DO STOCK MARKETS PROMOTE ECONOMIC GROWTH?[*]

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Abstract. One of the most enduring debates in economics is whether financial development causes economic growth or whether it is a consequence of increased economic activity. Little research into this question, however, has used a true causality framework. This paper fills this lacuna by using Granger-causality tests and finds little evidence of a causal relationship going from stock market development to economic growth. We do find evidence that stock market development can cause currency appreciation, which may confound studies that use dollar denominated measures of economic growth.

Keywords: stock market, financial development, economic growth, Granger causality.

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1. Introduction

One of the most enduring debates in economics is whether financial development causes economic growth or whether it is a consequence of increased economic activity. Schumpeter (1912) argued that technological innovation is the force underlying long-run economic growth, and that the cause of innovation is the financial sector's ability to extend credit to the entrepreneur (see also Hicks, 1969). Joan Robinson, on the other hand, maintained that economic growth creates a demand for various types of financial services to which the financial system responds, so that "where enterprise leads finance follows" (1952, p. 86).

Several possible mechanisms have been advanced for a connection leading from equity market development to growth. Among these are:

1) The fact that a more developed equity market may provide liquidity that lowers the cost of the foreign capital essential for development, especially in low-income countries that cannot generate sufficient domestic savings (WIDER, 1990, Bencivenga et. al., 1996, and Neusser and Kugler, 1998).

2) The role of equity markets in providing proper incentives for managers to make investment decisions that affect firm value over a longer time period than the managers' employment horizons through equity-based compensation schemes (Dow and Gorton, 1997).

3) The ability of equity markets to generate information about the innovative activity of entrepreneurs (King and Levine, 1993b) or the aggregate state of technology (Greenwood and Jovanovic, 1990).

4) The role of equity markets in providing portfolio diversification, enabling individual firms to engage in specialized production, with resulting efficiency gains (Acemoglu and Zilibotti, 1997).

5) The fact that diverse equity ownership creates a constituency for political stability, which, in turn, promotes growth (Perotti and van Oijen, 1999).

Empirical investigations of the link between financial development in general, and stock markets in particular, and growth have been relatively limited. Goldsmith (1969) reports a significant association between the level of financial development, defined as financial intermediary assets divided by GDP, and economic growth. He recognized, however, that in his framework there was "no possibility of establishing with confidence the direction of the causal mechanisms (p. 48)." A number of subsequent studies have adopted the growth regression framework in which the average growth rate in per capita output across countries is regressed on a set of variables controlling for initial conditions and country characteristics as well as measures of financial market development (see King and Levine, 1993a, Atje and Jovanovic, 1993, Levine and Zervos, 1996, Harris, 1997, Levine and Zervos, 1998, and Levine, Loayza and Beck, 2000 among others).

All of these studies face a number of potential problems. In particular, they must deal with issues of causality and unmeasured cross-country heterogeneity in factors such as savings rates that may cause both higher growth rates and greater financial-sector development (see Caselli et. al., 1996). A number of techniques have been adopted in an attempt to deal with these issues including (a) using only initial values of financial variables (King and Levine, 1993, (b) using instrumental variables (Harris, 1997), and (c) examining cross-industry variations in growth that should be

immune to country specific factors (Demirgüç-Kunt and Maksimovic, 1996 and Rajan and Zingales, 1998).

A more difficult question arises with respect to whether the forward-looking nature of stock prices could be driving apparent causality between stock markets and growth. Current stock market prices should represent the present discounted value of future profits. In an efficient equity market, future growth rates will, therefore, be reflected in initial prices. This argues for using turnover (sales over market capitalization) as the primary measure of development, thereby purging the spurious causality effect because higher prices in anticipation of greater growth would affect both the numerator and the denominator of the ratio.

