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Entrepreneurial Impulse, Investment Behavior, and Economic Fluctuations–A VAR Analysis with Indian Data

PANCHANAN DAS*

This study analyzes the observed behavior of growth cycles and the dynamics of economic fluctuations in terms of entrepreneurial impulse with Indian macroeconomic time series data for more than 60 years. The fluctuations of investment are explained in terms of persistence, volatility, and comovements of the cyclical components. The study observes that the growth cycles of private investment were much more volatile than the growth cycles of public investment and gross domestic product. Investments in India were procyclical, but their growth cycles became acyclical. This study observes that the fluctuations of growth cycle frequencies of private investment appeared even when there were no shocks to gross domestic product. Such investment behavior may be because of the self-fulfilling beliefs of investors. Private investment in India has not been badly affected by the severe balance of payments crises. Rather, a cyclical downturn was seen as an opportunity to invest by the large business houses.

Keywords: animal spirits, growth cycles, Indian economy, time series decomposition
JEL codes: C32, E32, N10

I. Introduction

This study analyzes the observed behavior of investment and output dynamics in explaining growth cycles in India. The existence of highly volatile and persistent cycles affecting overall economic activity is an inherent feature of a market-based modern economy. A large number of competing theoretical models provide the essential causes for economic fluctuations, but there has been a discrepancy between them in explaining what actually happens in the real world. The empirical literature on business cycles has indeed shown that, at the aggregate level, investment is considerably more volatile than output, and fluctuations of both output and investment are highly synchronized. Furthermore, at the micro level, firms' investment behavior appears to be lumpy and strongly affected by a firm's financial structure. Whether

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the growth cycles follow optimal responses by rational agents to erratic changes in technology, or the cycles are influenced by the "animal spirits" of investors is an important issue in the context of recent financial crises and economic slowdowns that have appeared in both the developed and the developing world. If economic fluctuations are really guided by the outcome of Arrow–Debreu types of general equilibrium models, then allocations will be Pareto optimal and there will be no cause of concern, at least from regulators' point of view. But if growth cycles are independent of market fundamentals, then there may be an important role for policy makers in designing regimes that can reduce fluctuations and increase economic welfare.

John Maynard Keynes' animal spirits explanations were used globally to look into the behavior of economic fluctuations until the late 1970s. Subsequently, it was thought that the animal spirits hypothesis, like sunspots, appeared as a theoretical curiosity that did not have much to add to modern theories of the business cycle based on the rational expectations hypotheses. However, some scholars, particularly the post-Keynesians, believe that crises, in the form of a severe cyclical downturn in the advanced capitalist world such as the recent global financial crisis, occur because the expectations of economic agents, particularly the entrepreneur, are guided not by rationality alone. Farmer and Guo (1994) observed that fluctuations in business cycle frequencies appeared in the United States' (US) economy not by the shocks to the fundamentals of the economy, but by the self-fulfilling beliefs of investors. Investors become overly optimistic as the economy grows, but disappointed when profits fall short of their inflated forecasts. In fact, because of this kind of entrepreneurial behavior, every expansion sows the seeds of recession. In the process of fluctuations, while the upswing is slow and steady, the collapse is sudden and steep (Harvey 2010).

Against this backdrop, the objective of this paper is to analyze the dynamics of economic fluctuations in terms of entrepreneurial impulse with Indian macroeconomic time series data for more than 60 years. The theoretical background of the study relies primarily on Chapters 12 and 22 of Keynes' *The General Theory of Employment, Interest, and Money*. During the Great Depression, Keynes attributed the business cycle to alternating waves of optimism and pessimism, which he termed animal spirits.[1] Keynes (1921), in *A Treatise on Probability*, argued that, as the rational quantitative calculation alone cannot justify action under uncertainty, investment becomes inadequate and the economy settles into collapse without animal spirits. The fluctuations in aggregate economic activity might be driven at least in part by the waves of optimism or pessimism, and not by "the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities."[2] According to Keynes (1936), the formation of entrepreneurial expectations on

[1] See Barens (2011) for detailed sources of Keynes' use of the term "animal spirits."

[2] Keynes, J. M. 1921. *A Treatise on Probability*. London: Macmillan.

investment in an uncertain environment depends largely on conventional judgments and animal spirits. He argued that, given fundamental uncertainty, rationality alone is insufficient to justify action. Animal spirits are neither rational nor irrational in indicating the psychological urge to action which explained decisions being taken in spite of uncertainty (Dow and Dow 2011). When there is no basis for rational belief, investment behavior is dictated by psychological motivations and nonrational forces. Reasons and evidence can provide only a partial justification for decisions.

The questions of how economic fluctuations and investment decisions are interrelated and how the animal spirits hypothesis is relevant in analyzing growth cycles have been extensively debated in the literature. Samuelson's (1939) multiplier-accelerator model and Harrod's (1939) business cycle model were accounted as contributions of the early Keynesian literature to this debate. Kalecki (1937) and Goodwin (1951) studied the endogenous formation of business cycles by bringing in the heterogeneity and distributional aspects. While the underlying theoretical model implied by Keynes has proven to be rather complex, many studies have attempted to assess the Keynesian belief in relation to the psychological factors (Azariadis 1981; Crotty 1992; Howitt and McAfee 1992; Lawson 1981, 1985; Robinson 1979; Shleifer 1986). Dequech (1999) examined how animal spirits influence both expectations and confidence by demonstrating that animal spirits are interrelated with cognition. In a dynamic setting, Kiyotaki (1988) and Weil (1989) explored the role of animal spirits in the formation of business cycles in the presence of investment externalities. The inherent interaction of financial markets and investment has caused a wave of new research (see, for example, Fazzari 1988, Fazzari and Petersen 1993). In such studies it is observed that limited access to finance, higher transactions costs, and asymmetric information adversely affect investment. The underlying close association of the fluctuations of internal finance, profits, and business cycles suggest that the cost of external credit increases during recessions. Again, in many cases, the investment behavior has been affected more by fiscal policy parameters than by the cost of capital (Fazzari 1993).

Most of the research in this area, however, is theoretical or quantitative in nature and based mainly on the developed industrial world. The relevance of animal spirits in understanding investment behavior and economic fluctuations in a developing economy like India has not been examined empirically as such by scholars. There has also been some research on business cycles with Indian data. For example, Hatekar (1994) studied the historical paths and comovements of annual time series data in the Indian economy for the period 1951–1985 after detrending the series. The Reserve Bank of India (2002), via the Working Group on Economic Indicators, examined business cycles in India with quarterly time series data of nonagricultural gross domestic product (GDP). The empirical analysis in our study is based on growth cycles of GDP, public investment, and private investment over the period 1950–2013.

This study sets out to provide empirical estimations of growth cycles of output and investments in India to look into the investment behavior of the economy by decomposing the observed time series of real GDP, total investment, and private investment into trend and cyclical components. Private investment in India has not been badly affected by the severe balance of payments crises. Rather, a cyclical downturn was seen as an opportunity to invest by the large business houses. This type of entrepreneurial decision can hopefully be analyzed with rising animal spirits. Keynes' fundamental insight that animal spirits play an important role in affecting investment decisions may be relevant in analyzing fluctuations in economic activities and investment behavior in India not only during the recent global financial crisis, but also during different phases of state control. In this paper, we examine the interrelations between waves of optimism and pessimism, and the subsequent economic fluctuations around the turning points.

The empirical work of this paper is based on Keynes' theory of trade cycles, where instability in investment has been the major cause of economic fluctuations. Keynesian theories of business cycles are inherently endogenous because animal spirits originate investment instability, which in turn causes output fluctuations. Following Keynes (1936) on trade cycles, we assume that inescapable market uncertainty and individual expectations play a key role in shaping investment dynamics and triggering fluctuations in overall economic activity. In this framework, agents, both firms and workers, are heterogeneous, rationally bounded, and endowed with adaptive expectations. As in the case of Dosi, Marengo, and Fagiolo (2004), agents interact in an endogenously changing environment characterized by substantial uncertainty. The microeconomic dynamics of production and investment induce macroeconomic dynamics for aggregate investment and output.

