.69	6.97	4.96	7.83

Table 5

	Estimation			
	1	2	3	4
	MULT	ALFA	ALFA	ALFA
C	7.84	0.165	0.213	0.261
	(6.84)	(7.7)	(7.86)	(8.58)
Res2	—	0.016	0.016	0.028
		(1.65)	(1.89)	(3.54)
Inflap	-0.073	—	-0.003	—
	(1.68)		(2.45)	
Multinfp	—	—	—	-0.002
				(3.71)
Du	-2.85	—	—	—
	(2.13)			
R^2	0.41	0.15	0.39	0.55
F	5.15	2.7	4.80	9.32

3. Conclusions

There seems to exist a consensus regarding the existence of a short-run trade-off between inflation and unemployment. Yet there also seems to be a wide disagreement as to why such a trade-off exists. Several theories have been put forward to explain such a phenomenon. Just to mention some arguments we have Lucas' (1973) information-based theory, articles -such as Aiyagari, Christiano and Eichenbaum (1992)- belonging to the real business cycle school and others -such as Ball, Mankiw and Romer (1988)- belonging to the new Keynesian school. The objective of this paper was to put to an empirical test one of those theories: the new Keynesian theory.

As we explained in the introduction, the new Keynesian theory suggests that the value of the government consumption multiplier will be smaller as the average inflation increases and the degree of financial intermediation declines. After analyzing the relationship between the size of the change in real output -arising from a variation in nominal

demand- and the behavior of average inflation, Defina (1991) and Koelln, Rush and Waldo (1996) provide evidence that supports and rejects respectively the new Keynesian theory. However, these papers suffer from methodological problems and their estimates are biased because of omitted variables.

After taking care of these problems, we find that the empirical evidence can not reject the validity of the new Keynesian theory. Specifically, we find that the estimated parameter for the degree of financial intermediation is robust -according to Leamer's (1985) test, statistically significant and positively correlated with the size of the government consumption multiplier. Besides backing the new Keynesian theory, this result has two consequences. First, the estimation bias produced by the omission of this variable may be considerable and therefore, Defina's and Koelln, Rush and Waldo's results need to be taken with caution. Second, the use of government expenditure as a mechanism to stabilize output depends to a great extent on how sound the banking system is.

We also found that average inflation belongs to the set of determinants of the size of the government consumption multiplier. More specifically we found a negative and statistically significant correlation between these two variables, a result that is compatible with the new Keynesian theory. Since average inflation rate may be correlated with its volatility, we tested whether the importance of the inflationary process was grounded on Lucas' information-based theory or on the new Keynesian theory. Even though we used several proxies for aggregate demand variability, the empirical evidence does not support Lucas' information-based theory.

Finally, since financial intermediation and the inflationary process may be correlated, we estimated a proxy for financial intermediation that was orthogonal to such process. Once that was done, we find that these two variables do shape the size of the government consumption multiplier. Thus, the empirical evidence can not reject the validity of the new Keynesian theory.

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