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## Working Paper

# The Decline of Investment in East Asia since the Asian Financial Crisis: An Overview and Empirical Examination

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## ADB Economics Working Paper Series



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Donghyun Park, Kwanho Shin, and Juthathip Jongwanich  
No. 187 | December 2009





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**Donghyun Park, Kwanho Shin, and Juthathip Jongwanich**  
December 2009

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## **Abstract**

A key legacy of the Asian financial crisis of 1997–1998 is a sustained drop-off in the investment rates of East Asian countries that were hardest hit by the crisis. We first review the stylized facts of investment in those countries, and then explore and evaluate the various possible explanations for the decline in investment. In our empirical analysis, which expands upon Park and Shin (2009) by updating the data to include 2005–2008, we investigate the extent to which the investment rates of Asian countries can be explained by the underlying fundamental determinants of investment such as gross domestic product (GDP) growth and demographic variables. We also empirically revisit the various hypotheses put forth to explain the investment drop-off, in particular competitive pressures from the People's Republic of China and heightened risk and uncertainty. Our analysis yields two main findings: (i) some evidence of overinvestment in the precrisis period but (ii) very little evidence of underinvestment in the postcrisis period. The results suggest that investment rates are currently more or less at appropriate levels despite their postcrisis decline. The salient policy implication is that quantitatively boosting investment may be less important for future growth than enhancing the investment climate.





## I. Introduction

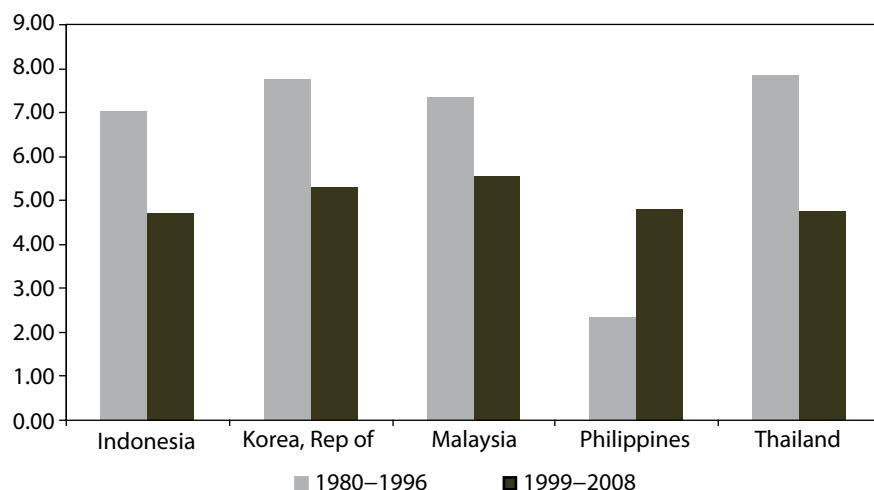
The Asian financial crisis of 1997–1998 had a devastating economic and social impact on the high-flying economies of East Asia. The crisis abruptly halted the East Asian miracle, which had transformed the region from a group of poor, stagnant developing countries into the most dynamic component of the global economy. Although East Asia as a whole was affected by the crisis, some countries were hit harder than others. In particular, Indonesia, Republic of Korea (henceforth Korea), Malaysia, Philippines, and Thailand were generally perceived to be the five countries that bore the full brunt of the crisis. With the exception of the Philippines, in the precrisis period all the crisis countries had experienced sustained rapid growth that elevated per capita incomes and sharply reduced the incidence of poverty. Korea was a first-wave newly industrialized economy (NIE) that directly followed in the footsteps of Japan in successfully pursuing export-oriented industrialization, while Indonesia, Malaysia, and Thailand comprised the second-wave NIEs.

While the crisis was short-lived and East Asia defied gloomy predictions to achieve a V-shaped recovery, it shook to the foundation the collective self-confidence of a region where rapid growth, rising prosperity, and ebbing poverty had become the norm. The enduring impact of the Asian crisis is by no means confined to the psychological sphere. At a more fundamental level, the region had suffered a tangible loss of economic dynamism since the crisis. Although East and Southeast Asia continue to grow faster than other parts of the world, growth has tapered off in the crisis countries in the postcrisis period (Figure 1). Average annual real gross domestic product (GDP) growth fell by over 50% in Indonesia and Thailand and by over 40% in Korea and Malaysia. The only exception to this trend is the Philippines, which was not a part of the East Asian miracle. Korea has arguably reached per capita income levels of a mature rich economy typically experiencing slower growth, but the slowdown of Indonesia, Malaysia, and Thailand is more difficult to explain.

A number of explanations have been put forth for the postcrisis slowdown of East Asia. One explanation is growing competitive pressures from the fast-rising People's Republic of China (PRC). In particular, the PRC's comparative advantage as an exporter of manufactured goods may be jeopardizing the region's export-led growth. However, there is no clear-cut evidence of competitive pressures from the PRC having intensified in the postcrisis period. Furthermore, this explanation ignores the fact that the rise of the PRC not only presents challenges for the region but also opportunities—e.g., a potentially huge market—which can raise rather than lower growth. Another explanation

is that the very rapid growth of the precrisis period was unsustainable in the sense that it was accompanied by serious imbalances that eventually culminated in the Asian crisis. While this explanation is quite plausible for the gap in the GDP growth rate between the immediate precrisis period and the postcrisis period, it is much less convincing for the gap between the longer precrisis period and the postcrisis period.

**Figure 1: Average Annual Real GDP Growth, 1980–1996 and 1999–2008, Selected Asian Countries (percent)**



Source: World Bank, World Development Indicators online database, downloaded 12 November 2009.

Another explanation for East Asia's postcrisis decline in GDP growth is a key stylized fact of the region's postcrisis economic landscape—a sustained decline in its investment rate. The East Asian miracle was driven by a constellation of sound policies, e.g., prudent monetary and fiscal policy that led to macroeconomic stability; and favorable structural shifts, e.g., demographic dividend from a bulge in the share of the working-age population. One defining feature of the region's growth-friendly constellation of policies and structural conditions in the precrisis period has been its high savings and high investment rates. Relative to other parts of the developing world, the region saved more and invested more in future productive capacity. By enabling the region to rapidly build up its physical capital stock, high investment powered its export-oriented industrialization. Inasmuch as the region's precrisis growth was fueled by investment, the persistent failure of the investment rate to recover to its precrisis levels is, in principle, a viable explanation for the postcrisis GDP deceleration.

In the context of Asia's current account surplus, Park and Shin (2009) find that underlying fundamental determinants such as GDP growth and demographic variables account for much of Asia's saving and investment. They also find stronger evidence of oversaving than underinvestment in the region after the 1997 crisis. We expand upon Park and

Shin (2009) by updating the data up to 2008 to allow for a more accurate analysis of investment in the postcrisis period. More fundamentally, this paper focuses on Asia's postcrisis investment decline whereas Park and Shin (2009) looked primarily at the region's current account surplus. This paper has three central objectives: (i) to provide an overview of the investment decline in the crisis-hit countries; (ii) to empirically investigate the extent to which the investment decline can be explained by precrisis overinvestment, postcrisis underinvestment, or other factors such as competition from the PRC; and (iii) to draw relevant policy implications from our main empirical findings.