We have examined the stochastic behavior of growth cycles of the macroeconomic time series of output, private investment, and total investment in India from 1950 until 2013. The cyclical variation in investment is examined in terms of persistence, volatility, and comovements of the cycles of GDP. The fluctuations of GDP in real terms obviously indicate the overall economic fluctuations that may affect the behavior of aggregate investment. In our analysis, we have concentrated mainly on the reverse causality—that is, how growth cycles of investment are causally related to the growth cycles of output. According to the real business cycle hypothesis, the entrepreneur's impulse in taking investment decisions is affected by economic fluctuations. If the real business cycle hypothesis is actually effective in an economy, there is no role for animal spirits in analyzing investment behavior. However, self-fulfilling expectations may also be the driver of business cycles in the presence of expectational indeterminacy in investment in a real business cycle model. This study concentrates on the real sector of the economy to carry out an empirical exercise in investigating the growth cycles as observed in India in a partial equilibrium framework. We hypothesize that entrepreneurial activity toward investments is affected largely by some nonrational factors in given political, social, and economic

situations. Entrepreneurs do not have access to a full information set and they are not capable of describing fully the statistical distribution of economic shocks, but they try to forecast by following adaptive types of expectations.

This paper observes that the fluctuations of growth cycle frequencies of private investment appeared even when there were no shocks to GDP, the major macroeconomic fundamental. This type of investment behavior may be because of the self-fulfilling beliefs of investors. The insignificant relationship between growth cycles of output and investment may imply the role of animal spirits in analyzing investment behavior of an economy, at least in a statistical sense. The paper is organized in the following manner. Section II describes the data. Section III analyzes the stochastic behavior of trend and growth cycles of GDP, public investment, and private investment in India. Volatility, persistence, and comovements of the growth cycles are investigated in Section IV. Section V deals with the dynamic relationship between the cycles of investment and GDP. Section VI concludes.

II. Data

The Central Statistical Office (CSO) of the Ministry of Statistics and Programme Implementation and the Reserve Bank of India are the sources of the data used in this study. The estimates of India's national income have been revised by the National Accounts Division of the CSO in preparing National Accounts Statistics (NAS) from time to time. Base years have been revised periodically by the CSO in the past, starting from 1948–1949. The 2004–2005 series widens the database for different sectors by the inclusion of several items not previously covered. GDP at constant 2004–2005 prices, the most important macroeconomic aggregate of national accounts, is used as an output variable. Real gross capital formation is taken as a proxy for investment. In NAS, gross capital formation has two components: gross fixed capital formation (GFCF) and change in stocks. GFCF is the gross value of goods that is added to the fixed domestic capital stock in a year. The change in stock is the difference between market values of the stocks at the beginning and end of the period. We have treated GFCF as total investment. NAS also provides GFCF by the household sector, the private corporate sector, and the public sector. We have used data for GFCF by the private corporate sector as private investment. All data used in this study are reproduced in the *Handbook of Statistics on Indian Economy, 2013*, published annually by the Reserve Bank of India.

III. Trend and Cycles of Outputs and Investments

Identification of trends and cycles of a macroeconomic variable is often an important empirical issue in macroeconomic analysis, particularly in analyzing growth behavior in an economy. Different methodologies have been suggested in

the empirical literature in identifying business cycles or growth cycles. While the National Bureau of Economic Research methodology is simple to understand, we do not follow it in this study because the trend–cycle decomposition is needed to identify the importance of economic growth and productivity.[3] Moreover, empirical investigation of the behavior of fluctuations of the macroeconomic time series around its trend assumes significance in order to identify the possible sources of economic instability. We define the fluctuations of a variable around its trend as the growth cycle and it differs in stochastic character from the conventional business cycle as defined in the National Bureau of Economic Research literature. In most cases, however, growth cycles and business cycles are not distinguishable (Canova 1999).

It is very unlikely that any given type of linear deterministic trend would persist over long stretches of time. For this reason, the trend stationary approach to view growth and fluctuations as a sum of deterministic trends and stochastic cycles may not be a proper methodology. In the difference stationary process, trends are stochastic because of interactions with shorter fluctuations as well as structural breaks. They have no tendency to return to linear trends (Nelson and Plosser 1982). The components of stochastic trends are purely unpredictable and there is little to be done about the unpredictable shocks, their hypothetical long-term effects, and the stochastic variations in economic activity with this approach (Diebold and Rudebusch 1999).

The trending behavior has been examined by carrying out Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) unit root tests. Perron (1989) argued that the evidence in favor of unit roots has been overstated, as standard tests have low power against trend stationary alternatives with structural breaks in trend level or growth rate. He resolved this problem by modifying the ADF test with dummy variables to account for a single structural break. Zivot and Andrews (1992) extend this methodology to an endogenous estimation of the break date. In this study, a unit root test is performed after incorporating the major break, if any, in the series. Tables 1 and 2 display the break points estimated on the basis of the likelihood ratio test and estimated statistics for testing unit root, respectively.

A visual inspection of the data, as shown in Figure 1, shows that GDP, public investment, and private investment in India appear to have experienced growth with some short-run fluctuations as normally observed in any economy, but the growth of private investment contained severe fluctuations. The time series of GDP

[3]In the classical cycle approach, followed particularly in the studies of the National Bureau of Economic Research, the expansions and contractions in the level series could be analyzed without considering the trend adjustment process. But, the empirical studies conducted recently on business cycles provide serious attention to trend adjustment. The trend adjustments, however, reduce the variations of cyclical behavior both across series and within series over time (Burns and Mitchell 1946). In effect, the time series decomposition of macroeconomic variables associated with growth cycles is difficult because trends and cycles interact with and influence each other (Baxter and King 1999). A step function linking the average levels of a variable in successive business cycles was effectively the trend representation complementing the cyclical measures. This approach formalized the concept and estimation of the phase average trend for analyzing fluctuations in detrended variables.

Table 1. **Test Statistics for Structural Break**

Series	Break Point	QLR Supremum Statistics
GDP	2003	12.588
Growth cycle of GDP from HP filter	1964	12.535
Growth cycle of GDP from BK filter	1964	11.545
Private investment	2003	11.030
Growth cycle of private investment from HP filter	No break	
Growth cycle of private investment from BP filter	1959	31.154
Public investment	No break	
Growth cycle of public investment from HP filter	1961	13.159
Growth cycle of public investment from BP filter	1958	11.628

BK = Baxter–King, BP = band-pass, GDP = gross domestic product, HP = Hodrick–Prescott, QLR = Quandt Likelihood Ratio.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

Table 2. **Estimated Statistics for Testing Unit Root**

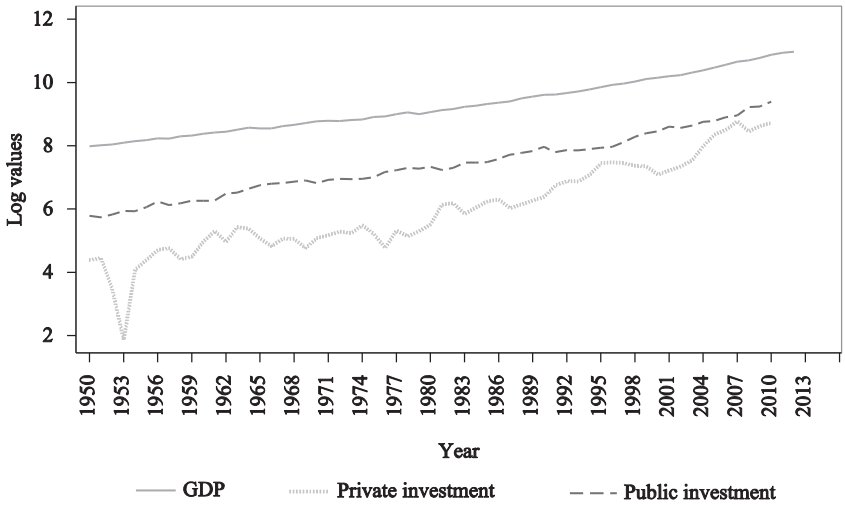
Series	ADF Statistics	PP Statistics
GDP	3.432	4.215
Δ GDP	−5.056	−7.463
Private investment	−0.519	−0.296
Δ Private investment	−7.685	−8.95
Public investment	1.054	1.291
Δ Public investment	−5.752	−8.865
Growth cycles from HP filter		
GDP	−7.174	−7.634
Private investment	−8.441	−7.722
Public investment	−6.51	−8.394
Growth cycles from BK filter		
GDP	−6.852	−7.84
Private investment	−6.818	−12.796
Public investment	−6.447	−7.75

