



ELSEVIER

Journal of Financial Economics 58 (2000) 301–334

JOURNAL OF
Financial
ECONOMICS

www.elsevier.com/locate/econbase

Do stock market liberalizations cause investment booms?[☆]

Peter Blair Henry*

Graduate School of Business, Stanford University, Stanford, CA 94305-5015, USA

Received 8 February 1999; received in revised form 30 March 1999

Abstract

Stock market liberalizations lead private investment booms. In a sample of 11 developing countries that liberalized their stock markets, 9 experience growth rates of private investment above their non-liberalization median in the first year after liberalizing. In the second and third years after liberalization, this number is 10 of 11 and 8 of 11, respectively. The mean growth rate of private investment in the three years immediately following stock market liberalization exceeds the sample mean by 22 percentage points. The evidence stands in sharp contrast to recent work that suggests capital account liberalization has no effect on investment. © 2000 Elsevier Science S.A. All rights reserved.

JEL classification: F3; F4; G15

Keywords: Capital account liberalization; Investment; Capital flows; Emerging markets

[☆]This paper is a revised version of Chapter 2 of my Ph.D. thesis at the Massachusetts Institute of Technology. I thank Christian Henry and Lisa Nelson for their support and encouragement. I am grateful to Steve Buser, Paul Romer, William Schwert (the editor), Andrei Shleifer, Jeremy Stein and two anonymous referees whose detailed comments on earlier drafts substantially improved the paper. I also thank Olivier Blanchard, Rudi Dornbusch, Stanley Fischer, Jerry Hausman, Chad Jones, Jim Poterba, Robert Solow, René Stulz, Sheridan Titman, Ingrid Werner and seminar participants at Georgetown, Harvard, the NBER Conference on Macroeconomic Effects of Corporate Finance, Oxford, Stanford, UC-Irvine and UCLA. The International Finance Corporation and the Research Foundation of Chartered Financial Analysts generously allowed me to use the Emerging Markets Data Base. Ross Levine generously shared his extensive list of capital control liberalization dates. Finally, I would like to thank the National Science Foundation, The Ford Foundation, and the Stanford Institute for Economic Policy Research (SIEPR) for financial support. All remaining errors are my own.

* Corresponding author. Tel.: + 1-650-723-0905; fax: + 1-650-725-0468.

E-mail address: pbhenry@stanford.edu (P.B. Henry).

1. Introduction

A stock market liberalization is a decision by a country's government to allow foreigners to purchase shares in that country's stock market. Standard models of international asset pricing predict that **stock market liberalization may reduce the liberalizing country's cost of equity capital**.¹ This prediction has two important empirical implications for those emerging markets that liberalized their stock markets in the **late 1980s and early 1990s**. First, if stock market liberalization reduces the aggregate cost of equity capital, then **holding expected future cash flows constant**, we should observe an increase in a country's equity price index when the market learns that a stock market liberalization is going to occur. The second implication is that we should observe **an increase in physical investment following a stock market liberalization**, because a fall in a country's cost of equity capital will transform some investment projects that had a negative net present value (NPV) before liberalization into positive NPV endeavors after liberalization. **Henry (2000)** shows that the data confirm the first implication. This paper examines whether the data are consistent with the second implication. Specifically, in order to determine whether stock market liberalizations are associated with increased investment, this paper **analyzes the growth rate of real private investment following stock market liberalization in eleven emerging markets**.

Fig. 1, which plots the average growth rate of real private investment around the time of stock market liberalization in these eleven countries, conveys the central message of the story that this paper will develop in detail. On average, countries experience **large, temporary increases** in the growth rate of real private investment on the heels of stock market liberalization. More precisely, in the sample of eleven emerging markets examined in this paper, the mean growth rate of real private investment in the three years immediately following stock market liberalization exceeds the sample mean by 22 percentage points. Sign tests on medians confirm the robustness of the increase. In the first year after liberalization, 9 of 11 countries experience growth rates of private investment above their non-liberalization median. In the second and third years after liberalization, this fraction is 10 of 11 and 8 of 11, respectively. The relationship between private investment growth and stock market liberalization **persists after controlling for world business cycle effects, contemporaneous economic reforms, and domestic fundamentals**. However, we **cannot conclude that stock market liberalizations cause investment booms**, because the possibility of reverse causality cannot be ruled out.

A country's cost of equity capital has two components: the equity premium and the risk-free rate. Thus, there are three reasons why stock market

¹ See Stulz (1995, 1999a, b) for an extensive survey of this literature.

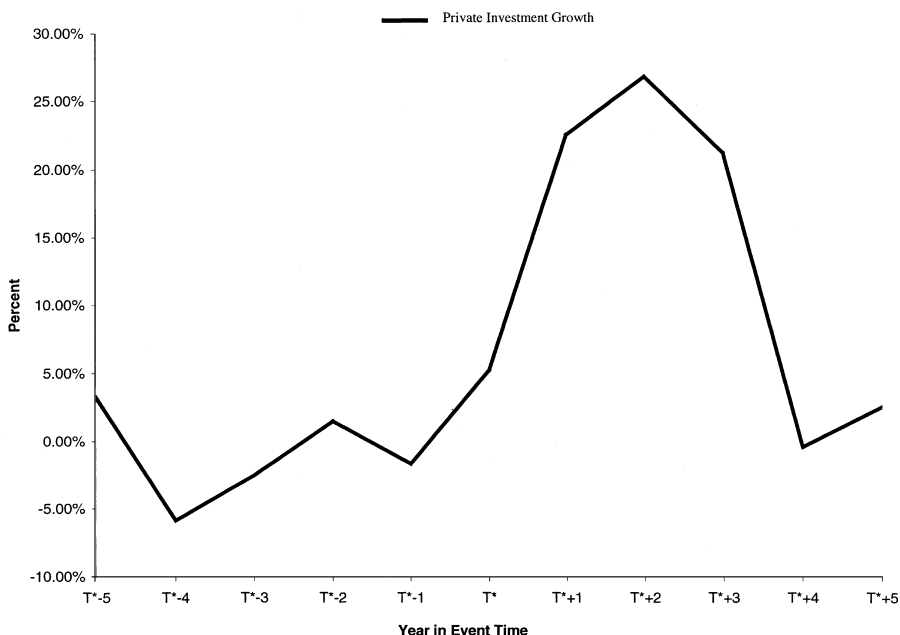


Fig. 1. The response of private investment to stock market liberalization. This figure plots the average growth rate of private investment in real local currency terms across all 11 countries in stock market liberalization time. For example, the value on the y-axis corresponding to the x-axis value of T^* is the average growth rate of private investment across all 11 countries in the year the stock market was liberalized.

liberalization might cause a fall in the liberalizing country's cost of equity capital.² First, stock market liberalization might increase net capital inflows, and an increase in net capital inflows could reduce the risk-free rate. Second, allowing foreigners to purchase domestic shares facilitates risk sharing between domestic and foreign residents. Increased risk sharing should reduce the equity premium. Finally, Levine and Zervos (1998b) demonstrate that increased capital inflows may also increase stock market liquidity. Increased liquidity will also reduce the equity premium (Ahimud and Mendelson, 1986; Ahimud et al., 1997).

However, it is important to realize that liberalizing the stock market need not always cause a fall in the cost of equity capital. While stock market liberalization unambiguously reduces the equity premium, it could, in principle, lead to an increase in the risk-free rate. If the liberalizing country's risk-free rate rises following stock market liberalization, then its cost of capital could increase.

² From now on, I will refer use the phrase, 'cost of capital' interchangeably with 'cost of equity capital'.

Whether a country's risk-free rate rises or falls following stock market liberalization depends crucially on whether: (1) the liberalization of restrictions on capital **inflows** through the stock market is accompanied by a liberalization of restrictions on capital **outflows** by domestic residents; (2) the autarky risk-free rate, which is an equilibrium outcome of aggregate savings and investment, is **above or below the world rate** at the time the liberalization occurs. Section 3 presents a detailed discussion of these issues.

Stock market liberalization is a specific type of a more general policy reform called **capital account liberalization**, which is a decision by a country's government to remove restrictions on capital inflows and outflows more generally. The empirical literature on capital account liberalization can be separated usefully into two strands: finance and macroeconomics. Tesar (1995), Tesar and Werner (1998), and Stulz (1995, 1999a, b) provide comprehensive surveys of the finance literature on capital account liberalization and international risk sharing. The central message is that the portfolios of developed-country investors are still biased toward domestic securities, but capital account liberalization has led to greater diversification. The effects of increased financial integration are most readily seen in emerging market stock prices. Kim and Singal (2000), Henry (2000), and Bekaert and Harvey (2000) find evidence consistent with the hypothesis that **stock market liberalization causes a one-time revaluation of emerging market stock prices and a fall in the cost of capital**. Levine and Zervos (1998b) provide evidence that suggests that stock market liberalization also increases **liquidity**. These papers confirm that stock market liberalization has financial effects, but they do not address the investment question.

On the other hand, the empirical macroeconomics literature looks at the impact of capital account liberalization on investment. Levine and Zervos (1998a) examine whether countries experience a permanent increase in the growth rate of their capital stocks when their stock markets become more integrated with the rest of the world. They find **no evidence that increased stock market integration leads to permanently higher capital stock growth rates**. This result is somewhat surprising given the evidence regarding the impact of stock market liberalization on the cost of equity capital. One possible explanation is that stock market liberalization leads to a temporary increase in the growth rate of the capital stock, not a permanent increase.