We address issues of causality in the framework introduced by Granger (1969). Granger causality tests have been widely used in studies of financial markets as well as several studies of the determinants of economic growth including savings (Carroll and Weil, 1994); exports (Rahman and Mustafa, 1997, Jin and Yu, 1995); government expenditures (Conte and Darrat, 1988); money supply (Hess and Porter, 1993); and price stability (Darrat and Lopez, 1989).[1]

A limited number of previous studies have used Granger causality to examine the link between financial markets and growth. Thornton (1995) analyzes 22 developing economies with mixed results although for some countries there was evidence that financial deepening promoted growth. Luintel and Khan (1999) study 10 developing economies and find bi-directional causality between financial development and economic growth in all the sample countries. Spears (1991) reports that in the early stages of development financial intermediation induced economic growth

[1]The studies cited are illustrative of many others looking at each potential determinant of growth. Others have used the Granger causality framework to examine the link between growth and factors such as privatization, literacy and defense spending.

in Sub-Saharan Africa, while Ahmed and Ansari (1998) report similar results for three major South-Asian economies. Demetriades and Hussain (1996) report "very little evidence that finance is a leading sector in the process of economic growth" in a sample of 10 countries, while Neusser and Kugler (1998) report that financial sector GDP Granger-caused manufacturing sector GDP in a sample of thirteen OECD countries. Finally, in work similar to ours because it focuses on equity markets and encompasses far more countries than other studies using Granger causality techniques to examine the link between financial markets and growth, Rousseau and Wachtel (2000) analyze 47 economies and report that greater financial sector development leads to increased economic activity. These results are quiet different from what we find. As will be discussed below, they apparently result from a different measure of real economic activity.

In summary, previous empirical research has suggested a possible connection between stock market development and economic growth, but is far from definitive. Although the relationship postulated is a causal one, most empirical studies have addressed causality obliquely, if at all. Moreover, most studies have not adequately dealt with the fact that efficient markets should incorporate expected future growth into current period prices.

2. Data and Methodology

Because we compare results from different countries, it is important that the data be consistently defined across countries.[2] In order to achieve as much consistency as possible, we rely

[2]According the International Federation of Stock Exchanges (see http://www.fibv.com/) some exchanges count as turnover only transactions that pass through their trading systems while others include off-market transactions subject to supervision by the market authority. In addition some sources compute turnover as annual sales over market capitalization averaged over the past twelve months, while others use the average of monthly sales to monthly market capitalization.

on data from the International Finance Corporation (IFC 1998 and earlier editions) for financial markets while growth rates and per capita GDP were obtained from International Monetary Fund's *International Financial Statistics* (various months). We were able to obtain consistent data for 70 countries for varying time periods beginning in 1985 (or the first year that the IFC reported data for the market) and ending in 1997. The list of countries used and periods covered are contained in Table 1.[3] In total, we have 878 country/year observations, although because of missing values we use between 680 and 750 observations for analyzing any given financial variable.

Stock market development is measured by two variables: (1) turnover velocity, and (2) the change in the number of domestic shares listed. While we initially analyzed whether market capitalization "causes" growth, interpretation of these results is particularly problematic since, as discussed above, efficient markets will reflect future earnings growth in current prices. Since earnings growth should be closely related to overall economic growth, this will make it look like increases in market capitalization preceded and, therefore, "caused" economic growth even if the true link ran in the reverse direction. We must, therefore, find indicators of market development that are independent of stock prices. Given that the role of a market is to reallocate capital to its most productive uses, the best such indicator may be the turnover velocity (the ratio of turnover to market capitalization). As a secondary measure, we also examine the annual percentage increase in the number of listed companies as an indication of financial deepening.

Since it is likely that the impact of stock market development on growth will vary across levels of development we provide estimates of the causal connection for countries divided into two

[3]It should be noted that some series are not available for some countries for the full period analyzed.

groups: "mature" and "emerging" markets according to International Finance Corporation categories.[4] Results are similar if we define the classifications more narrowly.

Table 2 presents the sample statistics for the key variables for the full sample and the income subgroups. Over our time period, higher income countries grew more rapidly than lower income ones, although there was a much wider divergence of experiences in the experiences of lower income countries. As might be expected, the ratio of turnover to market capitalization is higher for higher income markets but the change in the number of traded companies is greater for lower income markets.