BK = Baxter–King, GDP = gross domestic product, HP = Hodrick–Prescott.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

and investments, both public and private, are integrated of order 1, implying the presence of a stochastic trend (Table 2). A major significant break appeared in the trends of both GDP and private investment in 2003, but there was no significant break in public investment during the period 1950–2013 (Table 1). The apparently observed smoothness in the time series typically hides severe cyclical turbulences affecting economic aggregates. If we isolate the cyclical components, output and investments exhibit a completely different pattern.

We decompose the time series of GDP, public investment, and private investment into a cyclical and a trend element by using Hodrick–Prescott (HP) filters

Figure 1. **Trends in GDP and Investments in India**



GDP = gross domestic product.
Note: All variables are in logarithmic form.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

(Hodrick and Prescott 1997) and the Baxter–King (BK) version of a band-pass filter (Baxter and King 1999).

A seasonally adjusted time series can be viewed as the sum of a trend component (y_t^g) and a cyclical component (y_t^c):

$$y_t = y_t^g + y_t^c \tag{1}$$

The deviation from trend of a time series is commonly referred to as the growth cycle component. The HP filter removes a smooth trend (y_t^g) from a time series y_t by solving the following minimization problem:

$$\min \sum_{t-1}^{T} \{(y_t - y_t^g)^2 + \lambda((y_t^g - y_{t-1}^g) - (y_{t-1}^g - y_{t-2}^g))^2\}, \text{ with respect to } y_t^g$$

The first component is the squared cyclical part and the second is the squared second difference of the trend component. The sum of the second part is exactly zero for a linear trend, but differs from zero if the slope of the flexible trend is not constant. The weight λ is used to adjust the relative importance of these two criteria. The larger is λ, the more tightly the HP trend will be constrained to be linear. The smaller the value of λ, the more fluctuations will be admitted into the trend. If $\lambda = 0$, then we would minimize only the first summation and would do so by setting

$y_t = y_t^g$ for all t. The trend series is just the series itself and there is no linear trend in the traditional sense at all. The other extreme, $\lambda \to \infty$, implies that the linearity constraint becomes perfectly binding. In this case, the HP trend is identical to the linear trend estimated with a standard regression. For intermediate values of λ, we get a trend series that is, in smoothness, somewhere between the perfectly smooth linear trend and the perfectly unsmooth series itself. As annual data are used in this study, we have chosen the value of $\lambda = 100$.[4]

The HP filter removes unit root components from the data. Further, the filter is symmetric, so there is no phase shift. The cyclical component of the HP filter places zero weight on the zero frequency (King and Rebelo 1993). The HP filter allows only the components of stochastic cycles at or above a specified frequency to pass through, and removes the components corresponding to the lower-frequency stochastic cycles. The BK version of the band-pass filter is also a symmetric approximation, with no phase shifts in the resulting filtered series. It allows the components in the specified range of frequencies (6 to 32 quarters) to pass through and eliminates all the other components. The BK filter provides stationary cycles by carrying out moving averages based on 3 years of past data and 3 years of future data as well as the current observation if the underlying time series is integrated of order 1 or 2:[5]

$$y_t^* = \sum_{k=-K}^{K} a_k y_{t-k}, \quad with \quad \sum_{k=-K}^{K} a_k = 0 \tag{2}$$

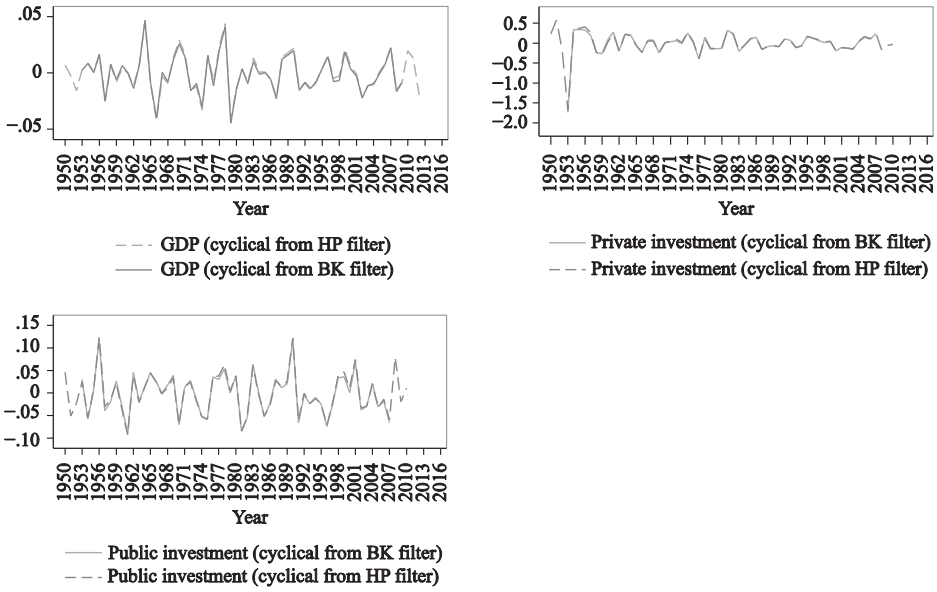
The Indian economy frequently exhibited significant cyclical variations of distinct pattern and origin comprising a boom and a recession. Figure 2 presents the HP-filtered and BK-filtered cycles of real GDP, public investment, and private investment. There is a very close correspondence between the growth cycles isolated by the HP filter and those generated by the BK filter. In this study, the HP filter is a reasonable approximation of the BK filter. There was a significant break in the growth cycles of GDP (obtained from both the HP and BK filters) in 1964. The HP cycle of public investment exhibited a major break in 1961, while the major break in the BK cycle appeared in 1958. In the case of private investment, the BK cycle experienced a break in 1959 and there was no significant break in the HP cycle. The estimated statistics as shown in Table 2 suggest that the growth cycles of GDP and investments, both public and private, and obtained either from the HP or BK filter, are integrated of order 0 as expected.

Volatility in GDP was higher during the period between the mid-1960s and late 1970s. The rate of volatility, however, declined beginning in the early 1980s.

[4]Hodrick and Prescott recommend choosing $\lambda = 1{,}600$ for quarterly series and argue that the value of λ should vary with the square of the frequency of the series. This implies a λ of 100 for annual data and 14,400 for monthly data.

[5]See Baxter and King (1999) for detail.

Figure 2. **Growth Cycles of GDP and Investment**



BK = Baxter–King, GDP = gross domestic product, HP = Hodrick–Prescott.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

The growth cycles identified during the 1990s were less erratic over time (Figure 2). The growth cycles of both public investment and private investment were more volatile than those of output, but private investment was even more volatile than public investment. The volatility of investment cycles was even more explosive during the 1950s, and these cycles were highly erratic after the 1990s as well.

Declines in public investment in India were severely deep in 1962, 1981, 1997, and 2008. Cyclical phases of investment and output were grossly mismatched, violating the classical observations on business cycles. Private investment in India was more erratic than public investment. The cyclical variation of private investment was more frequent than those of output and public investment. There was no synchronization between the growth cycles of private investment and output. We have shown below that the path of cycles of private investment did not follow the cyclical path of output at all. This reflects a gross violation of the stylized facts of advanced industrial economies supported mostly by the real business cycle hypothesis.

