Money Growth and Economic Growth in Developed Nations: An Empirical Analysis

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Money growth and output growth are positively correlated across a small homogeneous group of OECD countries. This relationship has received little attention. I perform a cross-country growth analysis and find that the relationship holds after controlling for standard determinants of economic growth. Estimation of vector autoregressions and tests for Granger Causality reveal that money growth helps drive economic growth in the OECD sample. Evidence indicates that this positive influence is a result of higher levels of economic freedom in more developed nations, which may create an environment where nominal money helps facilitate the production process or expedites capital accumulation.

INTRODUCTION

The general conclusion among macro and monetary economists is that there is no correlation between money growth and real output growth. One study often referenced in support of this conclusion is that of McCandless and Weber (2001). This is not a surprise given the thorough nature of their approach; they examine long-run cross-country correlations based on data over a thirty year period for 110 countries using the M0, M1 and M2 definitions of money. In addition, they calculate correlation coefficients based on two subsamples – one consisting of 21 OECD countries and the other consisting of 14 Latin American Countries.[1] Interestingly enough, for the subsample of OECD countries money growth and real output growth are positively correlated. Why? Are there specific characteristics exhibited only by developed nations that lead to a positive correlation between money growth and real output growth?

I consider these questions. I find that money growth and output growth remain positively correlated for a subsample of OECD countries after controlling for standard determinants of economic growth. Estimation of vector autoregressions and tests for Granger Causality reveal that money growth helps drive economic growth in the OECD sample. Evidence indicates that this positive influence is a result of higher levels of economic freedom in more developed nations, which may create an environment where nominal money helps facilitate the production process or expedites capital accumulation.

MONEY GROWTH AND ECONOMIC GROWTH – EXISTING EMPIRICAL EVIDENCE

A brief summary of the literature examining the relationship between money growth and real output growth is useful. Kormendi and Meguire (1985) in a cross-section analysis regress the mean growth of real output on a number of proposed macroeconomic determinants of growth including the mean of money supply growth and the standard deviation of money supply shocks. The time period for this study is 1950-77, and the data set consists of 47 countries. Kormendi and Meguire find that mean money growth is positively correlated with the mean growth rate of real output while the standard deviation of money supply shocks is negatively correlated with real output growth.

Dwyer and Hafer (1988) use a data set consisting of 62 countries and find that the coefficient on the growth rate of money in a cross-country regression of the growth rate of real income on the growth rate of money is negative. The growth rates used in this study are the averages of annual growth rates for the six years 1979-1985; this seems like a relatively short time period for an analysis involving growth, and the authors acknowledge this by noting that the study was aimed at addressing specific money related questions prevalent at the time.

McCandless and Weber analyze the period 1960-1990. Measures of money growth and real output growth are calculated as the geometric average rates of growth over this 30 year time period. The correlation coefficients for money growth and real output growth in the full sample are found to be -0.027, -0.050 and -0.014 for the M0, M1 and M2 definitions of money, respectively. In the subsample of Latin American countries the correlation coefficients are found to be -0.171, -0.239 and -0.243. Finally, the OECD sample yields correlation coefficients of 0.707, 0.511 and 0.518, each of which turns out to be statistically significant. This finding prompts the authors to regress real output growth on real money growth for the OECD subsample, and the slope parameter turns out to be about 0.1 for all three definitions of money. McCandless and Weber do not investigate this finding any further but acknowledge that further analysis is needed and hypothesize that the positive correlation may be a reflection of the fact that the institutional structure of the OECD countries permits separation of fiscal and monetary policies which is not observed in the rest of the world. I have found nothing in the literature that further explores the positive relationship between money growth and real output growth in the OECD countries.

THEORETICAL FRAMEWORK

As a theoretical framework for the analysis, I consider the Solow model with exogenous technical progress and a production function which includes labor and physical capital. Recall that the fundamental differential equation associated with this model is

$$\dot{k} = sy - (n + d + g)k \tag{1}$$

where k is capital per effective worker; $\dot{k}$ represents the differentiation of capital per effective worker with respect to time; s is the saving rate or the ratio of investment in physical capital to total income;[2] y is output per worker; $(n+d+g)$ represents augmented depreciation where n is the growth rate of the labor force, d is the rate at which physical capital depreciates and g is the rate at which technology grows. It follows that in the steady state, equation (1) can be written as

$$sy = (n + d + g)k\ . \tag{2}$$

Thus, the determinants of the steady state levels of output per worker and capital per worker are s and $(n+d+g)$. Finally, conditional convergence tells us that an economy grows faster the further it is from its own steady state position; so, an empirical growth equation should include initial output per worker to control for differences in steady states across countries.