The overview consists of reviewing the stylized facts of investment in East Asia as well as exploring and critically assessing the various possible explanations for the decline in investment. The overview will give the reader a better understanding of the actual trends in investment, along with why investment may have declined. The empirical analysis will shed light on the fundamental question of whether the postcrisis investment decline reflects precrisis overinvestment, postcrisis underinvestment, or some other causes. To the extent that the fundamentals can largely explain investment, it is less likely that the region suffers from underinvestment. On the other hand, actual investment that is substantially less than the levels predicted by fundamentals could be construed as evidence of underinvestment. We also empirically revisit the various hypotheses put forth to explain the investment drop-off in the postcrisis period. Finally, this paper evaluates whether or not policymakers should be concerned about the decline.

The rest of this paper is organized as follows. Section II takes a look at the actual trends in investment rates in Asian countries during 1965–2008. Section III critically reviews the various explanations put forth for the postcrisis investment slowdown. Section IV outlines the data and empirical model used in this paper for exploring the determinants of investment in Asia. The model is that of Park and Shin (2009), which builds upon Bosworth and Chodorow-Reich (2007). Section V reports and discusses the main findings of our empirical analysis. Section VI examines the central messages of the paper along with their implications for Asian policymakers.

## **II. Stylized Facts of Investment in Asia**

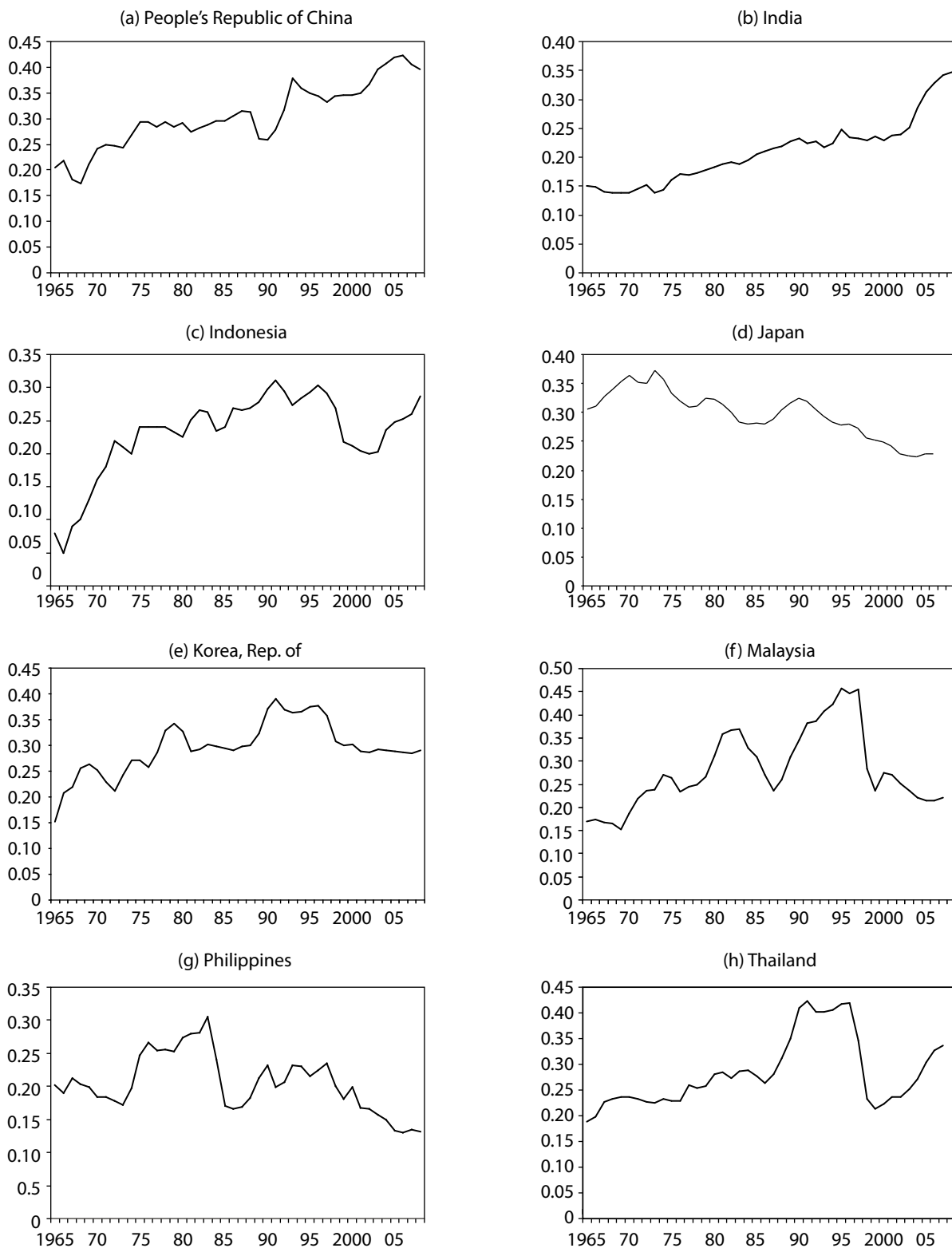
The law of diminishing returns implies that marginal returns to capital are higher in poor countries with limited stock of physical capital than in capital-abundant rich countries. Therefore, investment is an especially important driver of economic growth in poor countries, and the experience of East Asia is a case in point. High investment rates have been a hallmark structural characteristic of East Asian economies prior to the Asian crisis. For the most part, the high investment rates have been financed by high domestic savings rates. High savings and investment rates are measurable and unique features of the region that distinguish it from other developing regions, and comprise core ingredients

of the East Asian miracle. High investment rates led to a rapid accumulation of physical capital and catalyzed the reallocation of resources from subsistence agriculture to export-oriented manufacturing. This brought about a large expansion of productive capacity in a short period of time, and thus enabled the miracle economies to grow faster than their counterparts in Eastern Europe, South Asia, Latin America, Middle East, and Africa. The PRC has also followed in the footsteps of the miracle economies in growing rapidly by saving a lot and investing a lot.

According to conventional wisdom, the Asian crisis of 1997–1998 has disrupted the traditional high-investment, high-growth paradigm of East Asia. This is because regional economies that were hardest hit by the crisis are believed to have suffered a large and persistent decline in their investment rates. Therefore, of particular interest is the actual pattern of investment in the crisis countries during the precrisis versus postcrisis period. This will help us verify the extent to which data support the conventional wisdom of investment drop-off. For example, it is conceivable that investment rates have gradually bounced back to their precrisis levels. Furthermore, given the heterogeneity of the five crisis countries—from rich and mature Korea, to upper middle-income Malaysia, to underperforming Philippines—there is no reason why their investment behavior should be identical. In particular, the size of the decline may have been bigger in some countries than others. At any rate, looking at the actual data is the logical point of departure for any meaningful discussion of the decline.

Broadly speaking, the investment data for 1965–2008 confirm the conventional wisdom of a fall in the investment rate of all five crisis countries in the postcrisis period (Figure 2). With the exception of the Philippines, the crisis countries experienced a secular increase in the investment rate from 1965 up to the Asian crisis. In all five countries, investment rates still remain lower in 2007–2008 than the investment rate peaks of 1996–1997 although the gap between the two differs across countries. More generally, the exact behavior of the investment rate in the postcrisis period differs substantially from country to country. In the case of Korea, after dropping from 37.6% in 1996 to 30.8% in 1998, the investment rate has remained more or less stable around 30% since then. In the case of Indonesia, the investment rate fell from 30.4% in 1996 to 21.7% in 1999 but has since steadily recovered, reaching 28.7% by 2008. Therefore, in terms of investment rate, Indonesia has regained most of the ground lost during the Asian crisis even though it suffered the biggest contraction of output. Malaysia suffered a precipitous decline in the investment rate, from 45.6% in 1999 to 22.1% by 2004, and has remained around that level since then. Thailand's investment rate suffered a similar collapse, from 42.0% in 1996 to 21.4% in 1999 but in contrast to Malaysia, has steadily recovered since then, up to more than 33%. In the case of the Philippines, the investment rate has declined on a secular basis, from 23.4% in 1997 to a little over 13%.