The growth cycles of investments and output as described above are highly mismatched and exhibit very different patterns in every cyclical phase. We have shown below that the cyclical movement of investments did not follow the cycles of output. The share of public investment was significantly dominating before the 1990s. Moreover, during the regime of state control prior to the 1990s the government owned roughly half of the economy's productive capacity. Indian recessions in that

phase were mainly triggered by bad monsoons, along with social and political factors that cannot be predicted fully by market fundamentals. Since the early 1990s, however, the free market has come to dominate the economy. During this phase, particularly after 2003–2004, the share of private investment was more than public investment, largely because of the absolute fall in public investment after the initiation of economic reforms, and the cycles appeared in this phase can be explained mostly, at least theoretically, by market fundamentals.

We perform ADF and PP unit root tests for the observed series of public investment, private investment, and GDP, and their growth cycles obtained by de-trending with HP and BK filters. The choice of lag length is crucial in performing unit root test to determine the order of integration; the number of lags used in the ADF regressions has been selected by the Akaike Information Criterion.[6] The estimated test statistics are shown in Table 2. As for most of the macroeconomic time series, the output and investments contain unit root, implying the presence of a stochastic trend that is completely unobservable (Das 2007).[7] The ADF and PP statistics as shown in Table 2 suggest that all the original series are integrated of order 1. The presence of unit roots in the original data series has serious macroeconomic policy implications. Any external shock from economic reforms, for example, could have a permanent effect (either positive or negative) on real output and investment. On the other hand, the growth cycles are stationary. The hypothesis that the presence of unit roots is rejected for the growth cycles both in terms of ADF and PP statistics.

IV. Volatility and Persistence of Growth Cycles

This section focuses on the variance and covariance properties of growth cycles. In this study, the standard deviation measures the extent of volatility of the different growth cycles with a 95% confidence interval, while the covariance component captures the persistence of the cycles. The analysis of the covariance and autocorrelation structure of the original series, as well as their cyclical components, allows us to single out some stylized facts that seem to represent investment patterns at the macro level in the Indian economy. The standard deviation and correlation measures of the original series and the growth cycles from HP filter are shown in Table 3.[8] Both public investment and private investment were more volatile than GDP, but private investment exhibited significantly higher volatility than public investment. The volatility of the cyclical components was significantly lower than

[6]See Akaike, H. 1969. Fitting Autoregressive Models for Prediction. *Annals of the Institute of Statistical Mathematics*. 21 (1). pp. 243–47.

[7]Nelson and Plosser (1982) observed first by applying ADF test with US 14 macroeconomic time series that most of the macroeconomic time series contain unit root.

[8]As the growth cycles from the HP filter are highly synchronized with those from the BK filter, we have used only cycles from the HP filter to analyze the cyclical behavior of the Indian economy.

Table 3. **Estimated Statistics of Growth Cycles, 1950–2013**

Variables	Standard Deviation	Relative Standard Deviation	First Order Autocorrelation	Contemporaneous Correlation with GDP
GDP	0.86	1	0.95	1
Public investment	1.21	1.41	0.93	0.96
Private investment	1.43	1.66	0.91	0.95
HP cycles				
GDP	0.02	1	0.02	1
Public investment	0.05	2.5	0.21	0.36
Private investment	0.29	14.5	−0.06	0.09

GDP = gross domestic product, HP = Hodrick–Prescott.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

the volatility in the original series for obvious reasons. However, the growth cycles of private investment were much more volatile than the growth cycles of public investment and the growth cycles of output. This stylized fact is roughly similar to those observed in advanced industrialized economies, supporting the hypothesis of classical business cycle theory.

An autocorrelation structure of the series allows us to single out the persistence of the stochastic character in the macroeconomic cycles. The persistence indicates the inertia in growth cycles and captures the length of observed fluctuations. To explain statistically the persistence of the growth cycles, we have examined the pattern of the autocorrelation function of the original as well as the detrended series of GDP, public investment, and private investment. Higher autocorrelation implies a longer cycle. A positive autocorrelation coefficient indicates that higher cycles will induce higher ones (and vice versa), while a negative coefficient indicates that higher cycles will be followed by lower ones (and vice versa).

The large and positive values of the first order autocorrelation coefficient of the original time series indicate the persistence of the behavior of the series of GDP and investments. But, the degree of persistence was very low for the growth cycles (Table 3). For private investment, the first order autocorrelation coefficient was negative, implying that a lower cycle in the current period induced a larger cycle in the subsequent period (and vice versa). The contemporaneous correlation between the series is a rough measure of comovement, or degree of synchronization, between them. While the correlation coefficients between public investment and GDP and between private investment and GDP were positive and very high, the correlation between growth cycles of GDP and public investment was very low and the correlation coefficient between growth cycles of GDP and private investment was nearly equal to zero. Thus, investments in terms of the original series were procyclical, but they became acyclical after detrending the series. This stylized fact, as observed from the original series in India, follows the classical business cycle

Table 4. **Estimated Relationship between Growth Cycles of Public Investment and Output**

Variables	Coefficient	z-statistic	P>z
Y^c	0.37	1.03	0.302
Constant	−0.0001	−0.02	0.984
ARMA			
AR1	−0.19	−0.60	0.551
Σ	0.04	10.79	0

ARMA = autoregressive moving average.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

theory. Traditionally, business cycle fluctuations of investment and output are highly synchronized and exhibit very similar patterns (Stock and Watson 1999). But the cyclical behavior of investment and output as observed in this study has not been supported by the classical business cycle hypothesis.

V. Dynamics of Growth Cycles

In terms of the autocorrelation function, we measure the persistence of the growth cycles. A high autocorrelation coefficient implies a very persistent economic fluctuation. We examine, here, the relation between the cyclicality of real GDP and investments. We have estimated separately the relationship between the growth cycles of private investment and GDP, and between the cycles of public investment and GDP in a dynamic frame. We also carry out vector autoregressive (VAR) analysis to locate the direction of causality, if any between the cycles.

The econometric model for estimating the relationship is specified as

$$\ln I^c_{T,t} = \phi_{01} + \phi_{11} \ln y^c_{t-1} + u_{1t}$$

$$\ln I^c_{P,t} = \phi_{02} + \phi_{12} \ln y^c_{t-1} + u_{2t} \quad (3)$$

$I^c_{T,t}$, $I^c_{P,t}$, *and* y^c_t present the cyclical components of public investment, private investment, and output (or GDP) in period t, respectively, and u_{it} is the white-noise error.

As the order of integration of the observed series of investments and output is the same, they may be cointegrated. However, we are interested in the dynamic relation between the growth cycles of investments and output. As the growth cycles are stationary, we can estimate the relationship between the cycles of public investment and GDP, and between the cycles of private investment and GDP in an autoregressive moving-average (1, 0) structure. The relationships are specified in Equation (3) and the estimated results are shown in Tables 4 and 5. The cycles of

Table 5. **Estimated Relationship between Growth Cycles of Private Investment and Output**

Variables	Coefficient	z-statistic	P>z
Y^c	1.59	0.44	0.663
Constant	−0.0001	−0.12	0.998
ARMA			
AR1	0.03	0.24	0.811
Σ	0.29	23.24	0

ARMA = autoregressive moving average.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

Table 6. **Estimated Coefficient of VAR Model**

	I_P^c	I_T^c	$\mathbf{Y}^c$
Constant	−0.01	−0.001	0.00
I^c_{Pt-1}	0.06	0.01	−0.01
I^c_{Tt-1}	0.82	−0.07	−0.04
$Y^c{}_{t-1}$	1.12	0.42	0.04
R^2	0.02	0.04	0.02
χ^2	1.14	2.75	0.99
P> χ^2	0.69	0.43	0.80

VAR = vector autoregressive.
Note: The estimated coefficients are not statistically significant.
Source: Author's estimation with data from Reserve Bank of India. 2014. *Handbook of Statistics on Indian Economy*. Mumbai.

both public investment and private investment are not related significantly to that of GDP. The AR1 coefficients are also statistically insignificant. Thus, the cyclical movement of investments did not follow the cycles of GDP supporting the fact that investment in India, both public and private, had not been badly affected by the cyclical downturn of the economy. Thus, investments in the Indian economy might not be determined fully by the rational actions of the entrepreneurs but by the animal spirits, at least partly.