ESTIMATING EQUATION

That being said and specifying the model to be log linear, economic growth can be estimated in a cross-country setting as follows:

$$\ln y_t - \ln y_0 = \beta_0 + \beta_1 \ln y_0 + \beta_2 \ln(n + d + g) + \beta_3 \ln s + \varepsilon\ . \tag{3}$$

Equation (3) comes directly from what the simple Solow model tells us about growth.[3] However, I am interested in the relationship between real output growth and money growth in a subsample of OECD countries. Adding a money growth regressor to equation (3) seems valid if we assume that money growth affects productivity or factor accumulation.[4] Thus, the following equation replaces equation (3):

$$\ln y_t - \ln y_0 = \beta_0 + \beta_1 \ln y_0 + \beta_2 \ln(n + d + g) + \beta_3 \ln s + \beta_4 (\ln m_t - \ln m_0) + \varepsilon \, . \tag{4}$$

The variable y denotes real GDP per worker and m is the nominal money supply; the subscripts 0 and t refer to the initial and terminal dates of the period to be analyzed. Therefore, ($\ln y_t - \ln y_0$) represents the growth rate in real GDP per worker over the sample period, and ($\ln m_t - \ln m_0$) represents the growth rate of the nominal money supply over the sample period. All other variables have been previously defined.

I use the sample period 1979-1997. This is the longest period of time for which the data is available for the maximum number of countries. Summers and Heston (2002) is the data source used for output per worker and augmented depreciation. The dependent variable is computed from the *rdgdpwok* series in the Summers and Heston data set. The annual average over the sample period is used for $n+g+d$. Mankiw, Romer and Weil (1992) assume $g+d = 0.05$; thus, a proxy for $n+g+d$ is obtained by adding 0.05 to the annual average rate of growth of the labor force. There is no explicit labor force series in the Summers and Heston dataset, but it can be calculated implicitly.[5] As a proxy for s, I use the annual average ratio of gross fixed capital formation to GDP reported in the OECD's fact book of Economic, Environmental, and Social statistics (2006). Finally, the International Monetary Fund's *International Financial Statistics* (IFS) *Yearbook* provides data for the nominal money supply. For many of the countries in the McCandless and Weber OECD subsample, national definitions of money (M0, M1, M2, M3) are not reported in the online version of the IFS yearbook nor the hardcopy versions. That being said, in order to include the maximum possible number of countries over the longest period of time, I use the *Money plus Quasi-Money* definition, which is given in line 35l of the IFS yearbook (1999). The value of *Money plus Quasi-Money* generally lies between the M2 and M3 definitions of money. OLS is used to estimate equation (4), and all reported standard errors are corrected for possible heteroskedasticity using White's (1980) correction.

CROSS-COUNTRY RESULTS

Table 1 presents the cross-country estimates of the growth equation for a subsample of OECD countries.[6] Column 1 presents estimates of the model when initial income is the only covariate. As is apparent, the coefficient on initial income is negative and highly significant indicating conditional convergence among the subsample of OECD countries. However, it can be seen from column 2 that when augmented depreciation and the investment share are included with initial income, the estimated coefficient on initial income increases dramatically and becomes statistically insignificant.

TABLE 1
CROSS-COUNTRY GROWTH REGRESSIONS – OECD SUBSAMPLE, 1979-1997

	Equation		
	1	2	3
Variable			
Intercept	3.752***	-1.494	-4.930*
	(0.657)	(1.556)	(2.738)
Initial Income	-0.332***	-0.093	0.117
	-0.064	(0.080)	(0.144)
Augmented Depreciation	---	-0.580***	-0.760***
		(0.182)	(0.228)
Investment Share	---	0.368***	0.579**
		(0.136)	(0.212)
Nominal Money Growth	---	---	0.063*
			(0.037)
Adjusted R^2	0.483	0.636	0.655
Sample	15 obs.	15 obs.	15 obs.