To examine this possibility, consider a closed economy Solow (1956) model in steady state, so that the capital stock and the labor force are growing at the same rate. Now suppose that the stock market is liberalized to foreign capital inflows. If stock market liberalization reduces the cost of capital, agents will respond by driving down the marginal product of capital to the new cost of capital. This result can only occur if the capital stock temporarily grows faster than the labor force. Once the marginal product of capital equals the post-liberalization cost of capital, the growth rate of the capital stock will return to its pre-liberalization rate (i.e., the same rate as the labor force). In other words, theory suggests that

stock market liberalization will induce a temporary increase in the growth rate of a country's capital stock. This paper provides a sharp test of the theory by employing an event study approach that compares the growth rate of private investment during stock market liberalization episodes with the growth rate of private investment during non-liberalization periods.³

The paper proceeds as follows. Section 2 briefly reviews previous work and explains the contribution of this paper relative to the existing literature. Section 3 presents a theoretical discussion of the channels through which stock market liberalization may affect aggregate valuation, the cost of capital, and investment. The central message here is not that stock market liberalization will automatically reduce the liberalizing country's cost of equity capital, but that it will probably change that country's cost of capital. Under reasonable assumptions, the theory predicts that stock market liberalization will cause a fall in the liberalizing country's cost of equity capital. If stock market liberalization reduces a country's aggregate cost of equity capital, it will also cause a temporary increase in the growth rate of investment, via the following mechanism:

$$\text{Stock Market Liberalization} \Rightarrow \uparrow \text{Stock Prices} \Rightarrow \uparrow \text{Investment}. \quad (1)$$

Thus, there are two tasks involved in determining whether the data support the theory. The first step involves examining the correlation of investment with both liberalization and stock prices. The second step involves determining whether the correlations, if they exist, can be given a causal interpretation.

Section 4 analyzes the correlation of private investment growth and stock market liberalization. First, the existing evidence on the impact of liberalization on risk sharing, valuation, and liquidity is summarized. Next, the analysis turns to the growth rate of private investment during liberalization episodes in order to determine whether investment is unusually high following stock market liberalizations. Examination of graphs, means, and medians all convey the same message: Investment booms consistently follow stock market liberalizations.

Section 5 analyzes the correlation between the growth rate of private investment and changes in stock market valuation. Although Fischer and Merton (1984), Barro (1990), Morck, Shleifer, and Vishny (1990) and others have demonstrated that higher stock returns forecast increased future investment in the U.S., Rama's (1993) survey shows that there is a paucity of evidence on this subject in less-developed countries (LDCs). Moreover, financial markets in LDCs can be characterized as displaying financial repression, government directed credit, and the prevalence of informal financial markets. Therefore, it is not obvious that

³ A temporary increase in the growth rate of the capital stock implies a temporary increase in the growth rate of investment. The growth rate of investment is analyzed because capital stock data were not available.

the standard investment stock return correlations will hold for this group of countries (see Agénor and Montiel, 1996 on this point). Regressions of private investment growth on stock returns demonstrate a positive and significant correlation.

Section 6 explores alternative explanations for the investment boom. Having demonstrated the plausibility of a causal link from liberalization to investment in Sections 4 and 5, the question in Section 6 is whether omitted variables or reverse causality can explain the investment liberalization correlations. The analysis here is motivated by the fact that the political decision to liberalize a country's stock market may be endogenous. Governments, in general, have an incentive to liberalize the stock market when there is good news about the future. Specifically, liberalizations may be timed to coincide with (1) high points in the world business cycle, (2) the implementation of other economic reforms, and (3) positive shocks to aggregate demand and the terms of trade. Including regressors that try to capture these effects explains part of the boom, but stock market liberalization retains a statistically significant and an economically meaningful effect on the growth rate of private investment.

The issue of reverse causality is more problematic. Evidence on the timing of stock market liberalizations is presented which suggests that stock markets are not liberalized in response to investment booms. However, the evidence cannot rule out the possibility that policymakers liberalize in anticipation of future shocks to the marginal product of capital. Therefore, we cannot conclude that stock market liberalizations cause investment booms. Section 7 presents some conclusions.

2. Previous work

For clarity, it is worth describing the contributions of this paper relative to Levine and Zervos (1998a), and explaining why the results here may differ from those generated by Levine and Zervos. The first contribution is that this paper asks whether stock market liberalization causes a temporary increase in the growth rate of the capital stock, whereas Levine and Zervos (1998a) ask if increased stock market integration causes a permanent increase in the growth rate of the capital stock. This difference in questions leads to methodological differences. Specifically, the estimation procedure used in this paper allows for different stock market liberalization dates across countries. Levine and Zervos use the same break point, 1985, for all of the countries in their sample. Choosing a homogenous break point does not induce important biases into Levine and Zervos' empirical procedure, since they are testing for a permanent effect. However, since this paper tests for temporary effects, it is important to capture country-specific stock market liberalization dates as accurately as possible. This paper identifies discrete, country-specific stock market liberalizations using

a systematic dating procedure, which is described in Section 4. This dating procedure facilitates an event study approach that provides a transparent test of whether stock market liberalization leads to a temporary increase in the growth rate of investment.

This paper makes a second contribution by only including developing countries in the sample. Levine and Zervos' study contains both developed and developing countries. If the general consensus is correct in suggesting that developing countries have a higher autarky cost of capital than developed countries, then increased stock market integration will lead to faster rates of capital accumulation in developing countries, but slower rates in developed countries. With both developing and developed countries included in their sample, Levine and Zervos' results may suggest that capital account liberalization has no effect on investment, but the results may also reflect the differing effects of liberalization in each of their subsamples.

A third contribution of this paper is that it presents a time series of country-specific policy changes that serves to set the impact of stock market liberalization apart from the potentially confounding effects of contemporaneous economic reforms. The paper also controls for time-specific shocks, such as fluctuations in the world business cycle.

The final contribution of this paper is that it focuses on private investment instead of using total investment. Total investment is the sum of government, private, and foreign direct investment (FDI). The empirical analysis in this paper is based on the theoretical relationship between private investment and the shadow value of capital in the stock market. This theory makes no predictions about the behavior of government investment. Therefore, data on private investment may be more appropriate. The behavior of FDI around liberalizations may be of independent interest and is analyzed separately in Section 4.

While it is desirable to understand the implications of stock market liberalization for general economic performance, this paper focuses on investment, because there is an unresolved debate as to whether capital account liberalization has any effect on real investment (Kraay, 1998; Obstfeld, 1998; Rodrik, 1998; Rogoff, 1999; Stiglitz, 1999). Levine and Zervos (1998a) provide an important first step in documenting the fact that capital account liberalization does not lead to a permanent increase in the growth rate of the capital stock. This observation does not necessarily mean, however, that capital account liberalization has no effect on investment. Liberalization might lead to a temporary increase in the growth rate of the capital stock. Given the empirical complications inherent in trying to isolate the impact of capital account liberalization, and the fact that there has been no formal analysis of the temporary hypothesis, it seems reasonable to focus on establishing a reliable set of facts about investment and liberalization before tackling broader issues.

3. Stock market liberalization, stock prices, and investment: theory

As motivation for the empirical analysis to follow, this section presents a theoretical discussion of the channels through which stock market liberalization may influence aggregate valuation and physical investment. An open economy extension of the analysis in Section 1.6 of Tobin and Brainard (1977) frames the key issues.

3.1. Autarky Stock Market Valuation

Assume that both the domestic stock market and money market are closed to foreign investors. Let $\bar{\Pi}_t$ denote expected aggregate profit per unit of capital, assume all profits are paid out as dividends, and let V_t denote the expected present value of aggregate profit per unit of capital. Since it is not central to the argument, ignore depreciation of the capital stock. Further, let r_t be the autarky domestic real interest rate, θ_t the autarky equity premium, and assume that the world risk-free interest rate, r_t^* , is less than the domestic risk-free rate r_t . For simplicity of exposition, assume that firms expect future interest rates, the equity premium, and profit per unit of capital to remain constant. Since increased risk sharing has theoretically and empirically ambiguous implications for the domestic savings rate, assume that stock market liberalization has no effect on the domestic savings rate.⁴ Finally, assume that stock market liberalization has no effect on $\bar{\Pi}_t$.

Given these assumptions, in the absence of bubbles, the autarky value of the stock market is given by

$$V_t = \frac{\bar{\Pi}}{r + \theta}. \quad (2)$$

Let P_K be the price of a unit of physical capital, and assume that

$$V_t = \frac{\bar{\Pi}_t}{r + \theta} = P_K, \quad (3)$$

so that the market for capital is in equilibrium and firms are indifferent to investing. Eq. (3), highlights the fact that the discount rate used in evaluating existing projects within a country consists of two components: the real risk-free rate of return and the equity premium. Starting from this equilibrium, suppose that the stock market is liberalized to foreign investors, but the domestic money market remains closed.

⁴ Levine and Zervos (1998a) find no impact of that increased capital market integration on savings rates. See Agénor and Montiel (1996) for an extensive review of the empirical literature on financial liberalization and savings.

3.2. *Stock market valuation after liberalization*

Consider first the impact of stock market liberalization on the equity premium. In autarky, the equity premium, θ , will be proportional to the variance of the country's aggregate cash flows. Once liberalization takes place and the country's stock market becomes fully integrated, its equity premium will be proportional to the covariance of the country's aggregate cash flows with those of a world portfolio. Therefore, the necessary condition for the equity premium to fall following liberalization is that the variance, which can be interpreted as the local price of risk, exceeds the covariance, the global price of risk. Stulz (1999b) demonstrates empirically that every emerging market satisfies this necessary condition. Tesar and Werner (1998), Errunza and Miller (1998), and Bekaert and Harvey (2000) also argue that this condition holds in practice. In keeping with the general consensus that the equity premium will fall when a completely segmented emerging country liberalizes its stock market, let $\theta^* < \theta$ be the equity premium which prevails following stock market liberalization.

In addition to allowing for increased risk sharing, stock market liberalization may also lead to more liquid markets, in which trading equities becomes less costly (Levine and Zervos 1998a, b). Ahimud and Mendelson (1986) and Ahimud et al. (1997) find that increased liquidity reduces the equity premium, which decreases the cost of capital and raises firm value. The fact that shareholders demand a liquidity premium means that, in addition to the premium they require for bearing systematic risk, they also require compensation for the frictional costs of trading equity. This statement is equivalent to saying that the equity premium, θ , consists of two components: (1) the premium required for bearing systematic risk, and (2) a liquidity premium. Therefore, increased liquidity also reduces the equity premium.