We also estimate the following VAR model to look at the dynamics and the direction of causality, if any, between the growth cycles of investments and output:

$$\ln I^c_{T,t} = \alpha_{01} + \beta_{11} \ln I^c_{T,t-1} + \beta_{12} \ln I^c_{P,t-1} + \beta_{13} \ln y^c_{t-1} + \varepsilon_{1t}$$

$$\ln I^c_{P,t} = \alpha_{01} + \beta_{21} \ln I^c_{T,t-1} + \beta_{22} \ln I^c_{P,t-1} + \beta_{32} \ln y^c_{t-1} + \varepsilon_{2t}$$

$$\ln y^c_t = \alpha_{03} + \beta_{31} \ln I^c_{T,t-1} + \beta_{32} \ln I^c_{P,t-1} + \beta_{33} \ln y^c_{t-1} + \varepsilon_{3t} \quad (4)$$

The VAR structure has been specified in Equation (4) and the estimated results are displayed in Table 6. The estimated coefficients are statistically insignificant in

every equation. We do not have causality in either direction. Neither the growth cycle of public investment nor the growth cycle of output have had a significant effect on the growth cycle of private investment. The estimated figures shown in the lower panel of Table 6 also suggest there is not a significant relationship between them.

VI. Conclusions

This study attempts to look into the behavior of growth cycles of private investment in India in terms of the entrepreneurial impulse. Animal spirits, in Keynes' view, characterize the entrepreneur's decision to undertake investments in the absence of sufficient information to gauge the probability of success. Keynes' fundamental insight that animal spirits play an important role in affecting investment decisions may be relevant in analyzing fluctuations in output and investment in India not only during the recent global financial crisis, but also during different phases of state control. In India, private investment has exhibited significantly higher volatility than output. This finding in our study is roughly similar to observations in advanced industrialized economies. For private investment, lower cycles in the current period induced larger cycle in the subsequent period (and vice versa). Investments were procyclical, but after detrending, the series investments became acyclical. The cyclical pattern of investment in India did not follow the classical business cycle hypothesis. The growth cycles of private investment and output as observed in this study are not similar and exhibit very different patterns in every cyclical phase. It is evident that the cyclical movement of private investment did not follow the cycles of output. The fluctuations at growth cycle frequencies of private investment appeared even when there were no shocks to GDP. These fluctuations in private investment may be due to the self-fulfilling beliefs of investors.

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Analysis of Credit Ratings for Small and Medium-Sized Enterprises: Evidence from Asia

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In Asia, small and medium-sized enterprises (SMEs) account for the major share of employment and dominate domestic economies, yet providing these companies with access to finance is a challenge across the region. Asian economies are often characterized as having bank-dominated financial systems and underdeveloped capital markets, in particular with regard to venture capital. As a result, banks are the main source of financing for SMEs. It is crucial for banks to be able to distinguish healthy from risky companies. If they can do this, lending and financing SMEs through banks will be easier. In this paper, we explain the importance of SMEs in Asia. Then, we provide a scheme for assigning credit ratings to SMEs by employing two statistical analysis techniques—principal component analysis and cluster analysis—applying 11 financial ratios of 1,363 SMEs in Asia. If used by the financial institutions, this comprehensive and efficient method could enable banks and other lending agencies around the world, and especially in Asia, to group SME customers based on financial health and adjust interest rates on loans and set lending ceilings for each group.

Keywords: Asian economies, SME credit rating, SME financing
JEL codes: G21, G24, G32

I. Introduction

Small and medium-sized enterprises (SMEs) are the backbone of Asian economies, accounting on average for 98% of all enterprises, 66% of the national labor force, and 38% of gross domestic product (GDP) during 2007–2012 (ADB 2014). Over the same period, SMEs accounted for an average of more than 30% of total export value. In the People's Republic of China (PRC) in 2012, SMEs accounted for 41.5% of total export value, up 6.8% year-on-year (y-o-y), while in Thailand

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they made up 28.8% of total export value, with 3.7% y-o-y growth. SMEs that are part of global supply chains have the potential to promote international trade and mobilize domestic demand.

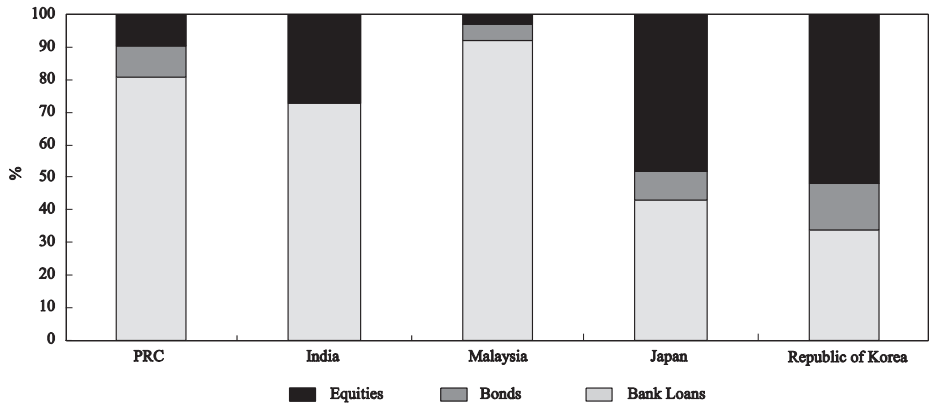
Because of the significance of SMEs to Asian national economies, it is important that ways be found to provide them with stable access to finance. Asian economies are often characterized as having bank-dominated financial systems and capital markets, in particular venture capital markets, that are not well-developed. This means banks are the main source of financing. Although the soundness of banking systems has improved significantly since the 1997/98 Asian financial crisis, banks have been cautious about lending to SMEs, even though such enterprises account for a large share of economic activity. Start-up companies, in particular, are finding it increasingly difficult to borrow money from banks because of strict Basel III capital requirements (Yoshino and Hirano 2011, 2013). Riskier SMEs also face difficulty in borrowing money from banks (Yoshino 2012).[1] Hence, an efficient credit rating scheme that rates SMEs based on their financial health would help banks to lend money to SMEs in a more rational way while at that same time reducing the risk to banks.

Various credit rating indexes such as Standard and Poor's (S&P) rate large enterprises. By looking at a large enterprise's credit rating, banks can decide to lend them up to a certain amount. For SMEs, the issue is more complicated as there are no comparable ratings. Nevertheless, there is a useful model in Japan. In a government-supported project, 52 credit guarantee corporations collected data from Japanese SMEs. These data are now stored at a private corporation called Credit Risk Database (CRD). If similar systems could be established in other parts of Asia to accumulate and analyze credit risk data, and to measure each SME's credit risk accurately, banks and other financial institutions could use it to categorize their SME customers based on their financial health. SMEs would also benefit as they could both raise funds from the banks more easily and gain access to the debt market by securitizing their claims.

In Section II, we describe the characteristics of Asian economies, in particular the important role played by SMEs. In Section III, we explain the advantages of preparing a complete SME database in each country. In Section IV, we propose a way of establishing SME credit ratings using statistical techniques and financial ratios. This captures all the characteristics of SMEs, including leverage, liquidity, profitability, coverage, and activity. This method can be used by banks all around the world, especially in Asia, to group SMEs based on their financial health, and adjust loan interest rates and set lending ceilings accordingly for each group. Section V contains concluding remarks.