The dependent variable is the cumulative growth rate in real GDP per worker, 1979-1997.
All explanatory variables are entered as natural logarithms except nominal money growth.
Parentheses ( ) contain White corrected standard errors.
* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Others, such as Mankiw, Romer, and Weil (1992), have estimated the same equation and found initial income to be significant. My result may reflect multicollinearity. For example, given that the sample period covers only 18 years, and all OECD countries have similar steady state characteristics, it may be that initially poor countries also have relatively low average annual investment shares. Nonetheless, the estimated coefficients on augmented depreciation and investment share have the expected signs and are both highly significant. Moreover, the inclusion of the aforementioned regressors improves substantially the fit of the regression as is apparent in the increase in the adjusted R^2 from 0.483 to 0.636.

Column 3 of Table 1 presents the results of estimating equation (4). Note that the estimated coefficient on nominal money growth is statistically significant at the 10% level. The estimate suggests that a 1% increase in the rate of nominal money growth over the period 1979-1997 is associated with a 0.06% increase in economic growth over the same period. Adding money growth to the model increases the adjusted R^2 from 0.636 to 0.655. This increase in explanatory power, albeit small, along with the significance of nominal money growth, implies that it is possible that money growth affects economic growth directly through an effect on productivity. However, correlation does not imply causality, and so the results must be interpreted carefully. It could be that we are seeing reverse causality. That is, the OECD countries effectively control inflation, and faster real output growth requires faster nominal money supply growth to meet the growth in money demand caused by real output growth. For completeness, I estimated the same equations for the McCandless and Weber subsample of Latin American countries and found nominal money growth to be insignificant. These results are reported in Appendix 2.

INVESTIGATING CAUSALITY

The positive correlation between nominal money growth and economic growth may arise from economic growth causing money growth, not money growth causing economic growth. To address this issue, I collect annual data for nominal money growth and economic growth over the period 1979-1997 for seven of the 15 OECD countries. Only seven countries have the necessary data. I then take the two times series and estimate a vector autoregression (VAR) to determine whether or not economic growth Granger causes nominal money growth.

It is imperative that the data being used in the estimation of a VAR be stationary. Therefore, before estimating the VARs, I first test for the presence of a unit root in each of the two series. Results of the Augmented Dickey-Fuller test are given in the top portion of Table 2.

TABLE 2
STATIONARITY AND REVERSE CAUSALITY

	Australia	Canada	Denmark	Japan	Norway	UK	USA
Augmented Dickey-Fuller Test							
Economic Growth	-3.53	-3.40	-3.87	-2.70	-3.64	-4.29	-4.54
	(0.015)	(0.020)	(0.006)	(0.087)	(0.011)	(0.002)	(0.001)
Money Growth	-4.23	-1.92*	-2.34*	-2.62*	-1.46*	-3.03	-2.21*
	(0.003)	(0.321)	(0.166)	(0.102)	(0.536)	(0.044)	(0.206)
VAR							
order	2	1	1	1	1	2	1
differencing	none	1	1	1	1	none	1
Granger Causality Wald Test	4.59	0.77	1.23	3.25‡	2.00	0.52	1.30
	[0.331]	[0.380]	[0.268]	[0.071]	[0.157]	[0.771]	[0.255]

The statistic reported for the Augmented Dickey-Fuller test is the tau statistic for the single mean case with one lag. Numbers in parentheses ( ) represent the probability less than tau.
* indicates the presence of a unit root.
The statistic reported for the Granger Causality Wald test is a chi-square statistic.
Brackets [ ] contain p-values. ‡ indicates significance at the 10% level.

The statistic reported is the tau statistic for the single mean case with one lag. Recall that the null hypothesis of the test is that a unit root is present in the series. Evidence indicates that the economic growth series is stationary for all seven countries. However, the null cannot be rejected for five of the seven money growth series, and so annual money growth in Canada, Denmark, Japan, Norway and the United States is a unit root process. That being said, when I estimate the VAR, I first difference the data for both series in each of the aforementioned five countries; first differencing is sufficient for creating a stationary series in all cases. For these countries, I estimate a first order VAR. A second order VAR is estimated for Australia and the UK, the two countries for which both economic growth and money growth are stationary over the sample period.[7] The last two rows of Table 2 present the chi-square statistic for the Granger Causality Wald test and its corresponding p-value. The null hypothesis is that economic growth does not Granger Cause nominal money growth. As can be seen from the table, the chi-square statistic is statistically significant only for Japan. Thus, reverse causality has no statistical support for six out of the seven countries.

WHY DOES THE RELATIONSHIP BETWEEN MONEY GROWTH AND ECONOMIC GROWTH ONLY HOLD FOR A SUBSAMPLE OF OECD COUNTRIES?

