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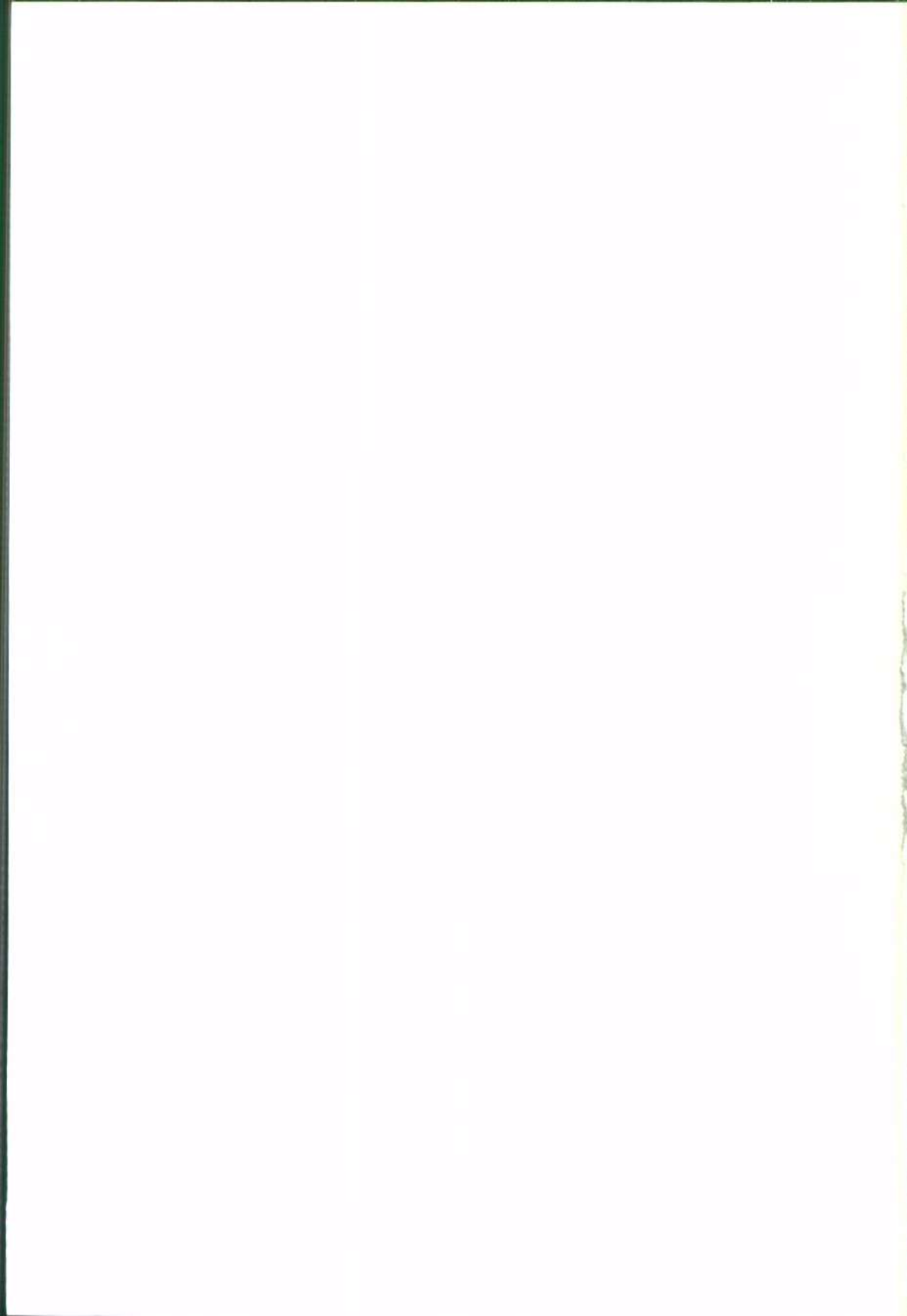
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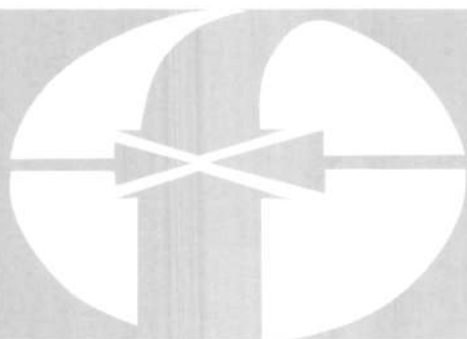
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STOCK MARKET LIBERALIZATION, THE COST OF CAPITAL, AND INVESTMENT: HOW SIGNIFICANT IS THE EFFECT IN EMERGING MARKETS?