**Figure 2: Investment Rate of Selected Asian Countries, 1965–2008**



Source: World Bank, World Development Indicators online database, downloaded 12 November 2009.

The overall pattern of investment rates in the crisis countries supports the notion that there has been at least some overinvestment during the precrisis period. Investment rates speeded up in the immediate precrisis period but fell back after the crisis. To the extent that the precrisis acceleration reflected overinvestment rather than higher long-run equilibrium investment rates, the postcrisis dropoff represents a desirable correction toward more sustainable investment rates. However, if the investment rate overcorrected, then we have underinvestment in the postcrisis period and there is much greater cause for concern among policymakers. In this case, however, the more relevant question is not so much why investment rates fell in the immediate postcrisis period but why they have remained too low for over a decade after the crisis. The collapse of business confidence, in conjunction with severely curtailed access to credit and a general deterioration of the business environment, can explain the decline of investment during the peak of the crisis but cannot explain an extended decline.

For comparative purposes, we also look at the investment behavior of the PRC, India, and Japan during 1965–2008. In striking contrast to the crisis countries, the PRC experienced a secular increase in its investment rate in the postcrisis period, from 33.2% in 1997 to almost 40% by 2008. This trend is consistent with the conventional wisdom that the PRC's remarkably rapid growth is to a large extent driven by rapid accumulation of physical capital. Unlike the crisis countries, the bigger risk for the PRC seems to be overinvestment rather than underinvestment. India's investment behavior also broadly follows the PRC's pattern, with investment rate continuing to rise throughout the postcrisis period. Quite interestingly and in sharp contrast to the crisis countries, there has been a marked acceleration of the investment rate since the Asian crisis, from 23.2% in 1997 to around 35%. India's investment acceleration closely parallels the acceleration of its economic growth. In the case of Japan, since the early 1970s, there is a more or less a continuous decline in the investment rate, with a temporary rise in the late 1980s prior to the bursting of the asset price bubble in the early 1990s. The investment rate has continued to fall since the Asian crisis but this is part of a longer structural trend that reflects Japan's maturing as a rich industrialized country.

### **III. Why Has Investment Declined?**

In the previous section, it was seen that the data confirm the conventional wisdom of a persistent decline in the investment rate of the crisis countries in the postcrisis period even though the precise trajectory of postcrisis investment behavior differs across countries. In this section, we draw from the existing literature to explore some potential explanations for the investment decline. The existing literature has thrown up a number of possible answers for the puzzle of why investment has dropped off on a sustained basis since the Asian crisis, and those possible answers are critically reviewed in this section.

Four major explanations have been proposed for the broad-based weakness of investment in the region since the 1997 crisis. According to one set of explanations, the weakness has been the result of lingering effects from the 1997 crisis (Chinn and Ito 2005, Eichengreen 2006). For example, the extensive restructuring of nonfinancial firms in the wake of the crisis inevitably entailed a period of weaker investment (ADB 2007). Furthermore, the efforts of banks to strengthen their balance sheets may have reduced the flow of credit to firms. It is also possible that the excess manufacturing capacity created by very high precrisis investment rates are blunting incentives for new investment. While these factors may have weakened investment in the immediate postcrisis period, they are much less plausible as explanations for the decade-long persistence of weak investment. A number of in-depth studies including Chinn and Ito (2005) and Eichengreen (2006) confirm that lingering crisis effects cannot explain the persistence of weak investment.

A second set of explanations revolve around the rise of the PRC and competitive pressures emanating from the PRC (IMF 2006, Wong and Adams 2002). The underlying idea is that investment in the PRC will displace investment in other parts of the region. Intuitively, however, there is no reason why increased investment in the PRC has to come at the expense of reduced investment elsewhere in the region. The displacement hypothesis is more plausible when it comes to foreign direct investment (FDI) inflows, which is an important component of investment in the region. For example, a big multinational company in the United States (US) may locate its production facility in the PRC rather than elsewhere in the region. However, FDI into the PRC and FDI into other parts of Asia can be complements as well as substitutes, especially in light of extensive vertical specialization in the region in which countries export parts and components to the PRC, which then assembles them into final goods and exports them to the US and other markets. Foreign investors may choose to locate different stages of production in different countries in the region. Under this scenario, FDI into the PRC can have a positive effect on FDI into other regional countries. In fact, a number of studies find evidence of such a complementary relationship (see, for example, Eichengreen and Tong 2006, McKibbin and Woo 2003).

A third explanation revolves around heightened risk and uncertainty since the 1997 crisis (IMF 2006 and 2005a, ADB 2007). The underlying idea is that the 1997 crisis alerted domestic and foreign investors to the substantial risks and uncertainties in the region's investment environment. One major cause for skepticism about this explanation is that by most measures macroeconomic and financial risk in the region has been relatively low in recent years. In particular, restructuring and reform undertaken by governments and private sectors across the region in the postcrisis period would have had the effect of reducing rather than raising the level of risk. Nevertheless, the severe impact of the Asian crisis may have made firms more sensitive to low-probability, catastrophic-outcome tail-end risks. For example, throughout the region, nonfinancial firms have built up large liquidity cushions in recent years, as a form of precautionary insurance against such



risks. Overall, the heightened risk explanation remains at best a tentative hypothesis unsupported by empirical evidence.

Finally, it is possible that the weakness of investment in the postcrisis period reflects shortcomings in the investment climate in the region (World Bank 2007). It is true that serious concerns about the investment climate persist in some Asian countries, as evident, for example, in surveys of companies that reveal substantial shortcomings in the business environment. However, the relevant issue is not whether there are deep-seated constraints to private sector investment but whether those constraints have become noticeably more severe since the Asian crisis. There is no compelling evidence of a systematic across-the-board deterioration in the region's investment climate that can account for the postcrisis decline in investment. In fact, well before the crisis, the region suffered from a wide range of structural impediments, such as extensive government-business ties and underdeveloped financial systems. If anything, the structural reforms undertaken by the crisis-hit countries in the wake of the crisis should have improved the investment climate. For example, in Korea greater openness toward foreign investors has brought about a sharp increase in FDI inflows in the postcrisis period.

At a broader level, the question of why the region has experienced a persistent weakness of investment for more than a decade after the Asian crisis remains a puzzle for which there seems to be no satisfactory answers. Some of the answers address the issue of why investment dropped in the immediate postcrisis period but cannot account for why investment has failed to recover after such a long period of time. In particular, the effects of the Asian crisis may have lingered for 1 or 2 years after the crisis but it is implausible to attribute the current weakness of investment to a crisis, devastating as it was, which occurred in 1997–1998. Growing competition from the PRC is a popular explanation based on a stylized fact—the emergence of the PRC as a globally significant economic power—but ultimately unsupported by the evidence. The fact that the crisis catalyzed extensive structural reforms throughout the region adds further to the puzzle. In principle, those reforms should have reduced the macroeconomic and financial risks facing private investors and, more generally, created a more conducive environment for investment. In short, the various explanations for the postcrisis investment decline fail to convince, individually and collectively.