Even if nominal money growth were insignificant in the estimation of equation (4), the correlation between nominal money growth and economic growth could not be dismissed. Rather, such a finding would imply that money growth is related to economic growth indirectly via a correlation with one or more determinants of the steady state. Otherwise, McCandless and Weber would not have found a positive correlation between money growth and real output growth. Moreover, the evidence from the previous section does not support reverse causality, and so it seems that nominal money growth is positively influencing economic growth. An interesting question is why this relationship does not hold across all countries or a subsample of Latin American countries. McCandless and Weber hypothesize that the institutional structure of the OECD countries permits separation of fiscal and monetary policies not observed in the rest of the world. Given the lack of support for reverse causality, for this to be the explanation behind the positive relationship between economic growth and money growth, it must be that such a separation positively influences money's ability to affect productivity or some determinant of the steady state. Extending this hypothesis, I submit that developed nations, in addition to exhibiting separability of monetary and fiscal policy, tend to have less government regulation, better legal structure, and more clearly defined property rights than their less developed counterparts. In other words, the OECD countries embrace the free market system more than the rest of the world. That being said, could it be that a higher degree of economic freedom yields an environment where money is a productive input? Or perhaps money only allows resources such as capital and labor to be used more efficiently in developed nations.

Testing the aforementioned hypothesis empirically seems far from a straightforward task. Gwartney and Lawson (2005) quantify economic freedom for a large number of countries by creating an index intended to capture aspects of economic freedom such as freedom to decide what is produced and consumed, freedom to keep what you earn, freedom of exchange with foreigners, and protection of money as a store of value and medium of exchange. The index is based on a zero-to-ten scale where higher ratings are indicative of institutions and policies more consistent with economic freedom. Gwartney and Lawson calculate the index every five years over the period 1970-2000 and then yearly starting in 2001. Given the existence of this index, if high levels of economic freedom create an environment where money is a productive input or at least increases the productivity of other inputs, then the change in the economic freedom index should be positively correlated with money growth for the subsample of OECD countries. To test this hypothesis, I consider OLS estimation of the equation

$$\ln m_t - \ln m_0 = \beta_0 + \beta_1 \Delta F + \varepsilon \qquad (5)$$

where ΔF is the change in the economic freedom index from 1980 to 1995 and ($\ln m_t - \ln m_0$) is the growth rate of the nominal money supply over the period 1980-1995. Results of the cross-country estimates of equation (5) are reported in column 1 of Table 3. Note that the change in economic freedom is statistically significant at the 5% level. Thus, increases in economic freedom are associated with increases in nominal money growth, and the hypothesis that high levels of economic freedom create an environment where money is productive has empirical support.[8]

TABLE 3
MONEY GROWTH AND ECONOMIC FREEDOM

	OECD Subsample		Latin American Subsample
	1	2	3
Variable			
Intercept	0.553*	29.629**	3.248***
	(0.272)	(5.883)	(0.450)
Change in Economic Freedom	0.686**	0.428*	-0.089
	(0.237)	(0.222)	(0.120)
Initial Income	---	-1.940***	
		(0.397)	
Augmented Depreciation	---	1.429*	
		(0.715)	
Investment Share	---	-1.464**	
		(0.630)	
Adjusted R^2	0.405	0.589	-0.079
Sample	15 obs.	15 obs.	14 obs.

The dependent variable is the cumulative growth rate in nominal money, 1980-1995.
Parentheses ( ) contain White corrected standard errors.
* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

Now, one may argue that the positive correlation between the change in economic freedom and money growth is simply a result of the fact that both nominal money and economic freedom tend to increase over time and there is no fundamental relationship between the two variables. To address this, I add other regressors that are significantly correlated with money growth to the right hand side of equation (5) and estimate the following equation:

$$\ln m_t - \ln m_0 = \beta_0 + \beta_1 \Delta F + \beta_2 \ln y_0 + \beta_3 \ln(n + d + g) + \beta_4 \ln s + \varepsilon \,. \quad (6)$$

[9]

As is apparent from column 2 of Table 3, the change in economic freedom remains significant at the 10% level even in the presence of the additional covariates. Thus, the change in economic freedom is explaining variation in nominal money growth not captured by initial income, augmented depreciation, or the investment share; this implies that the relationship between the change in economic freedom and nominal money growth is not trivial, and moreover, it further solidifies the argument that better institutions, better legal structure and less government regulation lead to faster nominal money growth.