William Miles
Wichita State University

1. Introduction

Stock market creation and reform have become very widespread in developing countries over the past fifteen to twenty years. The process of bourse development continues to spread to "frontier" markets in small newly emerging nations in Africa and Eastern Europe. Many observers claim that opening the domestic market to foreign participation will lead to an increase in stock prices, and in physical investment. This is important, as the increase in capital accumulation can increase growth. Moreover, foreign participation may improve corporate governance, leading to better quality investment, increasing total factor productivity. Thus, if stock market liberalization has a palpable impact on the cost of capital and physical investment, there are very positive welfare consequences for LDCs.

Given the importance of stock markets in allocating capital and potentially influencing growth and living standards, a number of authors have tested for the effects of liberalization to foreign investment on stock returns and physical investment. Bekaert and Harvey (2000), Kim and Singal (2000) and Henry (2000a) all find a statistically significant increase in returns after foreign investors are legally allowed to own local shares. Chari and Henry (2002) and Henry (2000b) find a statistically significant increase in physical investment following market opening. Overall, policymakers and investors should be encouraged from recent empirical work and have high expectations concerning equity market liberalization.

A closer look at the evidence, however, reveals reason to believe that the positive effects of market opening may not be so large. Rodrik (2004) presents evidence indicating that sharp increases in growth do not appear related to particular policy reforms in LDCs. Moreover, many countries which have undertaken a number of "Washington Consensus" reforms (which often include capital account liberalization, of which stock market opening is a component) in the last fifteen years have obtained disappointing results.

Furthermore, there are other reasons to suspect that, while previous papers have found a significant association between stock market liberalization on the one hand and prices and investment on the other, the causal impact is overstated. Many papers estimate the impact of a given policy on growth, investment, prices, etc.. But countries which choose this given policy usually have many other policies and attributes, some of which are unobservable in the data, and which also affect the dependent

variable. Eichengreen (2001) says this phenomenon affects studies on the impact of trade or capital account openness on growth. Because these studies fail to account for unobservable policies and attributes, their estimated policy effects are biased upward.

Finally, it is important to take account of the fact that capital flows to developing countries, and hence their effects on local economic variables, are often driven by interest rates and returns in the industrialized world. Evidence from some papers indicates that this "push" capital is more important than domestic policies and reforms.

In order to account for these problems, in this paper we will apply the difference-in-differences (DID) methodology to stock market opening. This method has become, in the last several years, the accepted way to measure the impact of policy changes in labor economics and public finance. It has rarely been applied to international, financial or macroeconomics, but Ball and Sheridan (2003) and Slaughter (2001) are notable exceptions, applying the technique to the effect of inflation targeting and trade openness, respectively. In each paper, the authors found, contrary to previous studies, that the policies in question had no significant impact. Previous papers had obtained overestimates of the true effect by conflating factors which cause countries to adopt inflation targeting or trade openness with the impact of the policies.