Granger causality tests rely on estimating two basic equations:

$$Y_t = \alpha_0 + \sum_{i=1}^{k_1} \alpha_i Y_{t-i} + \sum_{i=1}^{k_2} \beta_i X_{t-i} + \epsilon_t \quad (1)$$

and

$$X_t = \gamma_0 + \sum_{i=1}^{k_3} \gamma_i Y_{t-i} + \sum_{i=1}^{k_4} \delta_i X_{t-i} + \nu_t \quad (2)$$

where *X* denotes an indicator of stock market development, *Y* denotes economic growth and the subscripts t and t-I denote the current and lagged values. Hsiao (1981) suggests searching over the lag lengths (k_1 to k_4) and applying an information criterion to determine the optimal length of the lag

[4]A country's classification as an "emerging" or "mature" market does not depend on the level of its stock market development or other economic institutions, but instead merely on whether its GNP per capita is below or above the World Bank's threshold for a "high-income country" (USD 9,656 in 1998). Although the IFC is currently considering a revision to incorporate institutional aspects of market maturity into its definition of emerging markets, the results of this revision are not available at this time.

structure. We used the three most common choices of information criteria (Akaike, 1969; Hannan and Quinn, 1979; and Schwarz, 1978) but found that more than one lag in either X or Y was never optimal.

We must also address the fact that the presence of lagged values of the dependent variable on the right-hand side of Equations (1) and (2) in a dynamic panel data framework can lead to inconsistent parameter estimates unless the time dimension of the panel is very large (Nerlove, 1967, Nickell, 1981 and Keane and Runkle, 1992). Anderson and Hsiao (1981) propose using twice-lagged levels of the right-hand side variables as instruments.[5] Arellano and Bond (1991) suggest two GMM variants of the Anderson and Hsiao estimators. Kiviet (1995) suggests an alternative approach involving direct calculation of biases and correcting of least squares estimates. Simulation results in Judson and Owen (1996) have shown that Anderson-Hsiao estimators, while the least biased among the available alternatives, are considerably less efficient than the alternative proposed by Kiviet. On the other hand, extension of Kiviet's estimator to unbalanced panels, while conceptually possible, is computationally unfeasible. In our case, imposing the restriction that the panel be balanced would result in a considerable loss of data since emerging markets necessarily emerged to the point where data were available at different times.

Given the complications and efficiency loss imposed by attempting to correct for bias in estimates of the coefficients in Equations (1) and (2) arising from the dynamic panel nature of the data, we rely on simulations results in Judson and Owen (1999) showing that bias problems are almost entirely concentrated in the coefficient on the lagged dependent variables, while biases in the

[5]They also discuss the possibility of using lagged differences as estimates, but others (Arellano, 1989 and Kiviet, 1995 for example) have established the superiority of using twice-lagged levels over lagged differences.

coefficients of independent variables (beta and delta in Equations (1) and (2)) are "relatively small and cannot be used to distinguish between estimators [including OLS] (p. 13)." Given that we are not interested in point estimates of these coefficients and that correction for biases would result in a significant loss of efficiency that would do more damage to a search for causal relationships than a relatively small coefficient bias, we have elected to ignore bias corrections in the results that follow.

3. Results

Equations (1) and (2) were first estimated independently for each country for which we had six or more years of data. Given that our longest time series was only thirteen years, we were never able to reject an hypothesis of equality of coefficients within any income group. Thus, we pool observations across countries within each income group as well as for the entire sample to create an unbalanced panel. We estimated both country-fixed and random-effect models, although in every case we reject the hypothesis that the random effects are orthogonal to the regressors (Hausman, 1978).[6] Table 3, therefore, presents fixed-effect models. The first row within each country group presents OLS regression estimates of Equation (1) for all countries and years within that group, ignoring the panel structure of the data except for correcting the standard errors to account for heterogeneity of the residuals. The second row presents between-country estimates in which OLS regressions were run on country-mean values, estimating results only on the cross-country variance in the variables. The third and final row in each group presents Least Squares Dummy Variable

[6]Results are available at http://195.113.12.52/hanousek/growth.