Nominal money growth contributes to economic growth in developed nations. Empirical evidence in this section indicates that this may be because developed nations are more economically free, thereby yielding an environment where nominal money helps facilitate the production process or expedites capital accumulation. If the aforementioned conclusion is to have any merit, estimation of equation (5) for the subsample of Latin American countries should not yield a significant coefficient on ΔF. Recall that economic growth and money growth are not correlated in the subsample of Latin American countries (Appendix 2), and so improvements in economic freedom should not be correlated with nominal money growth. Column 3 of Table 3 presents the results of estimating equation (5) for the Latin American subsample. The coefficient on ΔF is negative but insignificant. This result is in line with what is expected.

CONCLUSION

This paper investigates the relationship between nominal money growth and economic growth in a subsample of OECD countries. Specifically, using the Solow model as a theoretical framework, I estimate a cross-country growth equation and find a positive and significant relationship between nominal money growth and economic growth. Moreover, the lack of evidence for reverse causality implies that money growth positively influences economic growth. Finally, my findings suggest that this positive influence is a result of the higher levels of economic freedom exhibited by the OECD countries; it seems that in countries with well developed institutions, nominal money helps facilitate the production process or expedites capital accumulation.

This result warrants further consideration. Theoretical analyses aimed at fleshing out the underlying forces of the mechanism by which institutional development enhances the productivity of money would be very useful. Empirically, it would be worthwhile to investigate causality for a larger number of OECD countries. Recall that I only estimated VARs for seven of the fifteen countries in my OECD subsample. Finding alternative data sources that would yield the necessary data to test for Granger Causality in all OECD countries would enhance the robustness of the results.

The simple Solow framework assumes economies are closed. However, most economies, especially the OECD economies, exhibit a high degree of openness. The effects of trade on growth are significant and have been well documented in the literature. Trade allows countries to import a larger variety of specialized inputs, which in turn has a positive effect on output. In addition, if capital is internationally mobile, capital deepening is not limited by national saving. Altering the underlying theoretical framework of the empirical analysis to allow for openness could prove to be a useful exercise and would serve as an additional robustness check of the positive relationship between nominal money growth and economic growth found herein.

ENDNOTES

1. The OECD subsample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Switzerland, the United Kingdom, and the United States. Countries included in the Latin American subsample include Argentina, Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Paraguay, Uruguay, and Venezuela.
2. In the Solow model, it is assumed that saving equals investment. In an open economy, capital is internationally mobile and thus saving and investment are not necessarily equal. A change in investment may not be related at all to a change in saving; the change in investment may just reflect a change in borrowing. However, over long periods of time, saving minus investment is stationary and so in the context of economic growth, which itself is a long run phenomenon, it should not make much difference whether we think of *s* as the saving rate or the ratio of investment in physical capital to total income.
3. This specification is consistent with the one presented in Mankiw, Romer and Weil (1992).
4. See Appendix 1 for a discussion of theoretical models that relate money growth to real output and real output growth.
5. Following Summers and Heston (1991), I calculate the labor force as follows. The proportion of the population under age 15 (PPU15) can be calculated as $PPU15 = 2 \times (1 - RGDPCH / RGDPEA)$. The labor force participation rate (LFPR) is equal to $RGDPCH / RGDPWOK$. Given explicit data on the total population (*POP*), the Labor Force is defined as $LF = LFPR \times (1 - PPU15) \times POP$. *RGDPCH, RDPEA,* and *POP* represent real GDP per person, real GDP per equivalent adult and total population, respectively. All three series are in the Summers and Heston (2002) dataset.
6. The sample I use contains only 15 of the 21 OECD countries used in the McCandless and Weber study. The fifteen countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Japan, the Netherlands, Norway, Portugal, Spain, the United Kingdom, and the United States.
7. I considered the results for first, second, and third order VARs in all seven cases. The Granger Causality test led to the same conclusion regardless of the order.

8. Note that if the results of the previous section had supported reverse causality, then the following argument could be made. The OECD countries, which exhibit high degrees of economic freedom, have central banks that follow similar feedback rules. That is, the central banks increase nominal money growth as real output growth increases. Therefore, countries that experience larger positive changes in economic freedom should experience higher rates of economic growth and thus higher rates of nominal money growth. In this case, a positive correlation between economic freedom and money growth could be attributed entirely to reverse causality. However, this is exactly the interpretation that has been ruled out by the results in the INVESTIGATING CAUSALITY section.
9. Results of regressing money growth on the determinants of the steady state for the period 1979-1997 are given in Appendix 3. These results provide the empirical justification for including the additional regressors in equation (6).