It is important, for investors as well as policymakers, to get a reasonably accurate estimate of the effects of stock market opening. This paper will certainly not conclude that markets should not be liberalized. However, inducing domestic and foreign actors to anticipate substantially larger effects than are realistic can lead to a misallocation of precious resources for developing countries. Thus, we will apply the DID technique to the question of opening developing country bourses. To anticipate the results, we find that there is no statistically significant impact of market liberalization on prices or investment. We conclude that previous findings of a large effect are likely based on incorrect inference.

2. Previous Literature

Bekaert and Harvey (2000) and Henry (2000a) both explain that standard International Asset Pricing Models (IAPM) strongly suggest that the cost of capital should fall in emerging stock markets once they are liberalized. Prior to market ope-

ning, the cost of capital is proportional to the variance of domestic cash flows, while in an integrated exchange, the cost is proportional to the correlation of domestic and world returns. In principle, the correlation could exceed the local variance, but Stulz (1999) finds that in practice, this is never the case. Henry (2000a) points out that the lower cost of capital resulting from liberalization should imply an increase in the stock price index when liberalization occurs. Thus in the long run, while the cost of capital should decrease, in the short run, an increase in returns should be observed.

Empirically, Bekaert and Harvey find that, for a sample of twenty countries, returns increase on average by 1.9 percent, shortly after reform, when an official liberalization indicator is employed. Henry (2000a) obtains an estimated impact of 4.7 percent on average. Kim and Singal (2000) also find that returns increase shortly after market opening in most nations, with the amount varying by country.

Henry (2000a, 2000b), and Chari and Henry (2002) point to another implication of the standard IAPM regarding market opening. Since there is a revaluation of stock prices and a decrease in the cost of capital, physical investment should increase following liberalization. Some projects which had a negative net present value at the pre-liberalization cost of capital will subsequently be viable, and thus an increase in investment should be observed. Henry (2000b) finds that for a sample of eleven liberalizing emerging markets, nine had significant increases in investment in the three years subsequent to liberalization. Chari and Henry (2002) find that for a sample of five countries which undertook stock market deregulation, investment substantially rose. Thus the empirical evidence thus far is strongly suggestive of both substantial revaluation and investment effects arising from stock market opening.

There are several issues to keep in mind when considering these results. Importantly, many of the liberalizations occurred in the late 1980s and early 1990s. This was a period in which capital was newly flowing from industrialized countries to emerging markets. While some country-specific variables (known as "pull" factors) may have played a role, some observers believe it was low returns available to investors in G-7 countries which induced capital to seek higher returns in developing nations. These lower returns are thus "push" factors.

Some authors, such as Calvo, Leiderman and Reinhart (1993) and Chohan, Claessens and Mamingi (1998) found that push factors played a fairly substantial role. Fernandez-Arias (1996) used a different methodology than the above authors, and

found that 85 percent of the capital flows to emerging markets were determined by push factors. With push factors playing such a large role, capital flowed to countries in various stages of reform. Even if restrictions on foreign investment were in place in a given country, capital may still have flowed in, raising returns and physical investment. A study which includes only countries which liberalized will thus be unable to discern the true effect of market opening. Thus we will apply a technique which can discern the effect of liberalization by including both market reformers and nations which kept their stock markets closed to foreign investment. This will enable us to obviate both the push-pull confusion and other problems of interpretation of the effects of stock market opening.

3. Methodology

There are important difficulties of interpretation of the papers on stock market opening. The first, as noted, are the push and pull factors. The second was alluded to by Eichengreen (2001). The author was discussing some empirical papers on growth and the impact of trade or capital market liberalization. Some papers such as Ben-David (1993) and Sachs and Warner (1995) had found positive effects of trade opening on output growth. However, Eichengreen pointed out that nations which choose a given policy regarding opening to the rest of the world with respect to trade or the capital account are likely to have other attributes and policies, some of which may be unobservable, which are correlated with the policy decision and which also affect growth. Thus the coefficient on the policy variable could well be biased upward in magnitude. Slaughter (2001), for instance, applies the difference-in-differences methodology to the question of trade policy and growth, and finds, contrary to the other authors, no significant effect. We will thus apply the technique to the effects of stock market opening here.