[1] For more information on SME financing constraints, see Vermoesen, Deloof, and Laveren (2013).

Figure 1. **Financial Markets in Asia**
(Equity markets, bond markets, and bank loans as % of total)



PRC = People's Republic of China.
Source: Kashiwagi, S. 2011. Presentation at FSA Financial Research Center International Conference. Tokyo. 3 February.

II. Characteristics of Asian Economies

A. High Potential Growth

Asian economies have had relatively high economic growth rates over the past 2 decades and further strong growth is expected over the next few years, driven by the region's expanding middle class. Populations are young in most of Asia. If Asian economies continue to expand, the rates of return on investments in the region will be higher than those in other regions. Thus, there is huge potential for growth and financial investment in Asia (Yoshino 2012).

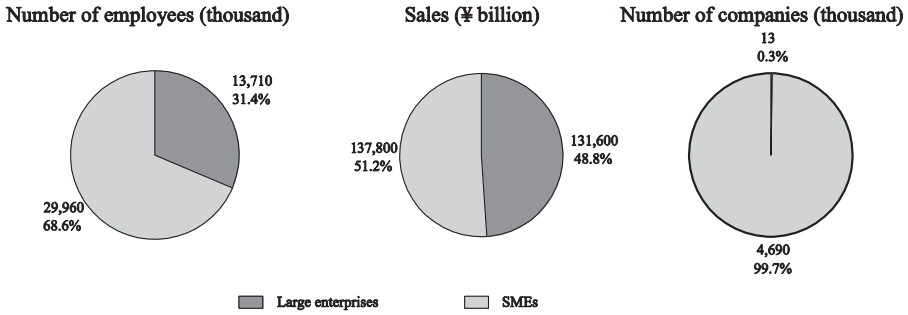
B. Bank-Dominated Financial Systems and the Economic Importance of Small and Medium-Sized Enterprises

Figure 1 shows the size of the equity and bond markets in comparison to bank loans in Asia.

Figure 2, Table 1, and Figure 3 show the shares of SMEs in the economies of Japan, the PRC, and Indonesia. SMEs dominate the domestic economy, in terms of the number of firms and the share of employment, in all three countries.

As shown in Figure 2, more than 99% of all businesses in Japan are SMEs; they also employ most of the working population and account for a large proportion of economic output.

Figure 2. **Small and Medium-Sized Enterprises in Japan**



SME = small and medium-sized enterprise.
Source: Government of Japan, Ministry of Economy, Trade and Industry. 2011. *White Paper on Small and Medium Enterprises in Japan*. Tokyo.

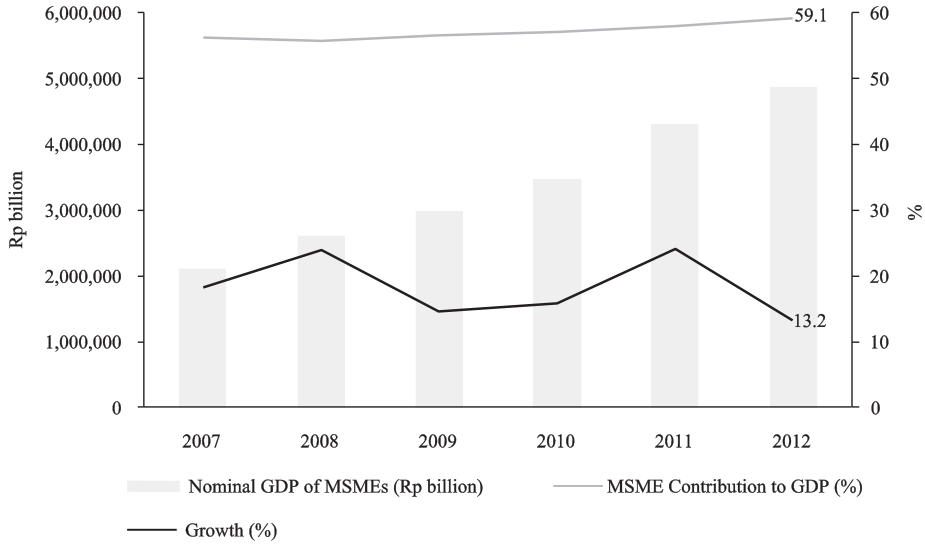
Table 1. **Small and Medium-Sized Enterprises in the People's Republic of China**

Item	2007	2008	2009	2010	2011	2012
Number of SMEs						
SMEs (number)	333,858	422,925	431,110	449,130	316,498	334,321
SMEs to total (%)	99.1	99.3	99.3	99.2	97.2	97.3
Employment by SMEs						
SME employees ('000)	60,521	68,671	67,877	72,369	59,357	...
SMEs to total (%)	76.8	77.7	76.9	75.8	64.7	...
SME Exports						
SME exports (CNY billion)	4,303	4,773	4,152	4,919	4,142	4,423
SMEs to total exports (%)	58.6	57.9	57.6	54.7	41.6	41.5

... = data not available, SME = small and medium-sized enterprise.
Notes: The data cover industrial enterprises above a certain operational scale. For 2007–2010, "above operational scale" refers to all industrial enterprises that generated a minimum annual income of CNY5 million from their core business. For 2011–2012, it refers to all industrial enterprises that generated a minimum annual income of CNY20 million from their core business. The industry sector includes mining; manufacturing; and electricity, gas, and water production and supply industries. Data for 2007–2010 are based on the following criteria: number of employees fewer than 2,000, sales of CNY300 million or less, or total assets of CNY400 million or less. Medium-sized enterprises must have more than 300 employees, sales of more than CNY30 million, and total assets of CNY40 million or more; the rest are small businesses. Data for 2011–2012 are based on 2011 SME classification criteria. Industrial micro, small, and medium-sized enterprises are defined as enterprises that employ fewer than 1,000 persons or whose annual turnover does not exceed CNY400 million. A medium-sized enterprise is defined as an enterprise that employs more than 300 persons and whose annual turnover exceeds CNY20 million. A small enterprise is defined as one that employs more than 20 persons and whose annual turnover exceeds CNY3 million. A micro enterprise is defined as an enterprise that employs fewer than 20 persons or whose annual turnover does not exceed CNY3 million. Data on micro enterprises in 2011–2012 are not available.
Source: ADB. 2014. *Asia SME Finance Monitor 2013*. Manila.

In the PRC, the number of SMEs has expanded steadily since the government introduced the Reform and Opening-up Policy in 1978. As can be seen from Table 1, SMEs have played a crucial role in boosting the economy, increasing employment opportunities, and creating industries. According to the Ministry of Commerce, there were 12.5 million enterprises (most of which were SMEs) registered with the State Administration for Industry and Commerce, and 37.6 million privately or individually owned businesses at the end of 2011. SMEs contributed 50% of tax

Figure 3. **Micro, Small, and Medium-Sized Enterprise Contribution to Gross Domestic Product in Indonesia**

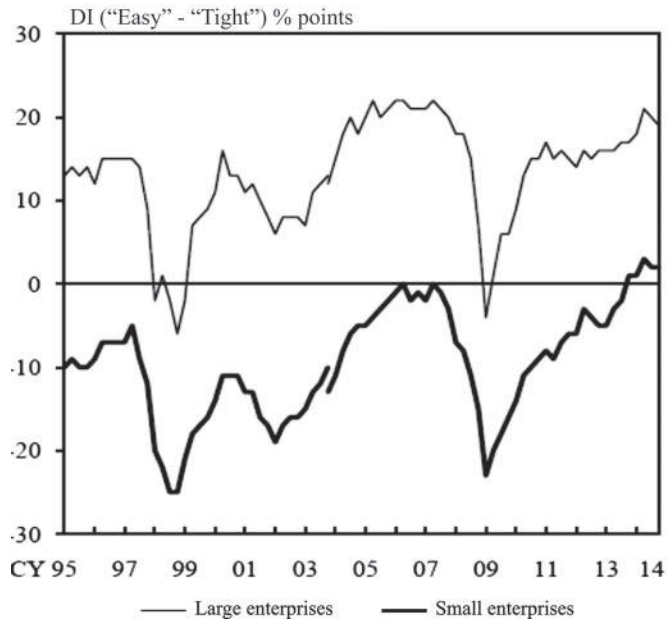


GDP = gross domestic product, MSME = micro, small, and medium-sized enterprise.
Note: Data include micro enterprises.
Source: ADB 2014.

revenues and 60% of GDP. They also provided 80% of urban job opportunities, introduced 75% of new products, and accounted for 65% of patents and inventions in the PRC (ADB 2014).