From a valuation standpoint, then, the empirical implications of increased liquidity are observationally equivalent to the implications of increased risk sharing. An increase in either, or both, reduces the equity premium. It is therefore important to bear in mind that, in addition to increased risk sharing, increased liquidity may play a central role in any liberalization-induced valuation and investment boom. The relative roles of risk sharing and liquidity are discussed further in Section 5.2.

Now consider the impact of stock market liberalization on the risk-free rate. Although the assumption is that the domestic money market remains closed following the stock market liberalization, the stock market liberalization may have an indirect effect on the domestic risk-free rate. As we have assumed that the domestic savings rate is constant, the capital inflow generated by stock market liberalization increases the total stock of loanable funds. This increase could cause the domestic risk-free rate to fall. Let $\tilde{r} < r$ be the post-liberalization risk-free rate. Finally, by assumption, liberalization has no impact on the numerator, $\bar{\Pi}$. Therefore, after the stock market is liberalized, aggregate

valuation is given by

$$V_t^* = \frac{\bar{\Pi}}{\tilde{r} + \theta^*} > P_k. \quad (4)$$

Stock liberalization drives a wedge between market valuation and the price of a new machine, thereby generating an incentive for firms to invest in physical capital.

3.3. *Objections to the theoretical framework*

There are two key objections to this description of the impact of a stock market liberalization on a country's aggregate valuation and investment. First, it is possible that the autarky risk-free rate might be lower than the world risk-free rate. Second, it may not be reasonable to assume that expected future profits and stock market liberalization are uncorrelated. Each of these objections is now considered in turn.

Suppose that $r < r^*$ and we allow for the more realistic assumption that the domestic money market is also liberalized when the stock market is opened. In this case, in addition to the foreign capital inflow into the stock market, capital will flow out of the domestic money market until the domestic risk-free rate rises to the world risk-free rate. Although the equity premium still falls due to the increased risk sharing, under this scenario the countervailing effect of an increase in the risk-free rate might lead to a net increase in the discount rate. Therefore, if $r < r^*$ in autarky, the post-liberalization cost of capital might actually rise following stock market liberalization. If we observed internal, market-determined interest rates in these countries, it would be instructive to compare pre-liberalization and post-liberalization interest rates. Unfortunately, all of the countries in this sample had some form of financial repression in place during the period, according to Williamson and Mahar (1998). In lieu of data on internal market rates, I now consider the plausibility of this alternative assumption that $r < r^*$.

The autarky interest rate is an equilibrium outcome of domestic savings and investment. Historically, a number of emerging Asian countries have had very high savings rates relative to developed countries (Collins and Bosworth, 1996; Young, 1995; Kim and Lau, 1994). If it has a high autarky savings rate, it is plausible that a poor country might have a lower autarky risk-free rate than the world risk-free rate. On the other hand, economies with high-savings rates may also have more attractive investment opportunities. Thus, it is not clear that high savings-rate countries will necessarily have autarky interest rates that are lower than the world rate. Even if its autarky risk-free rate is lower than the world rate, the liberalizing country may still experience a net capital inflow if its stock market liberalization is asymmetric in the sense that foreign portfolio inflows are liberalized, but the outflow of domestic residents' savings is still

subject to barriers. Section 4 provides evidence on both stock market liberalization and restrictions on the outflow of residents' savings.

The central message from this discussion, then, is not that stock market liberalization will in all cases lead to a fall in a country's cost of capital. Rather, the point is that there are sound theoretical reasons to believe that stock market liberalization may change the liberalizing country's cost of capital, with attendant implications for physical investment. Ultimately, whether a country's cost of capital rises or falls following stock market liberalization is an empirical question that must be considered case by case. Evidence on this question is presented in the next section.

A second objection to the theoretical framework is that it assumes that expected profits do not change when the stock market is liberalized. To the extent that stock market liberalizations are correlated with events that improve a country's physical investment opportunity set, this assumption is clearly unrealistic. Section 6 addresses this potential correlation by employing a detailed set of economic reform variables. Other possible omitted variables that could lead to higher investment, absent any impact of liberalization on the cost of capital, are also considered there.

4. Stock market liberalization, stock prices, and investment: facts

This section of the paper describes the data and presents the facts that are central to the subsequent empirical analysis of investment and stock market liberalization in the following set of countries: Argentina, Brazil, Chile, Colombia, India, Korea, Malaysia, Mexico, The Philippines, Thailand, and Venezuela.

4.1. Stock market liberalization dates

Evaluating the growth rate of private investment following a country's first stock market liberalization requires a systematic procedure for identifying the date of each country's initial stock market liberalization. Official policy decree dates are used when they are available. When policy decree dates are not available, two alternatives are pursued. First, many countries initially permitted foreign ownership through country mutual funds. Since government permission is presumably a necessary condition for establishing these funds, the date when the first country fund is established is taken as a proxy for the official implementation date. The second method for indirectly capturing official implementation dates is to monitor the IFC's Investability Index. The investability index is the ratio of the market capitalization of stocks that foreigners can legally hold to total market capitalization. A large jump in the investability index is taken as evidence of an official liberalization. The date of a country's first stock market liberalization is defined as the first month with a verifiable occurrence of any of

Table 1
First stock market liberalization and controls on capital outflows

The stock market liberalization dates are based on information obtained from the following sources: Levine and Zervos (1994), The Wilson Directory of Emerging Market Funds, IFC Investable Indexes, Park and Van Agtmael (1993), Price (1994), The Economist Intelligence Unit (various issues), The Economist Guide to World Stock Markets (1988), the IMF's Exchange Arrangements and Exchange Restrictions (various issues). Percentage change in total return index is calculated as the percentage change in the real dollar value of the IFC's total return index over the 12-month period leading up to the country's initial stock market liberalization. Restrictions on capital transactions using resident-owned funds: a 'Yes' entry under this column indicates that according to the International Monetary Fund's Exchange Arrangements and Exchange Restrictions, restrictions on the use of domestic residents' funds for capital transactions were still in place when the country's stock market was liberalized to the inward flow of foreign capital. Restrictions on domestic residents' ability to own foreign securities are as catalogued by Kim and Singal (2000). *According to the table entitled, "Summary features of exchange and trade systems in member countries" (IMF Exchange Arrangements and Exchange Restrictions 1987, p. 557), Malaysia had no restrictions on the use of resident-owned domestic funds. However, the discussion on page 333 of the same publication, which lists the rules governing capital flows in and out of Malaysia, indicates that there were some restrictions on capital outflows.

Country	Date of first stock market liberalization	Details about the liberalization	Restrictions on capital transactions using resident-owned funds?	Restrictions on domestic residents' ability to own foreign securities?	Percentage change in total return index
Argentina	November 1989	Policy Decree: The Liberalization began with the New Foreign Investment Regime in November 1989. Legal limits on the type and nature of foreign investments were reduced (Park and Van Agtmael, 1993, p. 326).	Yes	Yes	98.7
Brazil	March 1988	Country Fund Introduction: "The Brazil Fund Incorporated" (<i>The Wilson Directory of Emerging Market Funds</i> , p. 17).	Yes	Yes	19.6
Chile	May 1987	Country Fund Introduction: "The Toronto Trust Mutual Fund" (<i>The Wilson Directory of Emerging Market Funds</i> , p. 17).	Yes	Yes	39.6
Colombia	December 1991	Policy Decree: Resolution 52 allowed foreign investors to purchase up to 100% of locally listed companies (Price, 1994).	Yes	Yes	109

India	June 1986	Country Fund Introduction: “The India Fund” (<i>The Wilson Directory of Emerging Market Funds</i> , p. 12)	Yes	Yes	53.1
Korea	June 1987	Country Fund Introduction: “The Korea Europe Fund Limited” (<i>The Wilson Directory of Emerging Market Funds</i> , p. 13).	Yes	Yes	27.7
Malaysia	May 1987	Country Fund Introduction: “The Wardley GS Malaysia Fund” (<i>The Wilson Directory of Emerging Market Funds</i> , p. 14).	Yes*	No	62.5
Mexico	May 1989	Policy Decree: Restrictions on foreign portfolio inflows were substantially liberalized (Levine and Zervos, 1994).	Yes	No	30.7
The Philippines	May 1986	Country Fund Introduction: “The Thornton Philippines Re-development Fund Limited” (<i>The Wilson Directory of Emerging Market Funds</i> , p. 15).	Yes	Yes	72.9
Thailand	January 1988	Country Fund Introduction: “The Siam Fund Limited” (<i>The Wilson Directory of Emerging Market Funds</i> , p. 16).	Yes	Yes	41.6
Venezuela	January 1990	Policy Decree: Decree 727 completely opens the market to foreign investors except for bank stocks (Levine and Zervos, 1994).	Yes	No	32.5

the following: liberalization by policy decree, establishment of the first country fund, or an increase in the investability index of at least 10%.

Column 2 of Table 1 lists the date on which each of the 11 countries first liberalized its stock market. Column 3 of Table 1 provides details on the means by which each country liberalized. In particular, where the initial stock market liberalization is through a country fund, the specific name of the country fund is given. Table 1 also provides two indicators of whether these countries had restrictions on capital outflows at the time they liberalized foreign capital inflows into their stock markets. Column 4, which bears the label, “Restrictions on capital transactions using resident-owned funds?” provides the first indicator. A ‘Yes’ entry under this column indicates that according to the International Monetary Fund’s *Exchange Arrangements and Exchange Restrictions*, restrictions on the use of domestic residents’ funds for capital transactions were still in place when the country’s stock market was liberalized to the inward flow of foreign capital. Column 5, which bears the label, “Restrictions on domestic residents’ ability to own foreign securities?” provides the second indicator. A ‘Yes’ entry under this column indicates that according to Kim and Singal (2000) there were restrictions on domestic residents’ ability to purchase foreign securities when the country’s stock market was liberalized to the inward flow of foreign capital.