## **IV. Is There Underinvestment? Data and Empirical Framework**

The puzzling issue of why investment has declined in the postcrisis period is secondary to the more fundamental issue of whether or not the decline reflects underinvestment in the region. As noted earlier, it is possible that the decline is the result of a return to more

sustainable investment rates from overinvestment in the precrisis period. On the other hand, investment may have declined excessively to below their steady-state long-run equilibrium levels. The postcrisis investment weakness is of concern to policymakers only if it reflects underinvestment. At a broad level, our empirical methodology for establishing the presence of underinvestment is based on determining the extent to which fundamentals can explain investment rates. There are theoretical reasons why certain economic and demographic variables will influence the level of investment across countries and over time. A gap between the investment rate predicted by fundamentals and actual investment rates can be interpreted very loosely as evidence of underinvestment; very loosely because economic models of investment can only tell us which variables are important determinants of investment but cannot predict the optimal levels of investment.

A large and well-established theoretical literature seeks to formally model the relationship between economic/demographic variables and investment on the other. A corresponding empirical literature has emerged to test how well the various theoretical models can explain actual investment data. The model of investment we test in this paper is that of Park and Shin (2009), which is based on Bosworth and Chodorow-Reich (2007). The empirical analysis of this paper expands upon the analysis of Park and Shin (2009), which used data from 1965–2004, by updating the data to 1965–2008. The updated data that substantially extends the length of the postcrisis period allows us to take a closer look at the key issue of whether there has been underinvestment since the Asian crisis. Our model incorporates explanatory variables that are standard in much of the existing literature (e.g., IMF 2005b), and assumes that investment rates are influenced by three sets of variables: country-specific factors that change over time ( $X_{it}$ ), factors that vary across countries but not over time ( $C_i$ ), and demographic structure of the population ( $P_{it}$ ). We eliminate time-invariant factors that vary across countries ( $C_i$ ) from our empirical analysis by controlling for country-specific effects. The empirical specification is as follows:

$$I_{it} = I(X_{it}, C_i, P_{it}) + v_{it} \quad (1)$$

The growth of per capita output is an important explanatory variable since investment is determined by the growth of the capital stock, which parallels the growth of output in the long run. In the short run, labor input is the main driver of output but in the medium and long run, technological progress and capital accumulation are the main drivers. For relatively poor countries like those of developing Asia, capital accumulation is the main source of growth. In the Solow model, growth is high in poor countries as they catch up with rich economies through capital accumulation. Even in steady state where both technological progress and capital accumulation matter, the growth rate of output is equal to the growth rate of capital if technological progress is labor-augmenting. In the short run, positive demand shocks raise corporate profitability and thus encourage corporate investment. Furthermore, output growth will have a positive effect on investment in the

presence of financial market imperfections that increase the relative importance of internal funds in financing investment. In the long run, output growth is driven by productivity growth which, in turn, is driven by supply-side changes such as technological shocks, improvement in corporate governance, and reallocation of productive factors from low-productivity sectors to high-productivity sectors.

We also include the level of per capita GDP and the square of this variable for the following reason. According to a well-established stylized fact, the relationship between the level of per capita income and investment rate is positive up to a certain income level but negative above that income level. The absence of complementary factors such as macroeconomic stability, human capital, and good governance limit the marginal returns to capital in poor countries. The marginal returns to capital rise as income rises due to an increasing supply of complementary factors, and income begins to catch up with rich countries. However, after the catch-up is complete, diminishing marginal returns to capital begin to set in.

Demographic variables should also influence the investment rate. The demographic structure of a country's population ( $P_{it}$ ) is captured by two dependency rates: aged dependency rate (the ratio of the 65 and above population to the 15–64 population) and youth dependency rate (ratio of the under-15 population to the 15–64 population). Slower growth of the working-age population will slow down economic growth and thus reduce the returns to investment. Investment will consequently fall in the absence of technological progress and other structural changes that raise labor productivity. In the short run, however, it is conceivable that firms will invest more to substitute capital for labor as a means of coping with a growing shortage of workers, in which case higher dependency rates would have a positive effect on investment rate. Finally, we also include the ratio of M2 to nominal GDP as a measure of financial development. Financial development will have a positive effect on investment by facilitating the access of firms to credit. The Appendix provides a description of all the variables used in our empirical analysis, along with their data sources.

## V. Empirical Results

In this section, we report and discuss our main empirical findings. Table 1 shows the estimated relationship between investment rate and economic/demographic variables. The results of Table 1 are based on controlling for the impact of country-specific factors by using fixed-effects estimation, i.e., the analysis looks at the time-series variation of the variables. Our total sample for the investment regression consists of 141 countries, of which 12 countries are from Asia. Our Asian subsample consists of Bangladesh; PRC; Hong Kong, China; India; Indonesia; Republic of Korea; Malaysia; Pakistan; Philippines; Singapore; Sri Lanka; and Thailand. We ran regressions for the whole sample as well as

separate additional regressions for the Asian subsample and the non-Asian subsample for comparative purposes.

**Table 1: Investment Regressions, Country Fixed Effects, and Time Dummies**

	All countries	Asia	All Countries Minus Asia
GDP growth	0.303*** [0.056]	0.535** [0.214]	0.287*** [0.059]
Lagged GDP growth	0.179*** [0.049]	0.364 [0.225]	0.177*** [0.052]
Per capita income	0.193*** [0.057]	0.414*** [0.124]	0.139** [0.065]
Per capita income squared	-0.010*** [0.003]	-0.020*** [0.007]	-0.007* [0.004]
Life expectancy	-0.004 [0.038]	0.270* [0.140]	0.005 [0.039]
Aged dependency	-0.418** [0.167]	-0.171 [0.510]	-0.380** [0.177]
Youth dependency	0.014 [0.029]	-0.128 [0.090]	0.028 [0.030]
Financial development	0.010* [0.006]	-0.024 [0.025]	0.009 [0.006]
Observations	886	89	797
R-squared	0.155	0.609	0.137

\*, \*\*, and \*\*\* denote statistical significance at 10%, 5%, and 1% level, respectively.

GDP = gross domestic product.

Note: GDP growth is real GDP growth rate based on constant local currency. Per capita income is log of real GDP per capita (US\$ in 2005 constant prices: chain series). Life expectancy is obtained from United Nations's projections. Aged dependency rate is the ratio of those aged 65 and over to those aged 15–64. Youth dependency rate is the ratio of those under 15 to those aged 15–64. Financial development is the ratio of M2 to nominal GDP. Numbers in parenthesis represent standard error.

The most noticeable result of Table 1 is the positive and significant impact of current GDP growth on investment rates, for the whole sample as well as the Asian and non-Asian subsamples. Output growth seems to be an important determinant of investment. In addition, lagged GDP growth also has a positive and significant effect on investment for the whole sample and non-Asian subsample. However, for the Asian subsample, lagged output growth is insignificant. The evidence lends strong support to a hump-shaped investment function since the estimated coefficient is positive for per capita income but negative for per capita income squared for the whole sample and the two subsamples. Investment rises with per capita income up to a certain level but then falls as income rises as diminishing returns set in. Aged dependency is negative and significant for the whole sample and non-Asian subsample but is insignificant for the Asian subsample. Finally, financial development is positive and significant for the whole sample but insignificant for the Asian subsample.