The Indonesian economy has grown resiliently amid rapid changes in the global economy, backed by strong domestic demand and driven by the micro, small, and medium-sized enterprise (MSME) sector. In Indonesia, there were 56.5 million MSMEs, accounting for 99.9% of total enterprises in 2012. The MSME sector has regularly recorded about 2% y-o-y growth in terms of number of enterprises, even during and after the 2008/09 global financial crisis. Primary industries such as agriculture, forestry, and fisheries accounted for about 50% of MSMEs in 2011, followed by wholesale and retail trade and the hotel and restaurant sector with a combined share of 28.8%. The MSME sector employed about 97% of the total workforce, accounting for 107.7 million employees in 2012 on 5.8% y-o-y growth. The sectors employing the greatest number of MSME workers in 2011 were primary industries (42.4% of all MSME employees), followed by trade (21.7%), manufacturing (11.7%), and services (10.5%). These sectors have underpinned the national economy, regularly contributing about 60% of GDP (Figure 3); the trade sector contributes the most at 26.7% of MSMEs' GDP contribution in 2011. Indonesian MSMEs accounted for 14.1% of total export value in 2012. Small-scale, export-oriented manufacturers, such as handicrafts and wooden furniture industries, exist across Indonesia and often organize in clusters, which helps to make their production

Figure 4. **Access to Finance—Small and Medium-Sized Enterprise and Large Firms in Japan**



CY = commercial year, DI = diffusion index.
Note: The diffusion index is a method of summarizing the common tendency of a group of statistical series.
Source: Bank of Japan. 2014. *Financial System Report October 2014*. Tokyo.

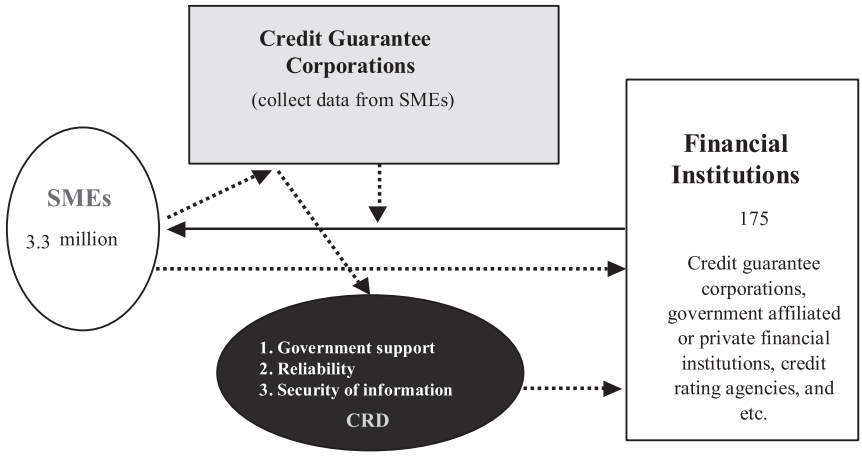
processes more efficient. MSME exports were directly affected by the 2008/09 global financial crisis, registering a sharp decrease of 8.9% in 2009. Although the business environment has gradually recovered since then, the growth of MSME exports remains volatile, as evidenced by the 11.1% y-o-y decrease in 2012 (ADB 2014).

C. Small and Medium-Sized Enterprises' Difficulties in Raising Money

Figure 4 shows the level of difficulty in raising money depending on firm size: the thick line shows the difficulties faced by SMEs, and the thin line shows the relative ease for large enterprises. Data points below zero indicate that companies are finding it difficult to raise money from either banks or the capital market. SMEs appear to face a more difficult situation in raising money when compared with large firms.[2]

[2]There are also nonbank financial institutions that can finance SMEs. For example, the coauthor of this paper, Naoyuki Yoshino, proposed the creation of Hometown Investment Trust Funds (HITs). HITs are new forms of financial intermediation that have been adopted as a national strategy in Japan. For more information on HITs, see Yoshino (2013) and Yoshino and Taghizadeh-Hesary (2014a, 2014b, and 2015).

Figure 5. **Credit Risk Database of Small and Medium-Sized Enterprises**



CRD = Credit Risk Database; SME = small and medium-sized enterprise.
Source: Authors and CRD website.[3]

III. Small and Medium-Sized Enterprise Database

Considering the importance of SMEs to many dimensions of Asian economic activity, further efforts need to be made to offer them access to finance. Their financial and nonfinancial accounts are often difficult to assess, but the Credit Risk Database (CRD) in Japan shows how SMEs can be rated based on financial and nonfinancial data. The CRD includes a huge amount of data that can be used to rate SMEs through statistical analysis.

Database Provided by the CRD Association

The CRD Association was established in 2001 as an initiative of the Japanese Ministry of Economy, Trade and Industry and the Small and Medium Enterprise Agency. The initial membership was 52 credit guarantee corporations as well as financial and nonfinancial institutions. Its aim was to facilitate fundraising for SMEs and to improve their operational efficiency. The association's membership increased from 73 institutions at the end of March 2002 to 175 by 1 July 2015.

The CRD covers SMEs exclusively (Figure 5). As of March 31, 2015 it included 2,210,000 incorporated SMEs and 1,099,000 sole-proprietor SMEs, and it is by far the largest SME database in Japan. The database for enterprises in default covered 500,000 incorporated and sole-proprietor SMEs. The CRD Association receives active support from both the private and public sectors, which has contributed

[3]www.crd-office.net

to its success. For example, the Small and Medium Enterprise Agency nominates representatives of the CRD Association to government councils, which gives the association an opportunity to promote its activities and increase its membership. Credit guarantee corporations and private financial institutions use the CRD when they create a joint guarantee scheme.[4] Before the CRD was formally established, the government invested ¥1.3 billion from the supplementary budgets for fiscal years 1999 and 2000 to finance the setting up of the CRD's computer system and other operational costs. The association provides sample data and statistical information, and scoring services.

Member financial institutions use scoring models to evaluate creditworthiness, check the validity of internal rating systems, and align loan pricing with credit risk. In addition, the CRD Association provides consulting services to support the management of SMEs on the assumption that if SMEs are better managed, this will reduce the credit risk for member financial institutions and strengthen SME business operations. Consulting services have also been offered to member financial institutions to help them promote implementation of Basel II.

If such systems could be established in other parts of Asia to accumulate and analyze credit risk data, and to measure each SME's credit risk accurately, SMEs would not only be able to raise funds from the banking sector, they could also gain access to the debt market by securitizing their claims.