A central point is that Column 4 indicates that every country in Table 1 had restrictions on the outflow of domestic savings at the time its stock market was liberalized. According to Column 5, 8 of 11 countries had restrictions on capital outflows. Thus, even if these countries had autarky risk-free rates that were lower than the world risk-free rate, it is reasonable to expect these countries to have experienced net capital inflows following their stock market liberalizations. The simple valuation model in Section 3 predicts that a net capital inflow should have increased stock market valuations and reduced the cost of equity capital for these countries. Section 4.2 examines whether the data support this prediction.

4.2. Risk sharing, valuation, and liquidity changes around liberalization

This subsection summarizes the existing evidence on the impact of stock market liberalization on risk sharing, aggregate valuation and liquidity. Stulz (1999a, b) argues that analyzing stock market returns around the time of a change in the capital account regime of a country can provide the best picture of the impact of capital account liberalization on risk sharing and the cost of capital. If the liberalization is anticipated, then the change in valuation will occur prior to the actual implementation. As a crude indicator of the valuation response in anticipation of liberalization, column 6 of Table 1 documents the real percentage change in each country’s stock market over the 12 months leading up to the implementation month of the first stock market liberalization

for each country.⁵ For example, for a country that first liberalized in December of 1991, the percentage change shown in Table 1 gives the percentage change in the dollar total return index from December 1990 to 1991.

While the numbers in Table 1 do not account for contemporaneous reforms or changes in fundamentals, they suggest large changes in aggregate valuation associated with stock market liberalization. Henry (2000) shows that, after controlling for economic reforms, macroeconomic fundamentals, and co-movements with developed-country stock markets, the valuation increases shown in Table 1 remain large and statistically significant. Kim and Singal (2000) and Bekaert and Harvey (2000) find similar effects, and argue that the numbers are consistent with a one-time revaluation of aggregate equity prices and a fall in the cost of capital. The countries analyzed in this paper are identical to those in Henry (2000), except that Taiwan is not included in this study, because private investment data were not available for Taiwan. While the evidence on valuation and the cost of capital is consistent with the hypothesis that stock market liberalization increases risk sharing, Levine and Zervos (1998b) document that stock market liberalization also increases market liquidity. Therefore, the documented changes in valuation could be due to increased liquidity as well as increased risk sharing.

4.3. Private investment data

The private investment series comes from the World Bank's Socioeconomic Time Series Access and Retrieval (STARS) database. The level of real private investment was obtained by dividing nominal private investment (local currency) by the domestic GDP deflator. There are a total of 11 developing countries that have both liberalized their stock market and kept data on private investment. Table 2, which presents summary statistics on the growth rate of real private investment for each country, illustrates that the sample contains a total of 151 observations of private investment. Although there are a total of 151 private investment observations, it is important to note that world-wide shocks can affect all 11 countries, which means that these observations may not be completely independent. The empirical analysis presented below controls for world-wide shocks by using dummy variables for each calendar year as well as other proxies for the world business cycle.

4.4. The growth rate of private investment around stock market liberalization

Let $\Delta \ln I_{it} = \ln I_{it} - \ln I_{it-1}$ be the growth rate of real private investment in country i in year t . Further, let $\Delta \ln I_t = \frac{1}{11} \sum_{i=1}^{11} (\Delta \ln I_{it})$ be the average growth

⁵ For a detailed discussion of the issues involved in trying to precisely date liberalization announcements, see Henry (2000).

Table 2
The growth rate of real private investment: summary statistics

The numbers in columns 3 through 6 are the growth rate of real private investment in the year of liberalization, the year after liberalization, the second year after liberalization, and the third year after liberalization, respectively. Columns 7 through 11 give the sample mean, median, minimum, maximum, and standard deviation of the growth rate of real investment, respectively. The level of real private investment was obtained by dividing nominal private investment by the domestic GDP deflator. The growth rate of real private investment is calculated as the change in the natural log of the level of real private investment. The last *Source*: The World Bank's *Stars* database and the author's calculations.

Country	Date of Liberalization	T^*	$T^* + 1$	$T^* + 2$	$T^* + 3$	Mean	Median	St. Dev	Min	Max	Years data are available
Argentina	November 1989	−0.376	0.062	0.309	0.601	0.113	0.143	0.277	−0.376	0.601	1985–93
Brazil	March 1988	0.313	0.145	0.402	−0.161	0.034	−0.029	0.200	−0.281	0.402	1981–93
Chile	May 1987	0.063	0.269	0.376	0.102	0.117	0.167	0.327	−0.495	0.742	1983–93
Colombia	December 1991	−0.078	0.123	0.292	0.416	0.110	0.022	0.192	−0.156	0.496	1985–94
India	June 1986	0.031	0.265	0.062	0.111	0.083	0.121	0.143	−0.328	0.269	1977–92
Korea	June 1987	0.260	0.222	0.259	0.275	0.161	0.096	0.158	−0.167	0.452	1977–93
Malaysia	May 1987	0.098	0.200	0.272	0.245	0.123	0.064	0.159	−0.221	0.365	1977–93
Mexico	May 1989	0.120	0.196	0.241	0.248	0.079	0.124	0.093	−0.480	0.357	1980–94
Philippines	May 1986	−0.011	0.084	0.219	0.263	0.085	0.144	0.183	−0.354	0.289	1977–94
Thailand	January 1988	0.367	0.301	0.310	0.145	0.153	0.104	0.132	−0.166	0.367	1977–94
Venezuela	January 1990	−0.411	0.608	0.141	0.006	−0.066	−0.149	0.545	−0.960	1.52	1977–94

rate of real private investment across all 11 countries in year t . Finally, let T^* denote the year in which the stock market is liberalized. Under these definitions of $\Delta \ln I_t$ and T^* , the expression $\Delta \ln I_{T^*}$ refers to the average growth rate of private investment across all 11 countries in the year of stock market liberalization. Fig. 1, which is a plot of $\Delta \ln I_t$ for $t \in [T^* - 5, T^* + 5]$, suggests a strong lagged response of private investment growth to stock market liberalization. The growth rate of private investment increases sharply in year $T^* + 1$, peaks in year $T^* + 2$, and returns to pre-liberalization magnitudes by year $T^* + 4$.

The correlation between liberalization and the growth rate of private investment at various dates is evaluated by estimating the following panel regression:

$$\begin{aligned} \Delta \ln(I_{it}) = & \alpha_i + \beta_1 \text{Lib}_{it} + \beta_2 \text{PostLib1}_{it} + \beta_3 \text{PostLib2}_{it} + \beta_4 \text{PostLib3}_{it} \\ & + \text{Year}_t + \varepsilon_{it}. \end{aligned} \quad (5)$$

Lib_i is a variable that equals one in the year that country i liberalizes its stock market. PostLib1_i takes on the value 1 in the first year after liberalization, PostLib2_i takes on the value 1 in the second year after liberalization, and PostLib3_i takes on the value 1 in the third year after liberalization. The α_i in Eq. (5) denote country-specific dummy variables. The Year_t denote year-specific dummy variables which are included to control for cross-country correlation in the error terms that might be induced by common world-wide shocks. The estimation procedure explicitly allows for heteroskedasticity in computing standard errors, but with an unbalanced panel it is not possible to relax the assumption of no cross-country correlation. The year dummies are an imperfect attempt to control for cross-country correlation. The first-difference specification reflects a well-known problem of empirical investment equations, the presence of a highly serially correlated error term when these equations are run in levels. The usual first difference specification relates $\Delta \ln(I_t/K_t)$ to stock returns (see Blanchard et al., 1993), but data on the stock of capital for each country are not available. Hence, the analysis throughout the paper follows Barro (1990) in using $\Delta \ln(I_t)$ as the left-hand-side variable. The results are presented in Table 3.

The second row of Table 3 illustrates that the average growth rate of private investment is 23 percentage points above the sample mean in the first year after stock market liberalization, 27 percentage points in the second year, and 17 percentage points in the third year. Heteroskedastic consistent standard errors are given in parentheses. Although the liberalization effects appear large and significant, there are three concerns. First, in spite of the first difference specification, subsequent observations of investment growth in individual countries might be autocorrelated. Second, with 11 countries in the sample, one might worry that the results are driven by one or two large outliers. Finally, although the estimates control for country-specific effects and common world-wide shocks, the right-hand side of the estimated equation may be missing other

Table 3

The growth rate of private investment around countries' first stock market liberalization

Mean, Huber estimates: the coefficient on a dummy variable for each of the years T^* , $T^* + 1$, $T^* + 2$, and $T^* + 3$ in a regression of the growth rate of private investment on a constant, 10 country-specific dummies, and year dummies. The constant term is not shown. The t -statistics are calculated using heteroskedastic-consistent standard errors. Mean, FGLS estimates: the coefficient on a dummy variable for each of the years T^* , $T^* + 1$, $T^* + 2$, and $T^* + 3$ in a feasible generalized least squares regression of the growth rate of private investment on a constant, 10 country-specific dummies, and year dummies. The constant term is not shown. Wilcoxon Test: This is a test of the hypothesis that the sample of private investment growth rates in each of the years T^* , $T^* + 1$, $T^* + 2$, and $T^* + 3$ have the same distribution as the non-stock market liberalization sample of private investment growth rates. Number Below Median: The number of countries with a growth rate of private investment below the non-liberalization median growth rate of investment in each of the years T^* , $T^* + 1$, $T^* + 2$, and $T^* + 3$. P -value: the 2-sided p -value of observing at most this many countries with private investment growth rates, in each of the years T^* , $T^* + 1$, $T^* + 2$, and $T^* + 3$, below their non-stock market-liberalization median growth rate of private investment.