To explain this technique, note that in most fields of economics the traditional approach to estimating the effects of a policy change, such as stock market opening, has been the use of a time dummy variable. As Slaughter explains, if there has been some sort of treatment or intervention for a given group of countries at time t , the following empirical model,

$$y_{it} = \alpha + \beta d_t + e_{it} \quad (1)$$

where y_{it} is the dependent variable for country i at time t , and d_t represents a dummy for the intervention and equals zero for $t=0$ and one if $t=1$, is employed.

Unfortunately, as Slaughter points out, many factors besides the policy intervention could have changed between $t=0$ and $t=1$. If this is the case, estimating equation (1) will give an upward bias to the magnitude of the coefficient on d_t . In order to control for the other potential factors that affect y_{it} , a control group of countries that did not undergo the policy change are added to the sample, and the following equation is estimated:

$$y_{it}^j = \alpha_0 + \alpha_1 d_t + \alpha_2 d^j + \beta d_t^j + e_{it}^j \quad (2)$$

where $j=1$ for the countries which implemented the policy change, and $j=0$ for those that did not undergo the change. The dummy d_t is again equal to one for the period after the policy change and zero for the period before; the dummy d^j equals one for the countries which undertook the policy, and zero for those that did not; and d_t^j equals one only if $t=1$ and $j=1$. The coefficient α_1 captures the effect of time on both the treatment and non-treatment group, and α_2 accounts for time-invariant differences between the two groups.

This technique has been employed in practice for several years in labor economics and public finance, but has rarely been applied in international or financial economics, Slaughter and Ball and Niamh (2003) being exceptions. Wooldridge (2003, p. 432) gives a very good exposition, based on a paper by Kiel and McLain (1995) on the effect of locating a garbage incinerator on property values near the site. Data is available for a year before the site was proposed, and three years later after the site had been proposed, approved and was built and running. If only post-construction data is employed, the following regression is run:

$$price = \delta_0 + \delta_1 nearinc + u \quad (3)$$

where *price* is the real selling price of houses and *nearinc* is a dummy for houses near the incinerator (other regressors were employed as well). The coefficient δ_1 was estimated to be -\$30,688, and is statistically significant, which suggests a very large

negative impact of the incinerator on nearby house values.

However, if data from the year before the incinerator was an issue is employed for the same model, the coefficient on *nearinc* is -\$18,824.37. That is, even before rumors of an incinerator materialized, houses near the future site of the then non-existent incinerator sold for substantially less than homes further away. Clearly, the siting of the incinerator was endogenous to some other characteristics of the location itself. Homes near the future incinerator sold for less than those not near the site for reasons that preceded the incinerator itself. Accordingly, including only a dummy for proximity to the incinerator for data which includes only years in which the incinerator existed will lead to an overestimate of the actual impact of locating the facility on nearby house prices.

To get an accurate assessment of how the incinerator changes home values, data for both a year previous to the siting and construction is gathered, and a pooled model is estimated:

$$price = \delta_0 + \delta_1 nearinc + \delta_2 time + \delta_3 time * nearinc + u \quad (4)$$

where *time* = 0 for the period prior to the location of the incinerator, and equals one for the year when the incinerator was running. Thus δ_2 captures the effect of time on all houses in the sample, and δ_1 measures the impact on house prices from being in the incinerator area that is not attributable to the incinerator itself. It is the coefficient δ_3 , the "difference-in-differences" estimator, which captures the effect of the incinerator in changing the values of houses near the site. Its estimated value is -\$11,863.9, which is certainly large from a homeowner's perspective, but barely a third the size of the original estimate of -\$30,688.

Since the DID technique gives a more accurate estimate of the effects of policy changes and interventions, it has come to be widely applied in microeconomics, especially in labor and public finance. Until recently, however, the technique was almost unknown in international and financial economics.