(LSDV) estimates, identifying the effect of financial factors of growth only from the variance within each country (since cross-country variance is absorbed by the country dummies).

Several results stand out in Table 3. Lagged growth rates are, in general, significant predictors of current growth rates. This effect is quite strong for high-income countries and relatively weak for middle and low-income countries, suggesting that macroeconomic conditions are less stable for the less developed countries in our sample. The effect relating past growth to current growth is much more pronounced between countries than within countries, suggesting that there is strong hysteresis in the pattern of growth rates across countries, even though macroeconomic variation continues to exist within any given country. As discussed above, however, possible biases in these coefficients mean that they should be interpreted with caution.

Turning to financial variables, the pattern is striking with respect to turnover velocity, which, as we argued earlier, should be the most appropriate indicator of the effect of stock markets on growth because it has been purged of forward-looking price effects. Results provide only a very mild suggestion that a higher turnover velocity Granger-causes growth. This result exists only across countries and only for the full sample. While the point estimate is larger for high-income markets, a smaller sample size and consequent higher standard error render the coefficient insignificant.

There is even less evidence that a change in the number of listed domestic companies is linked to differing rates of economic growth. Similarly, the reverse causality relationships were almost never significant and are, therefore, not reported.

4. Reconciliation with Other Studies

As discussed above, in the most closely related study Rousseau and Wachtel (2000, p. 1955) present evidence from VAR estimates that "increases in ... the market value of equity traded on organized exchanges have a strong effect on output." Their study uses a fixed effect framework and, therefore, reports results equivalent to the within estimates reported in Table 3, where we never find a positive causal relationship (and even find a suggestion of a negative relationship for low-income countries). The seemingly contradictory results presented above and by Rousseau and Wachtel call for reconciliation.

Possible explanations for the differences include: (1) differences in samples, (2) differences in estimating techniques, and (3) differences in variable definitions. In general we are able to rule out the first two possibilities but find strong evidence that the third accounts for the differences in findings. In particular, Rousseau and Wachtel used a measure of growth that introduces a spurious causal relationship from other sources. Once this relationship is eliminated, little evidence that equity markets determine growth remains.

Turning first to differences in the samples, Rousseau and Wachtel use a smaller number of countries but have more years of data for each country. If, however, we reestimate equations (1) and (2) above using only the years and countries that are common to both data sets, we continue to find significant causality using Rousseau and Wachtel's data from the World Development Indicators (WDI) but not with ours from the IFC.[7]

[7]We gratefully thank Rousseau and Wachtel for providing us with the data used in their paper. The comparative estimates can be seen at http://195.113.12.52/hanousek/growth.

Secondly, Rousseau and Wachtel apply the Arellano and Bond (1991) correction discussed above. Reestimation of their model without this correction still finds Granger causality running from market turnover to growth in per capita incomes[8] while reestimation applying the Arellano-Bond correction to our data shows no such causality.[9] Thus, it does not appear that differences in estimation techniques have created the fundamental differences in results reported.

Our results do appear to differ from Rousseau and Wachtel's, however, because of differences in variable definitions. Our measure of growth is the percentage change in GDP measured in real domestic currency units. Theirs is the absolute change in per capita GDP measured in constant 1987 US dollars. The difference in normalization choice (percentage change or absolute per capita change) is innocuous, but the choice of real domestic currency or real US dollar GDP is critical. In effect, the Rousseau and Wachtel results confound growth in the real economy with changes in exchange rates.[10] In their specification it is impossible to determine whether increased market activity Granger-causes economic growth or Granger-causes currency appreciation. This difficulty is compounded by the way the WDI calculates exchange rates. As stated in the technical documentation for the WDI data, "The World Bank uses a synthetic exchange rate commonly called the Atlas conversion factor.... The Atlas conversion factor for any year is the average of a country's

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[8]This estimation also uses our optimally determined lag lengths and more parsimonious specification, omitting additional right-hand side control variables, thereby ruling out these differences as the cause of the results differences as well. Again, the results can be viewed at http://195.113.12.52/hanousek/growth.