	T^*	$T^* + 1$	$T^* + 2$	$T^* + 3$
Number of Liberalizations	11	11	11	11
Mean, Huber estimates	0.04	0.23	0.27	0.17
t -statistic	(0.70)	(3.30)	(5.80)	(2.80)
p -value	(0.70)	(0.00)	(0.00)	(0.01)
Mean, FGLS estimates	0.043	0.16	0.29	0.19
z -statistic	(0.80)	(3.00)	(5.10)	(3.10)
p -value	(0.40)	(0.00)	(0.00)	(0.00)
Wilcoxon test				
Z -statistic	(0.18)	(2.58)	(2.85)	(2.04)
p -value	(0.42)	(0.01)	(0.00)	(0.02)
Number below median	6	2	1	3
p -value	(0.73)	(0.03)	(0.01)	(0.11)

important variables that exert an influence on private investment. Each of these issues is now discussed.

Two procedures were used to evaluate whether autocorrelated disturbance terms are corrupting the significance levels reported in Table 3. First, individual country regressions of private investment growth on a constant were performed to test for first-order autocorrelation in the residuals. For 7 of 11 countries the Durbin–Watson statistic indicated that there was no first-order serial correlation, and for the other 4 countries the Durbin–Watson statistic was inconclusive.⁶

⁶ The 7 countries and the associated Durbin–Watson statistics are as follows: Argentina (2.76), Brazil (1.85), Chile (2.80), India (2.12), The Philippines (2.04), Thailand (2.17), and Venezuela (2.01). The 4 countries, with their Durbin–Watson statistics in parentheses, are Colombia (1.39), Korea (1.51), Malaysia (1.21), and Mexico (1.51).

Second, Eq. (5) was re-estimated using feasible generalized least squares (FGLS), which allows for groupwise autocorrelation. The FGLS estimates of Eq. (5) are reported in the third row of Table 3. The mean growth rates of private investment in years $T^* + 1$, $T^* + 2$, and $T^* + 3$ are 16, 29, and 19 percentage points above the sample mean, respectively. All three estimates are significant at the 1% level. The similarity of the FGLS estimates shown in the third row of Table 3 to the estimates in the second row of Table 3, in both magnitude and statistical significance, suggests that autocorrelation is not a major statistical concern.

In order to address the concern about outliers, the fourth row of Table 3 presents the results of a Wilcoxon signed rank test. Specifically, each country's growth rate of private investment in years T^* , $T^* + 1$, $T^* + 2$, and $T^* + 3$ is compared to that country's median growth rate of private investment in non-liberalization years. The Z-statistics reject the hypothesis that the median growth rate of private investment during years $T^* + 1$, $T^* + 2$, and $T^* + 3$ is equal to the median growth rate in non-liberalization years. The fifth row of the table gives the results of a simple sign test. It lists the number of countries with a growth rate of private investment below their country-specific median growth rate, and gives the probability of finding at most this number of countries below their median. Like row 4, row 5 of Table 3 demonstrates that the abnormally high growth rate of private investment in each of the three years immediately following stock market liberalization is a robust empirical regularity not driven by a few countries. Finally, the concern that the estimates in Table 3 are overstated because of omitted variables is deferred until Section 6, where alternative controls for world-wide factors and a host of other possible omitted variables are considered.

4.5. *Foreign direct investment*

Another question that arises from looking at Fig. 1 and Table 3 is whether the increase in private investment simply replaces FDI, or whether both increase, following stock market liberalization. This question is addressed by looking at the ratio of foreign direct investment to private investment. Table 4 presents summary statistics on the ratio of foreign direct investment to private investment. The numbers indicate that the ratio of FDI to private investment tends to rise following stock market liberalization. In year $T^* + 1$, 7 of 11 countries have a ratio of FDI to private investment in excess of their country-specific median. In years $T^* + 2$ and $T^* + 3$, this fraction is 8 of 11 and 9 of 11, respectively.

These numbers suggest that the increase in private investment does not simply substitute for FDI. Following stock market liberalization, private investment increases, the ratio of FDI to private investment increases, and therefore the sum of private investment and FDI increases. One explanation for why FDI increases is that stock market liberalization may be positively correlated with

Table 4

The ratio of foreign direct investment to private investment around countries' first stock market liberalization

The numbers in columns 3 through 6 are the ratio of foreign direct investment to private investment in the year of liberalization, the year after liberalization, the second year after liberalization, and the third year after liberalization, respectively. Columns 7 through 11 give the sample mean, median, minimum, maximum, and standard deviation of the ratio of foreign direct investment to private investment, respectively. *Source:* The World Bank's *Stars* database and the author's calculations.

Country	Date of Liberalization	T^*	$T^* + 1$	$T^* + 2$	$T^* + 3$	Mean	Median	St Dev	Min	Max	Years data are available
Arg	November 1989	0.088	0.148	0.144	0.136	0.087	0.080	0.057	−0.001	0.157	1984–93
Braz	March 1988	0.045	0.013	0.011	0.013	0.029	0.028	0.017	0.008	0.056	1980–93
Chil	May 1987	0.082	0.039	0.242	0.100	0.091	0.084	0.056	0.039	0.241	1982–93
Col	December 1991	0.117	0.179	0.143	0.098	0.154	0.143	0.080	0.046	0.350	1984–94
Ind	June 1986	0.005	0.007	0.003	0.007	0.004	0.004	0.003	−0.003	0.007	1976–92
Kor	June 1987	0.017	0.019	0.013	0.009	0.009	0.008	0.006	0.0003	0.019	1976–93
Mal	May 1987	0.097	0.135	0.238	0.261	0.217	0.222	0.077	0.097	0.350	1976–93
Mex	May 1989	0.110	0.079	0.111	0.080	0.081	0.079	0.038	0.020	0.175	1979–94
Phil	May 1986	0.030	0.068	0.166	0.077	0.043	0.030	0.043	−0.017	0.166	1976–94
Thai	January 1988	0.070	0.083	0.084	0.059	0.045	0.043	0.022	0.011	0.084	1976–94
Ven	January 1990	0.189	0.438	0.107	0.069	0.059	0.012	0.121	−0.131	0.438	1976–94
Sample	NA	0.077	0.110	0.116	0.083	0.069	0.061	0.029	0.034	0.129	NA

other changes that reduce the operating risk of foreign multinationals operating in an LDC. In this case, the cost of capital for multinationals may also fall. Holding the cost of capital for multinationals constant, FDI may also increase if stock market liberalization is positively correlated with other economic reforms that increase the expected future cash flows from domestic investment. The possibility that FDI rises because of higher expected future cash flows reinforces the concern that the magnitude of the private investment-liberalization correlations in Table 3 may be overstated. Again, Section 6 of the paper directly addresses these issues.

5. Investment-stock return correlations

As outlined in Eq. (1), the theory predicts that, if stock market liberalization reduces the cost of capital, it will also cause higher investment via its intermediate effect on aggregate stock market prices. The correlations documented in Section 4 provide support for this transmission mechanism. However, the ultimate validity of this theory requires the existence of an intermediate empirical link from stock prices to investment. This section of the paper examines whether such a link exists.

Fig. 2 is a graph of annual stock returns and the annual growth rate of private investment in all 11 countries from 1977 to 1994. The solid line, which is plotted against the left-hand y-axis scale, is the simple average of the continuously compounded real local currency stock market return across all 11 countries. The stock returns are constructed using the dividend-inclusive, local currency *IFC Global Index* taken from the International Finance Corporation's *Emerging Markets Data Base* (EMDB). All stock market indexes are deflated by consumer price indexes from the International Monetary Fund's *International Financial Statistics*. The dashed line, which is plotted against the right-hand y-axis, is the simple average of the continuously compounded growth rate of real private investment.

Fig. 2 suggests that there are two components to the correlation between the stock market and investment. First, there is a cross-sectional component. In any given year, the stock market and investment tend to move in the same direction. Second, there is a time series component. Both investment and stock returns were higher after 1983, as the world economy moved out of recession. As in Section 4, this observation means that, although there are a total of 151 data points, they may not be completely independent. Again, the estimation procedure controls for the possible cross-country correlation induced by common world shocks by using year-specific dummy variables.

Let I_{it} and V_{it} denote the real local currency value of private investment and the stock market index in country i in year t . Also, let $v_{it} = \Delta \ln(V_{it})$. The correlation between private investment and stock returns is evaluated by

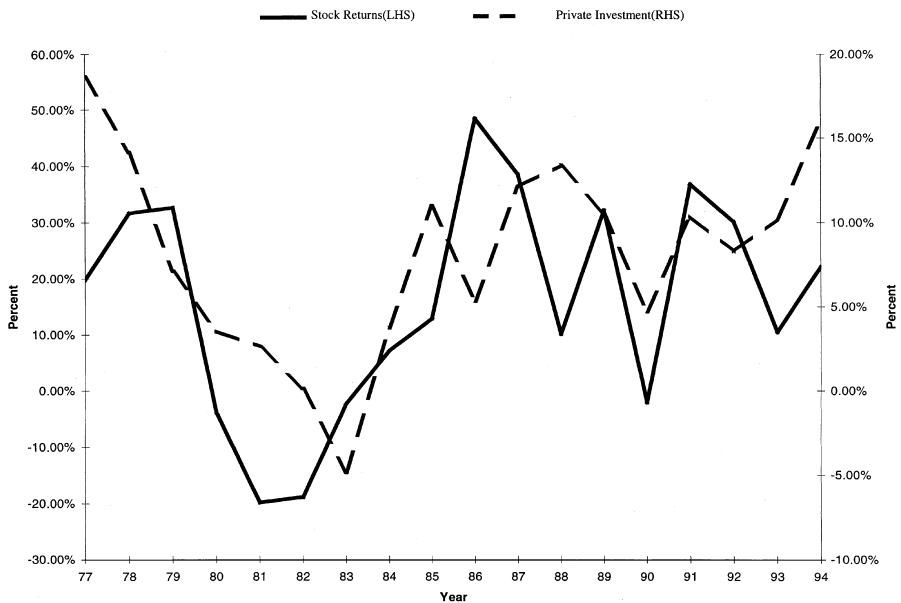


Fig. 2. Real stock returns and the growth rate of real private investment. The solid line is the average return on the stock market in real local currency terms across all 11 countries. The dashed line is the average growth rate of private investment in real local currency terms across all 11 countries.