Slaughter's (2001) paper was thus pioneering in its use of the difference-in-differences methodology to the question of how openness to international trade affected convergence in per-capita income among countries. Previous studies, such as Ben-David (1993) and Sachs and Warner (1995), had found that by dividing countries into

being "open" or "closed" to trade a pattern of strong convergence existed for poor, open countries, while poor closed nations showed no such tendency to converge to higher income levels. At first glance, such evidence seems strongly suggestive that openness to trade raises income and allows poor economies to catch up to richer ones.

Slaughter, however, points to a flaw in the methodology of the above papers. Both papers use samples in which, for the entire period, a country is classified either as open or closed. What if, in a period of about twenty years prior to the beginning of the sample, the subsequently open countries had been converging faster than they later were observed to be in the sample? And what if the closed countries had been diverging more rapidly than they later were? In that case, one could reasonably conclude that trade actually diverged incomes.

Accordingly, Slaughter applies DID to the question of trade convergence. He picks certain major trade liberalizations, and finds countries which participated and some which did not. He then observes convergence for a period before the liberalization for both the liberalizers and non-liberalizers, as well as an equally long period for both countries after the change in policy. Upon applying DID, the author finds in most cases no significant effect of trade liberalization on income convergence.

Similarly, Ball and Niamh applied DID to the effect of inflation targeting on economic performance in OECD countries. Citing several studies, such as Mishkin (1999) and Johnson (2002) which had found a clearly positive effect from inflation targeting in stabilizing the price level, the authors apply DID to a sample of countries, some of which adopted formal inflation targets and some of which did not. Results from the DID estimation find no significant impact from inflation targeting on inflation or growth for the countries in the sample, contrary to the cited papers.

In the literature on stock market opening and returns and investment, previous studies similarly do not compare performance before and after the change. We will thus employ DID to see if liberalization significantly affected returns and investment.

In order to apply DID here, we will need a sample of countries, all of which have stock markets with data available. The sample must include both countries which liberalized and some which did not. Bekaert and Harvey (2000) used a sample of 20 countries. Henry (2000a) used a sample of 12; Henry (2000b) employed eleven, and Chari and Henry (2002) employed five. It is somewhat challenging to find a sample in which several countries liberalized close enough in time to apply DID, and at the same

time there are several other countries which both have stock markets but did not liberalize. However, using the information from Bekaert and Harvey, we were able to find six countries, four of which liberalized in 1991, and two of which did not liberalize over the sample.

Table 1 displays the nations used in the analysis. Brazil, Colombia, Pakistan and the Philippines all opened their exchanges to foreign investment in 1991. Jordan and Nigeria would remain closed until 1995. The data for returns is monthly, and runs from January 1985 through June 1991, for a total of 468 observations.

Table 1: Sample Countries and Liberalization Dates

Country	Liberalization Date
Brazil	91.05
Colombia	91.02
Jordan	-
Nigeria	-
Pakistan	91.02
Philippines	91.06

Slaughter explained that applying DID to international trade isn't as straightforward as in, for example, labor economics. In standard applications of DID, there is a one-time policy change which impacts all those who are affected at exactly the same time. In trade policy, by contrast, reform is often undertaken by individual or pairs of countries, and so there is no one big change at a point in time which affects all participants in the sample.

Similarly, there was no one-time change for all participating countries regarding foreign stock market participation. However, as the liberalizations were closely clustered in time, we will do the following: the variable d will equal 1 for the four liberalizers and zero for Jordan and Nigeria. For the time-variant variables, we note that both Bekaert and Harvey (2000) and Henry (2000a) point out that liberalizations are usually anticipated in some way by market participants. This anticipation should lead to at least a partial revaluation of the stock market prior to the actual opening. Indeed, the price increase during the month of the actual opening should reflect only the clearing up of any uncertainty regarding liberalization.

Thus, for each country, we will follow Henry and set the liberalization period for month of the actual opening, plus each of the seven months prior to the liberalization.