[9]Because the Arellano-Bond technique requires a balanced panel, we lose a considerable number of observations, especially for emerging markets. Even so, it is not possible to reject the hypothesis that the point estimates are the same as those presented in Table 3.

[10]A similar problem haunts many other studies in this literature including the series of works by Levine and various coauthors. A notable exception is Demetriades and Hussain (1996).

exchange rate for that year and its exchange rate for the two preceding years, adjusted for the difference between the rate of inflation in the country and that in the G-5 countries (World Bank, 2000, p. 362)." Furthermore, the World Bank uses an alternative conversion factor when, according to subjective expert evaluation, the Atlas conversion factor is judged to deviate from the true effective rate. Such an *ad hoc* correction was applied to approximately 7 percent of the observations in the Rousseau and Wachtel sample (World Bank, 2000, pp: 364-368).

The inclusion of currency effects in the measure of GDP means that a finding that equity market activity Granger-causes "growth" may mean only that a more active equity market leads to currency appreciation instead of causing an increase in real economic activity. In addition, since the estimates relate equity market changes between periods t-2 and t-1 to growth between periods t-1 and t, the fact that the World Bank uses a three-year moving average of currency changes means that any relationship found using this data also includes the effect of equity market activity on contemporaneous currency appreciation.[11]

Table 4 shows that exchange rates are, in fact, determined by equity market activity. In our sample (and in unreported results for Rousseau and Wachtel's as well), there is a clear and significant link between within county changes in equity market activity and currency appreciation.[12] This result is stronger for developed (high income) countries, which comprise a larger portion of the Rousseau and Wachtel sample. It appears that a booming stock market attracts capital leads to

[11]Indeed, the use of a three-year moving average means that what Rousseau and Wachtel report as a causal link between equity market activity and growth could, in reality, represent *reverse* causality running from currency markets to equity markets. Thus, if large currency inflows cause both appreciating exchange rates and an equity market boom, Rousseau and Wachtel will spuriously find that equity markets cause real economic growth.

[12]This result holds when we include contemporaneous effects as well.

currency appreciation and, if currency effects are confounded with growth measures, may create a spurious relationship between equity markets and growth.

5. Conclusions

In summary, using a large number of countries with varying economic conditions and levels of stock market activity, we find:

1) little relationship between stock market activity and future economic growth, especially for the lower income countries in our sample.

2) evidence that stock market activity does cause appreciation in currency rates.

The results of this research suggest that, while a developed equity market may play several roles in a modern economy, none of these appear to be essential for economic growth. Where such a market does not exist alternative channels appear to be equally effective (or ineffective) in allocating capital in growth promoting ways.

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Table 1
Countries Included in Analysis According to IFC Specification Mature versus Emerging Markets With Years Available

Mature Markets		Emerging Markets			
Country	Time span	Country	Time span	Country	Time span
Australia*	1985-1997	Argentina*	1985-1997	Mauritius*	1990-1997
Austria*	1985-1997	Bangladesh	1985-1997	Mexico*	1985-1997
Belgium*	1985-1997	Botswana	1991-1997	Morocco*	1985-1997
Canada*	1985-1997	Brazil*	1985-1997	Namibia	1993-1996
Denmark*	1985-1997	China	1991-1997	Nigeria*	1985-1997
Finland*	1985-1997	Chile*	1985-1997	Oman	1989-1997
France*	1985-1997	Columbia*	1985-1997	Pakistan*	1985-1997
Germany	1985-1997	Cote D'Ivoire*	1985-1997	Panama	1992-1997
Hong Kong	1985-1997	Cyprus	1991-1997	Paraguay	1993-1996
Iceland	1994-1997	Czech Republic	1994-1997	Peru*	1985-1997
Ireland	1994-1997	Ecuador	1993-1997	Philippines*	1985-1997
Italy*	1985-1997	Egypt	1985-1997	Poland	1991-1997
Japan*	1985-1997	Greece*	1985-1997	Portugal*	1985-1997
Luxemburg	1985-1992	Hungary	1991-1996	Saudi Arabia	1991-1996
Netherlands*	1985-1997	India*	1985-1997	Slovakia	1994-1997
New Zealand*	1985-1997	Indonesia*	1985-1997	South Africa*	1985-1997
Norway*	1985-1997	Iran	1991-1996	Sri Lanka*	1985-1997
Singapore*	1985-1997	Israel*	1985-1997	Thailand*	1985-1997
Spain*	1985-1997	Jamaica*	1986-1997	Trinidad Tobago*	1985-1997
Sweden*	1985-1997	Jordan*	1986-1997	Tunisia	1985-1997
Switzerland*	1985-1997	Kenya*	1989-1997	Turkey*	1987-1997
UK*	1985-1997	Korea*	1985-1997	Uruguay	1985-1997
US*	1985-1997	Malaysia*	1985-1997	Venezuela*	1985-1997
				Zimbabwe*	1985-1997