estimating panel regressions that allow for country-specific and time-specific effects:

$$\Delta \ln(I_{it}) = \alpha_i + \beta_1 v_{it-n} + Year_t + \varepsilon_{it}. \quad (6)$$

The growth rate of private investment is regressed on contemporaneous stock returns, one-year lagged stock returns, and two-year lagged stock returns.⁷ Investment is also regressed on all three lagged variables simultaneously. Regressions (1)–(4) in Table 5 indicate a positive correlation between stock returns and private investment. The relationship is strongest between investment and one-year lagged returns. The coefficient on v_{t-1} is 0.13. A 1% increase in the stock market last year is followed by a 0.13% increase in the growth rate of private investment. Neither the contemporaneous return on the market, v_t , or the two-year lagged change in the value of the stock market, v_{t-2} , are

⁷ The use of stock returns as a proxy for changes in q is another difference between this specification and those in the literature on investment in developed countries. The reason for this difference is that the debt variables needed to construct an aggregate measure of q are not available. This may not be a major concern, as Barro (1990) and Blanchard et al. (1993) both find that lagged stock market returns out-perform q as a predictor of future real investment.

significantly correlated with investment in year t . Column 4 shows that estimating the relationship with all three return variables entering simultaneously yields the same conclusion. Stock returns in year $t - 1$ strongly predict investment in year t , while contemporaneous and two-year lagged returns have little predictive power.

5.1. Investment and liberalization-specific valuation changes

It is natural to ask whether the correlation between investment and generic changes in market valuation, as presented in Columns 1–4 of Table 5, is the same as the correlation between investment and liberalization-specific changes in valuation. Estimating the following equation provides the most transparent means of answering that question:

$$\begin{aligned} \Delta \ln(I_{it}) = & \alpha_i + \beta_1 v_{it-2} + \beta_2 v_{it-1} + \beta_3 v_{it} + \beta_4 (v_{it-2} * PostLib2_i) \\ & + \beta_5 (v_{it-1} + *PostLib1_i) + \beta_6 (v_{it} * Lib)_i + \varepsilon_{it}. \end{aligned} \quad (7)$$

The interactive coefficients measure the correlation of investment in year t with a liberalization-specific valuation increase that took place in year $t - n$. If there is no difference in the responsiveness of private investment to liberalization-specific and generic valuation increases, then we should observe the following relations among the coefficients: $\beta_1 = \beta_4$, $\beta_2 = \beta_5$, $\beta_3 = \beta_6$.

The results are presented in Column 5 of Table 5. β_4 , the coefficient on the interactive term, $PostLib2 * v_{t-2}$, is positive and significant and a simple F -test reveals that it is statistically larger than the coefficient on v_{t-2} .⁸ Whereas a generic 1% increase in the stock market in year $t - 2$ has little or negative predictive power for investment in year t , there is a positive and significant investment response in year t to a 1% increase in year $t - 2$ that is associated with stock market liberalization. The fact that investment is more strongly correlated with liberalization-induced valuation increases than with generic valuation increases lends itself to two possible interpretations. First, stock market liberalization helps firms distinguish between news-driven and noise-driven valuation increases. Second, there is an omitted variable problem. Each of these interpretations is now considered.

A firm observing a typical increase in its stock price doesn't know whether that increase is due to news or noise (Stein, 1996). Undertaking new physical investment in response to noise-driven valuation increases will make long-term shareholders worse off, because such investment drives down the marginal product of capital without an accompanying fall in the discount rate or an

⁸ The F value is 5.25. Probability $> F = 0.024$.

Table 5

Private investment growth and stock returns

The left-hand-side variable is the annual, continuously compounded growth rate of private investment in real local currency terms. The variables v_t , v_{t-1} , and v_{t-2} denote the current, lagged, and two-year lagged real local currency return on the stock market respectively. *Lib*, *PostLib1*, *PostLib2* are dummy variables that take on the value 1 in the year of stock market liberalization, the first year after stock market liberalization, and the second year after stock market liberalization, respectively. $v_t * \text{Lib}$ denotes a variable which is equal to the product of v_t and *Lib*. The other interactive terms are defined analogously. A constant plus country-specific dummy variables and year dummies were also estimated but not reported. Heteroskedasticity-consistent standard errors are in parentheses. *, **, *** denote significance at the 10, 5, and 1% levels, respectively.

Right-hand-side variables	Alternative regression specifications				
	(1)	(2)	(3)	(4)	(5)
v_t	0.05 (0.06)			0.04 (0.06)	0.18** (0.07)
v_{t-1}		0.13*** (0.04)		0.13*** (0.04)	0.23*** (0.05)
v_{t-2}			−0.06 (0.06)	−0.04 (0.05)	0.00 (0.07)
$v_t * \text{Lib}$					−0.38*** (0.14)
$v_{t-1} * \text{PostLib1}$					−0.00 (0.12)
$v_{t-2} * \text{PostLib2}$					0.24 (0.12)

increase in expected future profits (Blanchard, Rhee, and Summers, 1993). However, when the stock market is liberalized, firms know that a change in the country's fundamentals has occurred. Namely, increased risk sharing is present. The attendant equity price boom signals to firms that they can increase shareholder welfare by investing in new capital.⁹

Investment may also be more strongly correlated with changes in valuation induced by the occurrence of liberalization than with generic valuation changes, because regression (5) of Table 5 is missing variables that are positively corre-

⁹ The mechanism through which greater risk sharing increases investment in my example is identical to the mechanism driving Fischer and Merton's (1984) managers to decrease investment following an increase in aggregate risk aversion. Greater risk sharing also leads to increased investment in Obstfeld (1994).

lated with both liberalization and investment. Call this vector of variables Z . If stock market liberalizations coincide with positive shocks to Z , then subsequent investment will appear more highly correlated with valuation changes induced by liberalization, when in fact the omitted variable Z may be driving the increased capital formation. Possible omitted variables are the subject of Section 6.

5.2. *Investment and liquidity*

The discussion in Section 3 explained why liquidity and risk sharing have observationally equivalent valuation implications. This fact raises an important interpretation issue. Suppose we observe that a stock market liberalization generates a large increase in equity prices and a subsequent investment boom. It would be useful to know how much of the investment increase is due to increased risk sharing versus increased liquidity. Because increased risk sharing and increased liquidity both have valuation implications, we cannot disentangle their relative effects on investment by running horse races between changes in liquidity and changes in valuation. However, Levine and Zervos (1998a) argue that regressing investment on liquidity and valuation may help us understand whether liquidity has an impact on investment that operates independently of the impact of liquidity on valuation.

The absence of a significant coefficient on liquidity in a regression of investment growth on changes in valuation and changes in liquidity would suggest that all of the effect of increased liquidity on investment works through the impact of liquidity on valuation. On the other hand, suppose a positive and significant correlation between investment and liquidity appears after controlling for valuation. Then, to the extent that stock market liberalization enhances liquidity, it is possible that part of the investment increase following stock market liberalization works through a liquidity channel that operates independently of the effect of liquidity on valuation.

Table 6 presents results from regressing the growth rate of private investment on contemporaneous and lagged changes in valuation and the measures of liquidity used in Levine and Zervos (1998a). The two measures of liquidity are the change in the turnover ratio, and the change in value of shares traded as a fraction of GDP. The final specification (4), which includes contemporaneous values, lagged values, and two-year lagged values of all three variables, is perhaps the most informative. The fact that the two-year lagged change in the turnover variable remains significant in the presence of contemporaneous, lagged, and two-year lagged changes in valuation suggests that increased liquidity may lead to increased investment through a channel that operates independently of the effect of liquidity on valuation. This result is consistent with Levine and Zervos (1998a), who find that increased liquidity leads to higher capital stock growth after controlling for valuation.

Table 6

Private investment, stock returns, and liquidity

The left-hand-side variable is the annual, continuously compounded growth rate of private investment in real local currency terms. The right-hand-side variables are as follows. v_t , v_{t-1} , and v_{t-2} denote the current, one-year lagged, and two-year-lagged real local currency return on the stock market, respectively. Turnover is calculated as the value of total shares traded divided by market capitalization. Value traded is calculated as the value of total shares divided by GDP. The data on market capitalization and value of total shares traded are taken from the International Finance Corporation's Emerging Markets Database. The estimations are performed on data from the entire sample period for each of the 11 countries. A constant plus country-specific dummy variables and year dummy variables were also estimated, but are not reported. Heteroskedasticity-consistent standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Right-hand-side variables	Alternative regression specifications			
	(1)	(2)	(3)	(4)
v_t	0.09 (0.09)			0.14 (0.10)
v_{t-1}		0.19** (0.08)		0.22*** (0.08)
v_{t-2}			-0.11 (0.09)	0.03 (0.07)
Change in turnover	-0.10** (0.05)			0.02 (0.08)
Change in turnover, one-year lagged		0.01 (0.08)		0.04 (0.07)
Change in turnover, two-year lagged			0.22 (0.10)	0.17 (0.08)
Change in value traded	-0.00 (0.05)			-0.04 (0.06)
Change in value traded, one-year lagged		0.03 (0.05)		0.06 (0.06)
Change in value traded, two-year lagged			-0.18* (0.10)	-0.14* (0.08)

6. Alternative explanations for the investment boom

Thus far, this paper has documented three salient facts about the stock market and private investment in developing countries. First, private investment booms follow stock market liberalizations. Second, there is a strong positive correlation between the growth rate of private investment and changes in stock market

valuation. Third, this correlation is stronger for liberalization-specific valuation changes than for generic valuation changes. Taken together with previous work that demonstrates that stock market liberalizations cause large increases in stock market valuation, these three facts constitute strong *prima facie* evidence that stock market liberalizations cause investment booms. This section of the paper argues that there are reasons to be skeptical of this evidence.