Two countries that invest heavily throughout the sample period are the PRC and Singapore. This naturally begs the question of whether the exceptionally high investment rates of those two countries are abnormal. One way to answer this question is to gauge the extent to which the investment rates of those countries can be accounted for by the underlying determinants of investment. Table 2 reports the results of this empirical

exercise. The PRC's average investment rate over the entire sample period is 33.2%. Countries/periods that have approximately the same level of per capita GDP as the PRC are defined to be "Others". Their average investment rate is 20.9%. Therefore, the PRC invests 12.3% more than other countries/periods of similar incomes. The table also shows the difference in fundamentals between the PRC and other countries. For example, the PRC grew by 7.9% on average while others grew by 1.6% on average. Multiplying the estimated GDP growth coefficient of 0.517 and the difference in average growth rate gives us 3.3%. This implies that the PRC's higher GDP growth rate can explain 3.3% of the 12.3% difference in investment rate. We repeat the exercise for all other fundamentals. This estimated coefficient of the dummy variable, 5.1%, represents the difference in investment that cannot be explained by the fundamentals.

**Table 2: Investment Rates of Selected Asian Countries: Explained versus Nonexplained Parts (percent)**

$$\text{Investment}_t = -0.395 + [0.517 * \text{GGDP}_t] + [0.314 * \text{GGDP}_{t-1}] + [0.121 * \text{PCGGDP}_t] - [0.007 * \text{GGDP}_t^2] + [0.006 * \text{Life}_t] - [0.141 * \text{Aged}_t] - [0.019 * \text{Youth}_t] + [0.022 * \text{FD}_t]$$

China, People's Rep. of								
	Actual Investment	GDP Growth	Lag GDP Growth	Youth Dependency	Aged Dependency	Life Expectancy	Financial Development	Country Dummy
PRC	33.2	7.9	6.6	44.8	9.1	4.2	4.3	5.10
Others	20.9	1.6	1.2	74.5	7.2	4.1	3.3	0.00
Difference	12.3	3.3	1.7	0.6	-0.3	0.1	2.1	5.10

Singapore								
	Actual Investment	GDP Growth	Lag GDP Growth	Youth Dependency	Aged Dependency	Life Expectancy	Financial Development	Country Dummy
Singapore	34.5	5.2	5.1	36.7	8.6	4.3	4.4	7.13
Others	23.5	2.5	1.9	47.5	12.6	4.3	3.8	0.00
Difference	11.0	1.4	1.0	0.2	0.6	0.0	1.3	7.13

Note: The top half of the table reports the estimated equation of the investment rate using the whole sample. This equation is equivalent to the first column in Table 3. For each country, we selected countries/periods that have approximately the same level of per capita GDP and define them to be "Others". For each country, in the first row, we report the average of an investment determinant, e.g., GDP growth, for that country. In the second row, we do the same for "Others". In the third row, we report the difference in investment rate between the country and "Others" that is explained by the difference in the savings determinant. For example, 3.3% of the 12.3% difference in investment rate between the PRC and "Others" is accounted for by the difference in GDP growth between the PRC and "Others".

Table 3 reports the results from a random-effects estimation of the investment equation that controls for time effects. This estimation looks at the variation of the variables across countries. Such time fixed effects regressions allow us to cross-check the country fixed effects regressions in Table 1. To capture the effect of the Asian crisis, we include an Asian crisis country dummy variable for the five hardest-hit crisis countries, Indonesia, Korea, Malaysia, Philippines, and Thailand. To track the behavior of investment in the crisis countries during different subperiods, e.g., 1990–1996, an additional Asian crisis country dummy variable for each subperiod is also included. Of particular interest is the crisis subperiod 1997–1999 and the immediate precrisis and postcrisis subperiods.

**Table 3: Investment Regressions, Asia-Crisis Country Dummies, and Time Dummies**

	All Countries	Asia Crisis Country Dummy	Asia Crisis Subperiod Dummy
GDP growth	0.517*** [0.064]	0.511*** [0.064]	0.507*** [0.064]
Lagged GDP growth	0.314*** [0.055]	0.309*** [0.055]	0.301*** [0.055]
Per capita income	0.121*** [0.030]	0.117*** [0.030]	0.115*** [0.030]
Per Capita income squared	-0.007*** [0.002]	-0.006*** [0.002]	-0.006*** [0.002]
Life expectancy	0.006 [0.025]	0.006 [0.025]	0.008 [0.025]
Aged dependency	-0.141** [0.059]	-0.124** [0.060]	-0.119** [0.060]
Youth dependency	-0.019 [0.020]	-0.015 [0.021]	-0.012 [0.021]
Financial development	0.022*** [0.004]	0.022*** [0.004]	0.021*** [0.004]
Asia crisis country dummy		0.014 [0.011]	
Asia crisis country dummy 1965–1969			0 [0.000]
Asia crisis country dummy 1970–1974			-0.009 [0.029]
Asia crisis country dummy 1975–1979			-0.005 [0.029]
Asia crisis country dummy 1980–1984			0.031 [0.029]
Asia crisis country dummy 1985–1989			0.015 [0.029]
Asia crisis country dummy 1990–1996			0.074*** [0.029]
Asia crisis country dummy 1997–1999			0.028 [0.029]
Asia crisis country dummy 2000–2004			-0.001 [0.028]
Asia crisis country dummy 2005–2008			-0.017 [0.028]
Observations	886	886	886
R-squared	0.261	0.263	0.269

Note: Asia crisis dummy is a dummy that takes the value of 1 if a country is one of the five crisis countries: Indonesia, Korea, Malaysia, Philippines, and Thailand, and zero otherwise. Asia crisis dummy for a subperiod, e.g., 1990–1996, takes the value of 1 if a country is a crisis country and the observation is from that subperiod, e.g., 1990–1996. See Table 1 for the definition of other variables.

The most striking result is the positive and highly significant effect of current GDP growth and lagged GDP growth on investment. This effect is evident for the whole sample as well as the Asian and non-Asian subsamples. GDP growth seems to be one of the most important determinants of investment rates across countries. The result echoes and lends credibility to the results of the country fixed effects regressions in Table 1. The estimated

coefficients of per capita income and per capita income squared support a hump-shaped investment function in which investment initially rises with income but subsequently falls with income. Aged dependency has a negative and significant effect on the investment rate for the whole sample and both subsamples. On the other hand, youth dependency is insignificant in all cases. In accordance with economic intuition, financial development has a positive and significant impact on investment for the whole sample as well as the two subsamples.

The estimated coefficient of the Asian crisis dummy indicates that on average the investment rate of the five crisis countries is only 1.4% higher than would be expected of countries with their characteristics. Moreover, the Asian crisis dummy is insignificant. Turning to the subperiod dummies, significantly and interestingly, the estimated coefficients are positive and significant only during the immediate precrisis period of 1990–1996. During this period, the investment rate of the crisis countries is 7.4% higher than would be expected of countries with their characteristics. The fundamental determinants of investment thus do a poor job of accounting for the region's precrisis investment boom. This provides some empirical support for the popular view that the region suffered from a serious bout of overinvestment. Another significant finding is the insignificance of the postcrisis subperiod dummies, which can be interpreted as evidence against the view that the crisis countries suffer from underinvestment in the postcrisis period.