*Also in Rousseau and Wachtel's (2000) data, although for the period 1980-1995.

Table 2

Sample Characteristics

Group	Statistics	GDP growth	Turnover ratio	Change in No. of Companies
All Countries	Mean	-0.07	0.29	14.41
	Std. Error	99.35	0.32	171.72
	No. of obs.	878	740	682
Mature Markets	Mean	4.28	0.36	3.97
	Std. Error	18.09	0.24	19.78
	No. of obs.	301	261	246
Emerging Markets	Mean	-2.34	0.25	20.30
	Std. Error	121.83	0.35	214.18
	No. of obs.	577	479	436

Table 3

Tests of Granger Causality Running from Financial Variables to GDP Growth

GROUP	Panel	CNOC		TV	
		Lagged Y	Lagged X	Lagged Y	Lagged X
All Countries	Total	.558+	.012	-.187	.154
		(.326)	(.011)	(.391)	(.139)
	Between	.694**	.0004	.740**	.009*
		(.003)	(.0005)	(.003)	(.005)
	Within	-.448	.0016	-.374	.007
		(.546)	(.0014)	(.390)	(.024)
Mature Markets	Total	.671**	-.005	.534**	.071
		(.077)	(.009)	(.109)	(.061)
	Between	.903**	.002	1.02**	.013
		(.155)	(.058)	(.150)	(.018)
	Within	.483**	-.003	.239	.109
		(.102)	(.01)	(.151)	(.083)
Emerging Markets	Total	.557*	.001	-.188	.152
		(.326)	(.001)	(.392)	(.151)
	Between	.693**	.0004	.740**	.007
		(.002)	(.0004)	(.002)	(.005)
	Within	-.455	.0015	.374	-.027*
		(.555)	(.0014)	(.391)	(.014)

Standard errors are in parentheses

** = Significant at the 1% confidence level

* = Significant at the 5% confidence level

+ = Significant at the 10% confidence level

Table 4

Tests of Granger Causality Running from Financial Variables to Local Currency Growth

(i.e., Y stands for local currency appreciation)

GROUP	Panel	Change in No. of Companies		Turnover ratio	
		Lagged Y	Lagged X	Lagged Y	Lagged X
All Countries	Total	.597**	.002	.584**	.037+
		(.058)	(.006)	(.053)	(.023)
	Between	.886**	.002+	.863**	.017
		(.003)	(.001)	(.018)	(.012)
	Within	.295**	-.0005	.291**	.075*
		(.077)	(.0007)	(.069)	(.032)
Mature Markets	Total	.187**	-.011	.317**	.099**
		(.075)	(.029)	(.066)	(.028)
	Between	.498**	.023	.509**	-.003
		(.266)	(.092)	(.118)	(.02)
	Within	.179**	-.014	.302**	.162**
		(.078)	(.033)	(.067)	(.038)
Emerging Markets	Total	.603**	-.0004	0.562**	.043
		(.07)	(.0005)	(.066)	(.03)
	Between	.902**	.002+	.865**	.020
		(.03)	(.001)	(.02)	(.016)
	Within	.327**	-.0005	.289**	.039
		(.096)	(.0007)	(.086)	(.040)

Standard errors are in parentheses

** = Significant at the 1% confidence level

* = Significant at the 5% confidence level

+ = Significant at the 10% confidence level