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APPENDIX 1

Money Growth And Economic Growth – What Does Theory Say?

Is there any theoretical justification for including money growth as a regressor in equation (4)? A discussion of the theory relating money growth to real output and real output growth is warranted.

Consider first the Sidrauski (1967) MIU model. In this model, the representative agent maximizes an infinite sum of discounted utilities subject to a resource constraint where utility is dependent on per capita consumption and real per capita money holdings. It turns out that money is superneutral in this model. Thus, the Sidrauski model predicts that there is no long run relationship between nominal money growth and real output growth. However, in representative agent models, everyone is identical, so there is no reason to believe that there is exchange of any sort. Therefore, just sticking money in the utility function is questionable because it is not clear how money would provide any benefit.

Cash-In-Advance models provide an avenue for introducing money into an economy without directly inserting it into the utility function. CIA models where the Clower constraint is applied to consumption exhibit superneutrality, but if the Clower constraint is applied to capital, superneutrality does not hold. The constraint on capital implies that inflation taxes the transfer of resources from the present to the future. Thus, higher rates of money growth will lead to higher rates of inflation which will tend to discourage capital accumulation. Moreover, Stockman (1981) develops a model in which higher money growth leads to a lower steady state capital per worker ratio if the cash-in-advance constraint applies to both consumption and investment goods. By appealing to the Solow framework, Stockman's result implies that the economy will experience slower economic growth as a result of faster money growth. In similar spirit, Marquis and Reffet (1991) using an endogenous growth model conclude that higher money growth has a negative effect on long term economic growth as long as the cash-in-advance constraint applies to investment in either physical or human capital. Keep in mind though that in an economy where credit cards and other forms of financing via debt are prevalent, a cash- in-advance constraint is a bit of a stretch. However, in developing economies where financial institutions are not well established and credit markets are largely absent, a cash-in-advance constraint seems reasonable.

One drawback of the aforementioned theories is that they all employ representative agent models. Weil (1987) claims that in an economy with heterogeneous agents, changes in monetary policy have redistributional effects and will influence capital accumulation. Mino and Shibata (1994) focus on the redistributional effects of inflation and monetary policy in an overlapping generations model that yields endogenous growth; the model they develop concludes that money growth and economic growth are positively correlated.

The point to be made is that the literature includes theoretical models that predict no relationship, a negative relationship and a positive relationship between money growth and real output growth. Therefore, estimating an equation such as equation (4) is theoretically justified.

APPENDIX 2

I use the OECD's fact book of Economic, Environmental, and Social statistics (2006) to obtain my proxy for *s* when I estimate the growth equations for the OECD subsample. In the Latin American case, I use the annual average of the investment share of real gross domestic product per capita, which is the series *ci* in the Summers and Heston (2002) data set.

TABLE 4
CROSS-COUNTRY GROWTH REGRESSIONS – LATIN AMERICAN SUBSAMPLE, 1979-1997

	Equation		
Variable	1	2	3
Intercept	0.090	-0.925	-0.697
	(1.432)	(1.280)	(1.249)
Initial Income	-0.014	-0.255	-0.284
	(0.147)	(0.184)	(0.183)
Augmented Depreciation	---	-0.968**	-1.036**
		(0.383)	(0.394)
Investment Share	---	0.353	0.267
		(0.241)	(0.256)
Nominal Money Growth	---	---	0.025
			(0.030)
Adjusted R^2	-0.083	0.039	-0.044
Sample	14 obs.	14 obs.	14 obs.

The dependent variable is the cumulative growth rate in real GDP per worker, 1979-1997.
All explanatory variables are entered as natural logarithms except nominal money growth.
Parentheses ( ) contain White corrected standard errors.
* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.

APPENDIX 3

TABLE 5
CROSS-COUNTRY MONEY GROWTH REGRESSION – OECD SUBSAMPLE, 1979-1997

Variable	
Intercept	54.600***
	(7.484)
Initial Income	-3.329***
	(0.416)
Augmented Depreciation	2.858**
	(1.014)
Investment Share	-3.349*
	(0.896)
Adjusted R^2	0.575
Sample	15 obs.

The dependent variable is the cumulative growth rate in nominal money, 1979-1997.
All explanatory variables are entered as natural logarithms.
Parentheses ( ) contain White corrected standard errors.
* indicates significance at the 10% level, ** at the 5% level, and *** at the 1% level.