The evidence in Table 3 lends greater support to the precrisis overinvestment hypothesis than the postcrisis underinvestment hypothesis. To investigate possible differences in the investment behavior across the five crisis countries, we include country-specific dummies. In addition, we include a subperiod for each country dummy to check for differences in a country's investment behavior over time. Table 4 reports the results of running the regressions with the country-specific dummies. The most noticeable result is the positive and significant estimated coefficients for Malaysia and Thailand in the immediate precrisis period of 1990–1996. In contrast, the country dummies for Indonesia, Korea, and Philippines are insignificant. To investigate the possibility that this result is due to a limited number of observations, we try combinations among the three countries, but the results do not change. This suggests that Malaysia and Thailand may have experienced greater overinvestment in the precrisis period than Indonesia, Korea, and Philippines. Equally significantly, with the exception of the Philippines during 2004–2008, the results are not supportive of underinvestment in the postcrisis period.

**Table 4: Investment Regressions with Individual Crisis Country Dummies**

	Indonesia	Malaysia	Korea	Philippines	Thailand	Indonesia+ Korea	Indonesia+ Korea+ Philippines
GDP growth	0.519*** [0.064]	0.510*** [0.064]	0.514*** [0.064]	0.519*** [0.064]	0.513*** [0.064]	0.517*** [0.064]	0.516*** [0.064]
Lagged GDP growth	0.312*** [0.055]	0.313*** [0.055]	0.307*** [0.055]	0.313*** [0.055]	0.310*** [0.055]	0.306*** [0.055]	0.308*** [0.055]
Per capita income	0.119*** [0.030]	0.120*** [0.030]	0.121*** [0.030]	0.122*** [0.030]	0.118*** [0.030]	0.118*** [0.030]	0.119*** [0.030]
Per capita income squared	-0.007*** [0.002]	-0.007*** [0.002]	-0.007*** [0.002]	-0.007*** [0.002]	-0.007*** [0.002]	-0.007*** [0.002]	-0.007*** [0.002]
Life expectancy	0.007 [0.025]	0.007 [0.025]	0.007 [0.025]	0.009 [0.025]	0.009 [0.025]	0.008 [0.025]	0.007 [0.025]
Aged dependency	-0.137** [0.059]	-0.138** [0.059]	-0.125** [0.059]	-0.147** [0.059]	-0.132** [0.059]	-0.122** [0.060]	-0.132** [0.060]
Youth dependency	-0.017 [0.021]	-0.019 [0.020]	-0.014 [0.021]	-0.019 [0.020]	-0.015 [0.021]	-0.012 [0.021]	-0.016 [0.021]
Financial development	0.022*** [0.004]	0.022*** [0.004]	0.022*** [0.004]	0.022*** [0.004]	0.021*** [0.004]	0.022*** [0.004]	0.022*** [0.004]
Country 1965–1969 dummy	0 [0.000]	0 [0.000]	0 [0.000]	0 [0.000]	0 [0.000]	0 [0.000]	0 [0.000]
Country 1970–1974 dummy	-0.006 [0.063]	-0.022 [0.063]	-0.008 [0.063]	-0.018 [0.063]	0.008 [0.063]	-0.007 [0.045]	-0.011 [0.037]
Country 1975–1979 dummy	-0.004 [0.063]	-0.04 [0.063]	0.013 [0.063]	0.019 [0.062]	-0.017 [0.063]	0.005 [0.045]	0.01 [0.037]
Country 1980–1984 dummy	0.009 [0.063]	0.056 [0.063]	0.023 [0.063]	0.045 [0.062]	0.009 [0.063]	0.017 [0.045]	0.026 [0.037]
Country 1985–1989 dummy	0.031 [0.063]	0.006 [0.063]	0.028 [0.063]	-0.024 [0.062]	0.023 [0.063]	0.031 [0.045]	0.012 [0.037]
Country 1990–1996 dummy	0.031 [0.063]	0.120* [0.062]	0.088 [0.063]	-0.003 [0.062]	0.117* [0.063]	0.06 [0.045]	0.039 [0.037]
Country 1997–1999 dummy	0.03 [0.063]	0.045 [0.063]	0.076 [0.063]	-0.034 [0.062]	0.013 [0.063]	0.054 [0.045]	0.024 [0.037]
Country 2000–2004 dummy	-0.006 [0.063]	-0.005 [0.062]	0.059 [0.062]	-0.061 [0.062]	0.004 [0.063]	0.027 [0.044]	-0.003 [0.036]
Country 2005–2008 dummy	0.016 [0.063]	-0.057 [0.062]	0.036 [0.062]	-0.132** [0.062]	0.051 [0.063]	0.027 [0.044]	-0.027 [0.036]
Observations	886	886	886	886	886	886	886
R-squared	0.262	0.266	0.265	0.267	0.265	0.265	0.264

Note: Individual crisis country dummy is a dummy that takes the value of 1 if the observation belongs to a particular crisis country and zero otherwise. For example, Indonesia dummy takes the value of 1 if the observation belongs to Indonesia. Indonesia dummy for a subperiod, e.g., 1990–1996, takes the value of 1 if the observation belongs to Indonesia and the observation is from that subperiod, e.g., 1990–1996. See Table 1 for the definition of other variables.

Another way to look for evidence of underinvestment or overinvestment is to compare a country's actual investment rates with the investment rates predicted by its fundamentals in the random-effects estimation. An actual investment rate exceeding the investment rate fitted by the model can be loosely interpreted as evidence of overinvestment. Conversely, actual investment rate falling short of the fitted value can be loosely interpreted as evidence of underinvestment. For each, we compare the actual investment with the predicted investment over time. The results of this exercise are reported in Figure 3 and in general reconfirm the presence of postcrisis overinvestment and absence of