The variable d_t will equal one for the four liberalizers during the eight months in the sample before and during which they had opened their markets. The variable d_{it} , which aims to capture the period for all countries in the sample after which liberalization had taken place, will be specified as equal to one for the months November 1990 through June 1991. With this specification we are prepared to apply the DID methodology to emerging stock market opening.

4. Results

Table 2: *Liberalization and Stock Market Returns*

	1a	1b	1c	1d	2a	2b	2c	2d
d^l	0.0184 (0.079)			0.0199 (0.08)	0.018 (0.08)			0.0193 (0.092)
d_t		0.0281 (0.065)		0.0358 (0.042)		0.0251 (0.095)		0.0298 (0.092)
d_{it}^l			0.022 (0.254)	-0.0118 (0.625)			0.0219 (0.248)	-0.0072 (0.766)
LDC					0.23 (0.002)	0.224 (0.002)	0.23 (0.002)	0.2237 (0.002)
α_0	-0.0051 (0.489)	0.0042 (0.471)	0.0052 (0.366)	-0.0087 (0.275)	-0.007 (0.28)	0.0017 (0.767)	0.002 (0.688)	-0.109 (0.179)
R^2	0.0053	0.0051	0.0027	0.0108	0.0265	0.0253	0.0239	0.0307
N	468	468	468	468	468	468	468	468

Robust standard errors are employed. P-values are displayed in parentheses

Table 2 presents results for the effect of liberalization on returns. In this model, the frequency is monthly, and returns are the monthly change in the logarithm of the country's International Finance Corporation (IFC) index, as is standard. In the first four columns, without any regressors, (which are analogous to column 1a of Table 5 in Henry (2000a)) we find that both the d_t and d_{it} variables are significant individually when entered individually, at 10 percent. Regressions are run with robust standard errors, as in Henry. Individually, being a liberalizer adds about 1.8 percent to returns

over the entire sample. The time variable indicates a 2.8 percent increase for all of the countries in the sample, both those which opened and those which did not. The DID variable, d_t , is not significant. When entered jointly into the model in column 1d results again indicate that the property of being a market reforming country and the reform period both increased returns, but that reform itself did not have a significant impact. This suggests that those nations which liberalized their markets did not get a significant boost from this policy relative to those that kept their markets closed.

In the next four columns of Table 2, we add overall returns in emerging markets from the IFC index (labeled as LDC) as an independent variable, as did Henry. Individually, the d_t and d_i are still significant at the 10 percent level. The DID variable is not. Results from the full model in Table 2 tell the same story as in the 2a through 2c columns: market opening does not appear to significantly impact the cost of capital. Indeed, the DID coefficient is negative, although far from significant.

Results overall indicate that countries which eventually liberalized did benefit in some way (as evidenced by the positive, significant d_t coefficient), although not significantly from liberalization itself. Again, the phenomenon of liberalizers having other attributes which are hard to observe, and these attributes causing the returns to be higher, is likely the case. Perhaps more importantly, liberalization took place during a time of large "push" capital flows from industrialized countries. The significant estimate of the d_i parameter was larger than the d_t coefficient, indicating that these push flows were even more important than country-specific, time invariant characteristics in affecting returns. This reinforces the previous findings about the importance of external forces in affecting domestic emerging financial markets.

An implication of International Asset Pricing Theory, noted by Henry (2000b) and Chari and Henry (2002), is that, in addition to increasing equity prices, liberalization should subsequently lead to an increase in physical investment. Henry found, in a sample of eleven countries, that nine of the eleven experienced an increase in investment in the three years after a stock market opening. Chari and Henry found an overall increase in a panel model for five countries that liberalized.