6.1. Omitted variables

At least one possible alternative explanation for the temporary surge in the growth rate of private investment is that LDC policymakers timed the liberalizations to coincide with high points in the world business cycle. In the estimations that follow, in addition to using year dummies, real U.S. interest rates and OECD output growth rates are used to separate the cross-sectional effects of stock market liberalization from the impact of the world business cycle.

Overstating the impact of stock market liberalization on private investment could also occur because of the contemporaneous implementation of other economic reforms. Table 7 documents the major economic reforms occurring in each of the 11 countries between 1985 and 1994. The major economic reforms documented in Table 7 are the occurrences of: (1) macroeconomic stabilization programs, (2) trade liberalization, (3) privatization programs, and 4) easing of exchange controls. With only two exceptions, the sample countries implemented all four types of reforms during the period 1985–1994. The two exceptions are Malaysia, where no stabilizations were attempted, and Mexico, where exchange controls were not eased during this period. The data for Table 7 are taken from Henry (1999). With the aid of this table, four economic reform variables are created to help isolate the effects of stock market liberalization. These variables, which are given the names *Stabilize*, *Trade*, *Privatize*, and *Exchange*, take on a value of zero in all years except those years in which each of these reforms actually occur in each country. Like the *Liberalize* variable, 3 lags of each of the reform variables are also included in each of the regressions.

In addition to controlling for the world business cycle and contemporaneous reforms, it is important to account for domestic fundamentals, such as the growth rate of GDP, the terms of trade, and the external debt-to-GDP ratio. For any country, more rapid GDP growth or a positive terms of trade shock could lead to stronger sales and higher profits. One possible outcome of such a scenario is a private investment boom driven by an aggregate demand shock that is independent of stock market liberalization policies. Similarly, the literature on debt overhang and investment (Krugman, 1989; Sachs, 1989) argues that a large external debt-to-GDP ratio acts as a drag on investment. Therefore, a large fall in the external debt-to-GDP ratio could also lead to a substantial increase in future investment that is unrelated to stock market liberalization.

Table 7

Economic reforms in the 11 sample countries 1985–1994

S indicates that a macroeconomic stabilization program was implemented during the course of the year. T indicates that a trade liberalization was implemented during the course of the year. P indicates that a privatization program was implemented during the course of the year. E indicates that exchange controls were eased during the course of the year. Source: Henry (1999).

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Argentina	S		ST	TE	SP	P	STE	SP		TP
Brazil		SE		ST	T	TPE	P	SP	P	
Chile	ST		P		S	E	TE	E	TP	PE
Colombia	S	T	T		T	T	TPE	TP	TP	T
India				TE		T	STP	TPE	E	P
Korea	ST	T	T	T	E			P	TP	
Malaysia			P	T		P		T	T	E
Mexico	T	T	S	SP		P	P	P		T
Philippines		ST		P	SP	TPE	STPE	TPE	P	SP
Thailand	S	T	T			P	TE	P		T
Venezuela	P	E			STE	T	TP	P		

To account for these potentially important omitted variables, the following regression controls for world business cycle effects, contemporaneous economic reforms, and aggregate demand conditions as follows:

$$\Delta \ln(I_{it}) = \alpha_i + \beta_1 \text{Lib}_{it} + \beta_2 \text{PostLib1}_{it} + \beta_3 \text{PostLib2}_{it} + \beta_4 \text{PostLib3}_{it} + \text{BCYCLE} + \text{Reforms}_{it} + \text{Fundamentals}_{it} + \varepsilon_{it}. \quad (8)$$

BCYCLE is an abbreviation for the variables that serve as proxies for the world business cycle: year dummies, the real U.S. Treasury bill rate, and the logarithmic growth rate of OECD industrial production. The term *Reforms* denotes the matrix of reform variables. The *Fundamentals* are two lags of the growth rate of GDP, the contemporaneous growth rate of the terms of trade, and the contemporaneous growth rate of the external debt-to-GDP ratio. Further lags of the growth rate of GDP contribute very little explanatory power and were therefore dropped. Lagged values of the terms of trade and the debt-to-GDP ratio were dropped for the same reason. Contemporaneous GDP growth is not included on the right-hand side to avoid simultaneity bias. Including lagged GDP growth as a right-hand-side variable could introduce the same bias if serial correlation in the error term exists. However, the tests in Section 4 provide no evidence that there is serial correlation in the error term. The final specification closely resembles Fischer (1991), Warner (1992), and Cohen (1993).

Table 8 presents the results of three different variations on Eq. (8). The first specification uses year dummies as the sole proxy for the business cycle. The second specification uses the real Treasury bill rate and the growth rate of

Table 8

The growth rate of private investment around countries' first stock market liberalization revisited

The left-hand-side variable is the annual, continuously compounded growth rate of private investment in real local currency terms. The estimation procedure is ordinary least squares. A constant and 10 country-specific dummy variables were also estimated but not reported. *Lib* is a dummy variable which takes on the value 1 during the year of a country's first stock market liberalization. *PostLib1* and *PostLib2* take on the value 1 in each of the two subsequent years, respectively. The variables v_t , v_{t-1} , and v_{t-2} denote the current, lagged, and two-year lagged local currency logarithmic return on the stock market, respectively. *Stabilize*, *Trade*, *Privatize*, and *Exchange* are dummy variables for the initiation of macroeconomic stabilization, trade opening, privatization, and exchange controls, respectively. *Stabilize1*, *Stabilize2*, and *Stabilize3* are dummy variables that take on the value 1 in the first, second, and third year after liberalization, respectively. The other reform variables are defined analogously. Heteroskedastic-consistent standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% levels, respectively.

Right-hand-side variables	Alternative regression specifications		
	Year Dummies	T-bill and OECD Growth	Year Dummies, T-bill, and OECD Growth
<i>Lib</i>	0.02 (0.04)	−0.03 (0.04)	0.01 (0.04)
<i>PostLib1</i>	0.10 (0.06)	0.07 (0.05)	0.10* (0.06)
<i>PostLib2</i>	0.33*** (0.06)	0.24*** (0.05)	0.31*** (0.05)
<i>PostLib3</i>	0.20*** (0.05)	0.10** (0.05)	0.18*** (0.05)
<i>Stabilize</i>	0.06 (0.06)	0.04 (0.06)	0.04 (0.06)
<i>Stabilize1</i>	0.22*** (0.04)	0.16*** (0.04)	0.22*** (0.04)
<i>Stabilize2</i>	0.07 (0.05)	0.06 (0.05)	0.07* (0.04)
<i>Stabilize3</i>	0.17** (0.05)	0.15*** (0.04)	0.16*** (0.04)
<i>Trade</i>	0.01 (0.05)	0.01 (0.05)	0.00 (0.05)
<i>Trade1</i>	−0.04 (0.04)	−0.04 (0.04)	−0.04 (0.04)
<i>Trade2</i>	0.09*** (0.04)	0.06** (0.03)	0.07** (0.03)

Table 8 (continued)

Right-hand-side variables	Alternative regression specifications		
	Year Dummies	T-bill and OECD Growth	Year Dummies, T-bill, and OECD Growth
<i>Trade3</i>	−0.05 (0.05)	−0.05 (0.04)	−0.01 (0.04)
<i>Privatize</i>	−0.07 (0.04)	−0.05 (0.04)	−0.04 (0.04)
<i>Privatize1</i>	0.05 (0.04)	0.04 (0.03)	0.01 (0.04)
<i>Privatize2</i>	0.09** (0.04)	0.09** (0.04)	0.08* (0.04)
<i>Privatize3</i>	−0.09 (0.06)	−0.03 (0.04)	−0.06 (0.05)
<i>Exchange</i>	−0.09 (0.07)	−0.12 (0.07)	−0.08 (0.07)
<i>Exchange1</i>	0.06 (0.04)	0.01 (0.04)	0.03 (0.04)
<i>Exchange2</i>	0.12** (0.05)	0.08* (0.05)	0.11** (0.05)
<i>Exchange3</i>	−0.00 (0.07)	−0.08 (0.06)	−0.08 (0.06)

OECD industrial production. The third specification uses all three world business cycle measures. In order to conserve space, the estimates of the business cycle variables and fundamentals are not presented in the table.¹⁰ Column 2 shows that when year dummies and fundamentals are included, the coefficient on *PostLib1* falls to 0.10 and is no longer significant. The coefficients on *PostLib2* and *PostLib3* actually increase to 0.33 and 0.20, respectively. It is interesting to note that the growth rate of private investment is also significantly higher than the sample mean in the years following a number of the other reforms. For example, the coefficients on all of the *Stabilize* variables are positive, and the coefficients of 0.22 on *Stabilize1* and 0.17 on *Stabilize3* are both statistically significant. The direction of the relationship between private investment growth and the other reforms is less robust. The coefficients on *Trade2*,

¹⁰ Notable points about these estimates are that the year dummies in the early 80s are negative and significant, reflecting the effects of the Volcker recession. The Treasury bill rate and OECD industrial production variables have the expected *a priori* signs.

Privatize2, and *Exchange2* are all positive and statistically significant, but the coefficients on *Trade1*, *Trade3*, *Privatize*, *Privatize3*, and *Exchange* are all negative.

The regression in Column 3 of Table 8 controls for world business cycle effects by including the contemporaneous value of the real U.S. Treasury bill rate and the growth rate of OECD industrial production as right-hand-side variables. Under this specification, the coefficient on *PostLib2* is 0.24, again significant at the 1% level. The coefficient on *PostLib3* falls to 0.10, but remains significant. The reform variable coefficients are qualitatively identical to those of the specification in Column 2. Multiple leads and lags of the interest rate and growth rate of industrial production were also tried, but only the contemporaneous values displayed any significant effect. As a final check of robustness, year dummies, the real Treasury bill rate, and OECD growth rates were all included simultaneously. The estimates are presented in Column 4. For this specification, *PostLib1*, *PostLib2*, and *PostLib3* are all statistically significant, with point estimates almost identical to those in Column 2.