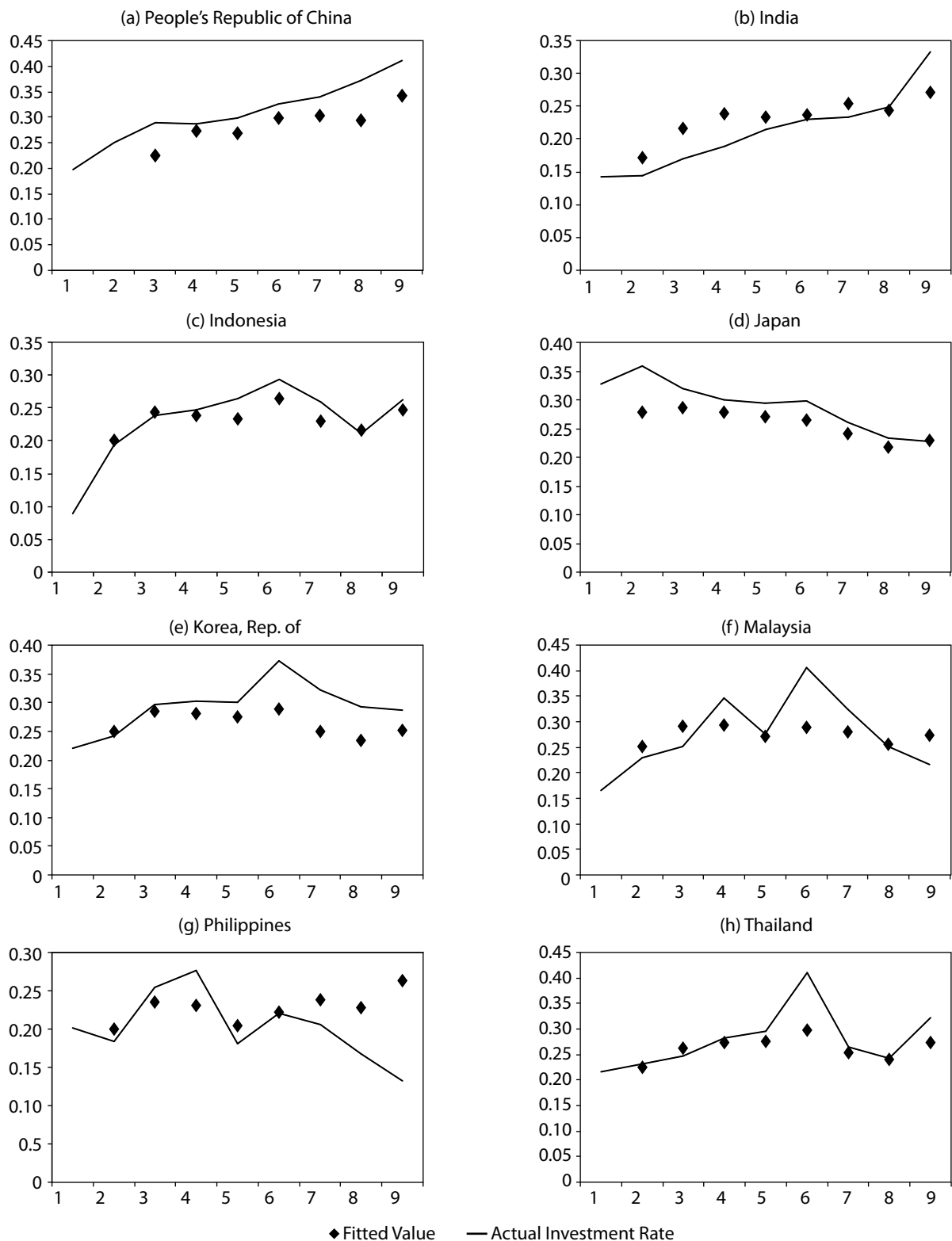


postcrisis underinvestment in the five crisis countries. Only the Philippines shows some evidence of underinvestment in the postcrisis period. If anything, there are signs of postcrisis overinvestment in Indonesia, Korea, and Thailand. In the immediate precrisis period, all countries other than the Philippines show signs of overinvestment although its extent varies across countries. For comparative purposes, we also perform the exercise for PRC, India, and Japan. Quite strikingly, the PRC seems to experience chronic overinvestment whereas India has shifted from chronic underinvestment to overinvestment during 2005–2008. Japan has also experienced chronic overinvestment but in contrast to the PRC, its investment rate is falling throughout the sample period.

In addition to delving into the broader issue of underinvestment, we also empirically revisit the various hypotheses put forth to explain the drop-off in the investment rate, discussed in Section III. The hypotheses include lingering effects of the crisis, competitive pressures from the PRC, heightened risk and uncertainty in the postcrisis period, and shortcomings in the investment climate. While we have already pointed out that none of the explanations are intuitively convincing or supported by existing empirical studies, we perform some empirical analysis of our own to further assess the validity of the proposed hypotheses. In particular, we examine the two issues of (i) whether investment in the PRC has displaced investment in other countries in East Asia and (ii) whether investor perceptions of greater risk and uncertainty since the crisis have pushed down investment.

To gauge the impact of competition from the PRC and heightened risk and uncertainty, we include two additional variables: (i) an interaction term between investment in the PRC and Asia crisis country dummy that captures the impact of the PRC on investment in other countries in the region, and (ii) the standard deviation of monthly exchange rate changes that captures the risk and uncertainty facing investors. A negative and significant interaction term would suggest that investment in the PRC came at the expense of investment in the crisis countries, thus contributing to the decline of investment in the latter. By the same token, a negative and significant standard deviation would indicate that risk and uncertainty have deterred investment in the crisis countries. Table 5 below reports the results of time fixed effects estimation that controls for time effects when we added the two variables. The regression underlying Table 5 is the same as the regression underlying Table 3 except it includes two more variables. The results do not support the PRC hypothesis or the risk/uncertainty hypothesis since both the interaction term and standard deviation are insignificant.

**Figure 3: Actual Investment Rate and Fitted Value in Selected Asian Countries, 1965–2008**



Note: 1 = 1965–1969, 2 = 1970–1974, 3 = 1975–1979, 4 = 1980–1984, 5 = 1985–1989, 6 = 1990–1996, 7 = 1997–1999, 8 = 2000–2004, 9 = 2005–2008.

**Table 5: Impact of the PRC's Investment and Uncertainty: Time Fixed Effects**

<b>Investment Rate</b>	<b>[1]</b>	<b>[2]</b>	<b>[3]</b>
GDP growth	0.508*** [0.066]	0.495*** [0.064]	0.515*** [0.066]
Lagged GDP growth	0.306*** [0.056]	0.298*** [0.055]	0.312*** [0.056]
Per capita income	0.117*** [0.031]	0.120*** [0.030]	0.121*** [0.031]
Per capita income squared	-0.006*** [0.002]	-0.007*** [0.002]	-0.007*** [0.002]
Life expectancy	0.007 [0.026]	0.004 [0.025]	0.008 [0.026]
Aged dependency	-0.113* [0.061]	-0.109* [0.060]	-0.132** [0.060]
Youth dependency	-0.006 [0.021]	-0.009 [0.021]	-0.011 [0.021]
Financial development	0.021*** [0.004]	0.020*** [0.004]	0.021*** [0.004]
PRC investment*Asian crisis country dummy	0.046 [0.033]	0.047 [0.032]	
Standard deviation of exchange rate	0.03 [0.032]		0.031 [0.032]
Observations	869	877	869
R-squared	0.252	0.25	0.25

Note: We add two variables to the regression underlying Table 3: (i) PRC investment  $\times$  Asian crisis country dummy and (ii) standard deviation of monthly exchange rate. See the note in Table 3 for the definition of all other variables.

The coefficients in Table 5 may be biased if the PRC's investment rate is endogenous or there are common drivers behind the investment rate of the PRC and its neighbors. To address this problem, we use an interaction term between the PRC's saving rate and crisis country dummy as an instrumental variable (IV) for the interaction term between the PRC's investment rate and crisis country dummy, and run an IV regression. While there is no perfect IV, the PRC's saving rate is closely correlated with its investment rate, but not much correlated with other countries' investment rates. This makes the PRC's saving rate a good candidate for an IV. The IV regression results, reported in Table 6, echo those of Table 5. Both the interaction term and standard deviation remain insignificant, thus casting doubt on both the PRC and risk/uncertainty hypothesis. Instead our evidence implies that the decline is due to precrisis overinvestment, and the postcrisis drop-off reflects a reversion toward more or less appropriate investment levels rather than underinvestment.

**Table 6: Impact of the PRC's Investment and Uncertainty: IV Regression with Time Fixed Effects**

<b>Investment Rate</b>	<b>[1]</b>	<b>[2]</b>
GDP growth	0.508*** [0.066]	0.494*** [0.064]
Lagged GDP growth	0.305*** [0.056]	0.298*** [0.055]
Per capita income	0.117*** [0.031]	0.120*** [0.030]
Per capita income squared	-0.006*** [0.002]	-0.007*** [0.002]
Life expectancy	0.007 [0.026]	0.004 [0.025]
Aged dependency	-0.113* [0.061]	-0.108* [0.060]
Youth dependency	-0.006 [0.021]	-0.009 [0.021]
Financial development	0.021*** [0.004]	0.020*** [0.004]
Standard deviation of exchange rate	0.03 [0.032]	
PRC investment* Asian crisis country dummy	0.048 [0.033]	0.049 [0.032]
Observations	869	877
R-squared	0.252	0.25

Note: We use the interaction term between the PRC's saving rate and Asian crisis country dummy as an instrumental variable for the interaction term between the PRC's investment rate\*Asian crisis country dummy. See notes in Tables 3 and 5 for the definition of all other variables.