In applying the DID methodology, it is difficult to get data on private physical investment for a sample including both countries which opened their stock markets and some which did not. Accordingly, we will use gross fixed capital formation as a percentage of GDP from the World Bank's World Development Indicators database for

the same six countries for which we investigated returns. Since Chari and Henry and Henry look at the increase in investment three years subsequent to liberalization, we will look at the increase in 1992, 1993 and 1994 for our six countries. To have a period of time prior to liberalization to compare with, we will include investment in 1988, 1989, 1990 and 1991. Thus in this estimation d^l will equal zero for Jordan and Nigeria, while it will equal one for the other four countries. The time variable d_t will equal zero for 1988 through 1991, and one from 1992 through 1994. The DID variable will accordingly be zero for all time for Jordan and Nigeria, and one for the later three years for the four reformers.

Table 3: Liberalization and Investment

	1a	1b	1c	1d	1e
d^l	-7.86 (0.168)			-0.59 (0.448)	
d_t		9.14 (0.04)		12.09 (0.232)	7.67 (0.056)
d^l_t			2.46 (0.548)	-4.42 (0.681)	
α_0	13.06 (0.016)	3.9 (0.199)	7.12 (0.022)	7.88 (0.288)	
R^2	0.0661	0.0985	0.006	0.1697	0.131
N	42	42	42	42	28

Robust standard errors are employed. P-values are displayed in parentheses. In column 1e, only the four reforming countries are included in the estimation.

Results are displayed in Table 3. As noted, the time variable, when entered by itself, is significant and positive, suggesting a 9 percent increase in investment during the period of reform (but not just for reforming countries). The coefficient on d^l was not significant. Finally, the estimated DID effect is insignificant. When the full model is run, none of the variables have a significant impact. Overall, these last two columns suggest that reform itself did not increase investment. Since we did not have data on private investment, the results in Table 3 may be more indicative than conclusive, but the fact remains that the DID term fails to exert a palpable impact on investment. As a

thought experiment, Jordan and Nigeria, the two non-reformers, were dropped, and investment was regressed on time for the four market-opening nations. This was analogous to the type of model estimated by Chari and Henry (2002) and Henry (2000b) in which investment was regressed on a reform dummy, but in which only liberalizers were included in the sample. The coefficient on time was positive and significant but slightly less in magnitude than when the non-liberalizers were included in the sample. This again suggests that while measured investment rises following reform, it is something other than the reform itself which is driving the results, such as push capital or omitted, unobserved characteristics.

5. Conclusion

The results clearly indicate that the effects of stock market liberalization have been overstated for investors and policymakers. Lavelle (2004) has pointed out that exchanges in developing countries, while receiving much attention from developed-world financial institutions, differ fundamentally from industrialized-nation bourses. Local governments have more and shareholders have less control over corporate governance than is the case in wealthy nations, especially when many shares on an LDC index are those of privatized entities. Thus it is perhaps not surprising that developing country stock markets do not react as strongly to liberalization as one would expect based on International Asset Pricing Theory.

It is important to reiterate, however, that these results do not suggest that market opening is undesirable. Stock markets do perform an essential function of allocating scarce capital and allowing for risk sharing between resource-poor developing countries and resource-rich industrialized nations. Frontier markets in African and other developing nations could play an important role in raising output and employment and reducing poverty. It is important, however, for optimal resource allocation that investors and policymakers have realistic, rather than inflated expectations regarding the likely effects of stock market reform.

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Abstract

Stock market development and liberalization proceed apace in developing countries. Potentially, stock exchanges and their reform could play a vital role in allocating scarce capital in LDCs, and some studies suggest that opening to foreign participation leads to significant effects on the cost of capital and physical investment. One might infer that growth, employment and poverty reduction would subsequently benefit as a result. However, recent research on developing country policy reform leads to questions regarding the impact of opening bourses to foreign inflows. Moreover, it is important for the optimal allocation of scarce capital in LDCs that investors and policymakers avoid inflated expectations of market openings. Accordingly, we apply the DID technique to stock market liberalization in developing countries. Results indicate, contrary to previous studies, no significant impact of liberalization on returns or capital accumulation.