The evidence in Table 8 demonstrates that the positive correlation between private investment growth and stock market liberalization is robust to a number of potential omitted variables, but should still be interpreted with caution. Although Table 8 documents a number of significant reforms, it does not directly capture elements such as judicial reform or public sector accountability changes. These changes may be prerequisites for a successful stock market liberalization in any country. To the extent that the stock market liberalization dummy variable inadvertently captures such changes, the estimated impact of liberalization on investment may still be overstated.

6.2. Reverse causality

The evidence in Table 8 demonstrates that the effect of stock market liberalization on investment is reasonably robust to the omitted variable critique, but it does not directly address the concern that causality might literally run in the opposite direction. There are at least two possible stories as to why the direction of causation might be reversed. First, governments might liberalize their countries' stock markets in response to abnormally high investment demand in previous years. Second, policymakers might liberalize their countries' stock markets in anticipation of positive future shocks to the marginal productivity of capital. In the absence of suitable instrumental variables for stock market liberalization, timing evidence is used to evaluate the plausibility of these two stories.

If past investment booms cause stock market liberalizations, then we should see liberalizations following surges in private investment. The evidence presented in Fig. 1 is not consistent with this first story of reverse causality. Fig. 1 is, however, consistent with the second story of reverse causality. Suppose that

policymakers liberalize their stock markets because they correctly anticipate that the marginal productivity of capital will be higher in the future. In this case, the growth rate of private investment will rise following stock market liberalization, but the liberalizations clearly do not cause the increase. The future increase in the marginal productivity of capital causes both the liberalization and the investment boom.

The fact that we cannot rule out reverse causality calls for a measured interpretation of the evidence in Table 8. This sample is somewhat special, because the universe of developing countries that liberalized their stock markets did so after beginning the process of economic reform, and at a time of relatively low real world interest rates. Suppose, at some point in the future a developing country were to liberalize its stock market before implementing other reforms, at a time when the world cost of capital is relatively high. In that case, it is not clear that the liberalizing country would see investment effects on the same order of magnitude as the countries in this sample.

The general implication, then, is not that stock market liberalizations cause investment booms. Rather, the following seems like a more reasonable summary of the evidence. In environments where the marginal product of capital is high and the domestic cost of capital exceeds the world cost of capital, theory predicts that capital account liberalization can lead to large increases in investment. The data presented here are consistent with this prediction.

7. Conclusion

This paper demonstrates that the developing countries in this sample experienced abnormally high growth rates of private investment after liberalizing their stock markets. Because it is possible that exogenous decreases in the world cost of capital and expected shocks to the future marginal productivity of domestic capital could cause both the investment booms and the liberalizations, we cannot necessarily conclude that stock market liberalizations cause investment booms. Nevertheless, the evidence presented here is relevant for the debate on whether or not capital account liberalization has any effect on real investment.

Previous papers tested the hypothesis that capital account liberalization has permanent effects on investment, and found no supporting evidence. However, standard models predict that capital account liberalization will cause a temporary increase in the growth rate of investment. This paper uses event study techniques to examine whether the data are consistent with this theoretical prediction. The fact that stock market liberalizations are consistently followed by a temporary increase in the growth rate of real private investment that cannot be explained by world business cycle effects, contemporaneous economic reforms, or domestic aggregate demand conditions suggests that capital account liberalization may matter for investment after all.

References

- Agénor, P.-R., Montiel, P., 1996. *Development Macroeconomics*. Princeton University Press, Princeton, NJ.
- Ahimud, Y., Mendelson, H., 1986. Asset pricing and the bid-ask spread. *Journal of Financial Economics* 17, 223–249.
- Ahimud, Y., Mendelson, H., Lauterbach, B., 1997. Market microstructure and securities values: evidence from the Tel Aviv Stock Exchange. *Journal of Financial Economics* 45, 365–390.
- Barro, R.J., 1990. The stock market and investment. *Review of Financial Studies* 3, 115–131.
- Bekaert, G., Harvey, C., 2000. Foreign speculators and emerging equity markets. *Journal of Finance* 55, 565–613.
- Blanchard, O.J., Rhee, C., Summers, L., 1993. The stock market, profit, and investment. *Quarterly Journal of Economics* 108, 115–136.
- Cohen, D., 1993. Low investment and large LDC debt in the 1980s. *American Economic Review* 83, 437–449.
- Collins, S.M., Bosworth, B.P., 1996. Economic growth in East Asia: accumulation versus assimilation. *Brookings Papers on Economic Activity* 2, 135–203.
- Economist Intelligence Unit, various years. *Quarterly economic reports*. London, U.K.
- Errunza, V., Miller, D.P. 1998. Market segmentation and the cost of capital in international equity markets. Unpublished working paper. McGill University and Texas A&M University.
- Fischer, S., 1991. Growth, macroeconomics, and development. *NBER Macroeconomics Annual* 6, 329–364.
- Fischer, S., Merton, R., 1984. Macroeconomics and finance: the role of the stock market. *Carnegie Rochester Conference Series on Public Policy* 21, 57–108.
- Henry, P.B., 1999. Appendix of major policy changes in selected developing countries. Unpublished mimeo. Stanford University Graduate School of Business.
- Henry, P.B., 2000. Stock market liberalization, economic reform, and emerging market equity prices. *Journal of Finance* 55, 529–564.
- International Monetary Fund, 1987. *Annual Report on Exchange Arrangements and Exchange Restrictions*, various issues, Washington, DC. p. 557.
- Kim, J., Lau, L.J., 1994. The sources of economic growth of the East Asian newly industrialized economies. 8, 235–271.
- Kim, E.H., Singal, V., 2000. Stock market openings: experience of emerging economies. *Journal of Business* 73, 25–66.
- Kraay, A., 1998. In search of the macroeconomic effects of capital account liberalization. Working paper. The World Bank, Washington, DC.
- Krugman, P., 1989. Financing versus forgiving a debt overhang. *Journal of Development Economics* 29, 253–268.
- Levine, R., Zervos, S., 1994. Capital control liberalization and stock market development: data annex of country policy changes. Unpublished mimeo. The World Bank, Washington, DC.
- Levine, R., Zervos, S., 1998a. Stock markets, banks, and economic growth. *American Economic Review* 88, 537–558.
- Levine, R., Zervos, S., 1998b. Capital control liberalization and stock market development. *World Development* 26, 1169–1183.
- Morck, R., Shleifer, A., Vishny, R., 1990. The stock market and investment: is the market a sideshow? *Brookings Papers on Economic Activity* 2, 157–215.
- Obstfeld, M., 1994. Risk-taking, global diversification, and growth. *American Economic Review* 84, 1310–1329.
- Obstfeld, M., 1998. The global capital market: benefactor or menace? *Journal of Economic Perspectives* 12, 9–30.

- Park, K., Van Agtmael, A.W., 1993. *The World's Emerging Stock Markets: Structure, Development, Regulations and Opportunities*. Probus Publishing Company, Chicago, IL.
- Price, M.M., 1994. *Emerging Stock Markets*. McGraw Hill, Inc, New York.
- Rama, R., 1993. Empirical investment equations for developing countries. In: Servén, L., Solimano, A. (Eds.), *Striving for Growth after Adjustment: The Role of Capital Formation*. The World Bank, Washington, DC, pp. 107–143.
- Rodrik, D., 1998. Who needs capital account convertibility? *Princeton Essays in International Finance* 207, 55–65.
- Rogoff, K., 1999. International institutions for reducing global financial instability. *Journal of Economic Perspectives* 13, 21–42.
- Sachs, J., 1989. The debt overhang of developing countries. In: Calvo, G., Findlay, R., Kouri, P., Braga de Macedo, J. (Eds.), *Debt, Stabilization, and Development: Essays in Honor of Carlos Diaz Alejandro*. Basil Blackwell, Oxford, pp. 80–102.
- Solow, R.M., 1956. A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70, 65–94.
- Stein, J.C., 1996. Rational capital budgeting in an irrational world. *Journal of Business* 69, 429–455.
- Stiglitz, J., 1999. Reforming the global economic architecture: lessons from recent crises. *Journal of Finance* 54, 1508–1521.
- Stulz, R.M., 1995. International portfolio choice and asset pricing: an integrative survey. In: Maximovic, V., Ziemba, W. (Eds.), *The Handbook of Modern Finance*. North-Holland, Amsterdam, pp. 201–223.
- Stulz, R.M., 1999a. International portfolio flows and security markets. Unpublished Working Paper No. 99-3. Dice Center for Financial Economics, The Ohio State University, Columbus, OH.
- Stulz, R.M., 1999b. Globalization, corporate finance, and the cost of capital. *Journal of Applied Corporate Finance* 12, 8–25.
- Tesar, L.L., 1995. Evaluating the gains from international risk sharing. *Carnegie Rochester Series on Public Policy* 42, 95–143.
- Tesar, L.L., Werner, I.M., 1998. The internationalization of securities markets since the 1987 crash. In: Litan, R.E., Santomero, A.M. (Eds.), *Brookings-Wharton Papers on Financial Services*, Brookings. Institution Press, pp. 281–372.
- Tobin, J., Brainard, W.C., 1977. Asset markets and the cost of capital. In: Balassa, B., Nelson, R. (Eds.), *Economic Progress, Private Values, and Public Policy*. North-Holland, Amsterdam, pp. 235–262.
- Warner, A., 1992. Did the debt crisis cause the investment crisis? *Quarterly Journal of Economics* 107, 1161–1186.
- Williamson, J., Mahar, M., 1998. A survey of financial liberalization. *Princeton Essays in International Finance* 211, 1–70.
- Young, A., 1995. The tyranny of numbers: confronting the statistical realities of the East Asian growth experience. *Quarterly Journal of Economics* 110, 641–680.