## VI. Concluding Observations

An enduring legacy of the Asian financial crisis of 1997–1998 has been a persistent fall in the investment rate of the five countries hardest hit by that crisis—Indonesia, Korea, Malaysia, Philippines, and Thailand. Since the postcrisis period has been marked by a noticeable drop in the GDP growth rate in those countries, weak investment has often been put forth as the main cause of such loss of economic dynamism. Our examination of the stylized facts confirms the conventional wisdom of a decline in investment in the crisis countries. Although the extent of the decline differed across countries, all the crisis countries saw a sharp drop-off in their investment rates, which have not yet returned to their precrisis levels more than a decade after the Asian crisis. Turning to the question of why, our survey of the theoretical and empirical literature on the causes of postcrisis investment weakness fails to yield a convincing answer. We also empirically test two hypotheses about the investment decline—competition from the PRC and heightened risk/uncertainty—but neither hypothesis is supported by our results. At most, the most popular explanations account for the collapse of investment during the crisis but cannot adequately explain the persistence of weak investment.

The more fundamental question is whether the decline in investment rate is a return to more sustainable levels or is instead a symptom of underinvestment whereby investment falls short of its sustainable levels. This question is intimately related to the issue of whether the region suffered from overinvestment in the immediate precrisis period, as is widely believed. Our empirical analysis seeks to answer these questions on the basis of very broad definitions of overinvestment and underinvestment. Our results are generally more supportive of the precrisis overinvestment hypothesis than the postcrisis underinvestment hypothesis. We find evidence of overinvestment in all the crisis countries except the Philippines. According to the results, the immediate precrisis period in particular seems to have been characterized by an unsustainable investment boom. In terms of underinvestment, the only country that shows any symptom of underinvestment in the postcrisis period is the Philippines. In fact, the evidence points to limited postcrisis overinvestment in three of the four other countries. We also empirically test other potential causes such as competitive pressures from the PRC and increased risk and uncertainty, but find that these cannot explain the investment drop-off.

The most significant policy-relevant finding to emerge from our analysis is that *quantitatively*, postcrisis investment rates are more or less at their sustainable levels despite their persistent decline since the Asian crisis. It is not that postcrisis investment rates are too low but rather, that precrisis investment rates were too high. Investment rates thus appear to have reverted to more sustainable levels in the postcrisis period from the abnormally high levels of the precrisis period. Therefore, the most salient policy recommendation to flow from the analysis is a negative one except in the Philippines, where policymakers should *not* try to quantitatively elevate investment rates. Policies aimed at boosting the quantity of investment are misguided and inappropriate. More specifically, if successful, such policies may create and exacerbate overinvestment, and in so doing sow the bubbles of another Asian crisis. In the case of Philippines, however, boosting the quantity of investment seems to be an appropriate policy objective. Moving beyond the crisis countries, our evidence justifies the widespread concerns about the sustainability of the PRC's high and growing investment rate. In the unique case of the PRC, policymakers should seek to bring down the investment rate and rebalance the economy from investment to consumption.

It should be emphasized that a more comprehensive empirical analysis of investment would require many more explanatory variables. Data limitations preclude us from including all variables that theoretically have an influence on the investment rate. For example, political instability is a major deterrent to investment in many developing countries but political instability is an elusive concept that is difficult to measure. It is unclear whether a long-lived authoritarian regime with explosive social tension simmering just below the surface is more stable than a vibrant multiparty democracy where revolving-door coalitions form short-lived governments. Another example of a relevant variable omitted from our analysis is the quality of institutions. A competent and honest civil service is attractive for investors, as are the rule of law and an impartial judiciary

system. The upshot is that we should exercise a great deal of caution in interpreting the results of an empirical analysis that excludes a large number of factors impinging upon the investment rate.

Within the confines of our incomplete analysis, we failed to find strong evidence of underinvestment in the postcrisis period. However, underinvestment and overinvestment are fluid, imprecise concepts that must be used with a great deal of caution. In particular, underinvestment and overinvestment depend on the definition of optimal investment levels, which, in turn, depend on the investment environment facing private sector investors. The level of investment may be more or less optimal given the investment climate, but the investment climate itself may be suboptimal. For example, financial underdevelopment deprives firms and entrepreneurs of instruments to adequately cope with the risk and uncertainty that are intrinsic components of any investment. Therefore, they will rationally choose to invest less than what they would have had they access to better risk-mitigating financial instruments. Investment may be more or less optimal given the poor investment climate but in this case the more fundamental challenge is to improve the investment climate. Specific shortcomings in the investment climate include a serious shortage of skilled workers in Malaysia and Thailand; rigid labor markets and weak governance in Indonesia and Philippines; and regulations that impede the growth of services industries in Korea. An improved environment for investors will not only raise the investment rate but also the output growth rate of a region seeking to regain its pre-1997 dynamism.

## Appendix: Description of Variable and Data Sources

We have converted all variables to 5-year averages of nine subperiods, beginning with 1965–1969 and ending with 2005–2008. We make exceptions for the sixth subperiod (1990–1996) and seventh subperiod (1997–1999) to better capture the impact of the Asian crisis. The total number of countries in our sample is 139.

- (i) *Investment Ratio*: Average ratio of domestic investment to gross national income for each 5-year period (source: World Bank 2009)
- (ii) *Real per capita GDP*: Log of purchasing power parity-adjusted real per capita GDP in 2005 constant prices at the beginning of each period (source: Penn World Tables). We used the average per capita GDP for 2005–2007 for the 2005–2008 subperiod because Penn World Tables stops at 2007.
- (iii) *Growth rate of real per capita GDP*: Average growth rate for each 5-year period
- (iv) *Financial development*: Nominal M2/nominal GDP (source: World Bank 2009]
- (v) *Aged dependency rate*: Ratio of those aged 65 and over to those aged 15–64 (source: World Bank 2009)
- (vi) *Youth dependency rate*: Ratio of those under 15 to those aged 15–64 (source: World Bank 2009)
- (vii) *Life expectancy*: expected life span at birth, number of years (source: World Bank 2009)

In addition to the above variables, we also include dummy variables for the Asian crisis of 1997–1998. These take on the value of 1 if the observation belongs to a crisis country (Indonesia, Korea, Malaysia, Philippines, or Thailand) and zero otherwise. Our motive for including the Asian crisis dummy is obviously to examine the impact of the crisis on investment in those countries. We also include additional Asian crisis country dummy variables for each subperiod, e.g., 1990–1996, to examine whether investment behaved differently in the crisis countries during different subperiods.

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## **About the Paper**

Donghyun Park, Kwanho Shin, and Juthathip Jongwanich explore the puzzle of why investment rates have declined in the five East Asian countries hit hardest by the Asian crisis of 1997–1998. They explain that none of the popular explanations for the decline are theoretically convincing nor supported by empirical evidence. Their econometric analysis suggests that the decline can be best explained by overinvestment prior to the Asian crisis and hence a return to more or less appropriate investment rates since the crisis.

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