IV. Analysis of Small and Medium-Sized Enterprise Credit Ratings Using Asian Data

Credit ratings are opinions expressed in terms of ordinal measures, reflecting the current financial creditworthiness of issuers such as governments, firms, and financial institutions. These ratings are conferred by rating agencies—such as Fitch Ratings, Moody's, and S&P—and may be regarded as a comprehensive evaluation of an issuer's ability to meet their financial obligations in full and on time. Hence, they play a crucial role by providing participants in financial markets with useful information for financial planning. To conduct rating assessments of large corporates, agencies resort to a broad range of financial and nonfinancial pieces of information, including domain experts' expectations. Rating agencies usually provide general

[4] A credit guarantee system would make it easier for banks to lend money to SMEs. For example, in the case of an SME default, a percentage of the losses would be met by the credit guarantee corporation, which is a governmental organization. For example, assuming a credit guarantee corporation sets 80% as the guarantee ratio, if an SME went into bankruptcy, a bank could recover 80% of its loan. If there were no credit guarantee system in place and an SME went into bankruptcy, the bank would lose its entire loan. Research is needed into the optimal level of partial credit guarantees; that is, the percentage at which a credit guarantee corporation can encourage lending yet ensure that banks have an incentive to carefully assess the creditworthiness of borrowers. Arráiz, Meléndez, and Stucchi (2014) have provided a framework for a partial credit guarantee system.

guidelines on their rating decision-making process, but detailed descriptions of the rating criteria and the determinants of banks' ratings are generally not provided (Orsenigo and Vercellis 2013). In search of more objective assessments of the creditworthiness of large corporate and financial institutions, there has been a growing body of research into the development of reliable quantitative methods for automatic classification according to their financial strength.

Extensive empirical research devoted to analyzing the stability and soundness of large corporates dates back to the 1960s. Ravi Kumar and Ravi (2007) provided a comprehensive survey of the application of statistical and intelligent techniques to predicting the likelihood of default among banks and firms. Despite its obvious relevance, however, the development of reliable quantitative methods for the prediction of large corporates' credit ratings has only recently begun to attract strong interest. These studies are mainly conducted within two broad research strands focusing on statistical and machine learning techniques, and may address both feature selection and classification. Poon, Firth, and Fung (1999) developed logistic regression models for predicting financial strength ratings assigned by Moody's, using bank-specific accounting variables and financial data. Factor analysis was applied to reduce the number of independent variables and retain the most relevant explanatory factors. The authors showed that loan provision information, and risk and profitability indicators added the greatest predictive value in explaining Moody's ratings. Huang et al. (2004) compared support vector machines and back-propagation neural networks to forecast the rating of financial institutions operating in the United States and Taipei,China, respectively. In each case, five rating categories were considered based on information released by S&P and TRC, respectively. The analysis of variance was used to discard noninformative features. In this study, support vector machines and neural networks achieved comparable classification results. However, the authors found that the relative importance of the financial variables used as inputs by the optimal models were quite different between the two markets.

In a more recent study, Yoshino, Taghizadeh-Hesary, and Nili (2015) used two statistical analysis techniques on various financial variables taken from bank statements for the classification and credit rating of 32 Iranian banks. The underlying logic of both techniques—principal component analysis (PCA) and cluster analysis—is dimension reduction; that is, summarizing information on numerous variables in just a few variables. While the two techniques achieved this in different ways, their results both classified 32 banks into two groups and sorted them based on their credit ratings.

While the aforementioned examples are for credit ratings of large corporate and financial institutions, the story is different for SMEs because of the lack of data. In Japan and other Asian economies, rating SMEs is regarded as a difficult action when compared to rating large corporates; data is available for large corporates

because of official auditing, while for SMEs, there are no such auditing requirements. As mentioned earlier, the CRD Association started to compile a database on SMEs, which made it much easier to evaluate SMEs since the huge datasets tell us the normal distribution of SME data. In Japan, SMEs have been categorized since 2012 into one of five rating classifications based on the CRD.

In this section, we present an efficient and comprehensive scheme for rating the creditworthiness of SMEs. First, we examine various financial ratios that describe the characteristics of SMEs and which enable banks to categorize their SME customers into different groups based on their financial health. The data for this statistical analysis were provided by an Asian bank for 1,363 SMEs.

A. Selection of the Variables

A large number of possible ratios have been identified as useful in predicting a firm's likelihood of default. Chen and Shimerda (1981) show that out of more than 100 financial ratios, almost 50% were found useful in at least one empirical study. Some have argued that quantitative variables are not sufficient to predict SME defaults and that including qualitative variables—such as the legal form of the business, the region where the main business is carried out, and industry type—improves a model's predictive power (Lehmann 2003; Grunert, Norden, and Weber 2004). However, the data used here are based on firms' financial statements, which do not contain such qualitative variables.

We have followed Altman and Sabato (2007) and Yoshino and Taghizadeh-Hesary (2014b) who proposed five categories to describe a company's financial profile: (i) liquidity, (ii) profitability, (iii) leverage, (iv) coverage, and (v) activity. For each of these categories, they created a number of financial ratios identified in the literature. Table 2 shows the financial ratios selected for this survey.

The firms considered as being unsound in this study are those whose risk-weighted assets are greater than their shareholders' equity.

In the next stage, two statistical techniques are used: PCA and cluster analysis. The underlying logic of both techniques is dimension reduction—summarizing information on multiple variables into just a few variables—but they achieve this in different ways. PCA reduces the number of variables into components (or factors). Cluster analysis reduces the number of SMEs by placing them in small clusters. In this survey, we use components (factors) that are the result of PCA and then run the cluster analysis in order to group the SMEs.

B. Principal Component Analysis

PCA is a standard data-reduction technique that extracts data, removes redundant information, highlights hidden features, and visualizes the main relationships

Table 2. **Examined Variable**

No.	Symbol	Definition	Category
1	Equity_TL	Equity (book value)/total liabilities	Leverage
2	TL_Tassets	Total liabilities/total assets	
3	Cash_Tassets	Cash/total assets	Liquidity
4	WoC_Tassets	Working capital/total assets	
5	Cash_Sales	Cash/net sales	
6	EBIT_Sales	Ebit/sales	Profitability
7	Rinc_Tassets	Retained earnings/total assets	
8	Ninc_Sales	Net income/sales	
9	EBIT_IE	Ebit/interest expenses	Coverage
10	AP_Sales	Account payable/sales	Activity
11	AR_TL	Account receivable/total liabilities	

Notes: Retained earnings refers to the percentage of net earnings not paid out as dividends, but retained by the company to be reinvested in its core business or to pay debt; it is recorded under shareholders' equity in the balance sheet. Ebit refers to earnings before interest and taxes. Account payable refers to an accounting entry that represents an entity's obligation to pay off a short-term debt to its creditors; the accounts payable entry is found on a balance sheet under current liabilities. Account receivable refers to money owed by customers (individuals or corporations) to another entity in exchange for goods or services that have been delivered or used, but not yet paid for; receivables usually come in the form of operating lines of credit and are usually due within a relatively short time period, ranging from a few days to 1 year.
Source: Authors' description.

that exist between observations.[5] PCA is a technique for simplifying a dataset, by reducing multidimensional datasets to lower dimensions for analysis. Unlike other linear transformation methods, PCA does not have a fixed set of basis vectors. Its basis vectors depend on the dataset, and PCA has the additional advantage of indicating what is similar and different about the various models created (Bruce-Ho and Dash-Wu 2009). Through this method, we reduce the 11 variables listed in Table 2 to determine the minimum number of components that can account for the correlated variance among SMEs.

In order to examine the suitability of these data for factor analysis, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were performed. KMO is a measure of sampling adequacy that indicates the proportion of common variance that might be caused by underlying factors. High KMO values (larger than 0.6) generally indicate that factor analysis may be useful, which is the case in this study as the KMO value is 0.71. If the KMO value is less than 0.5, factor analysis will not be useful. Bartlett's test of sphericity indicates whether the correlation matrix is an identity matrix, indicating that variables are unrelated. A significance level less than 0.05 indicates that there are significant relationships among the variables, which is the case in this study as the significance of Bartlett's test is less than 0.001.

[5]PCA can be also called the Karhunen–Loève transform (KLT), named after Kari Karhunen and Michel Loève.

Table 3. **Total Variance Explained**

Component	Eigenvalues	% of Variance	Cumulative Variance %
Z1	**3.30**	**30.00**	**30.00**
Z2	**2.19**	**19.90**	**49.90**
Z3	**1.25**	**11.38**	**61.28**
Z4	**1.08**	**9.78**	**71.06**
Z5	0.94	8.56	79.62
Z6	0.75	6.79	86.41
Z7	0.56	5.09	91.50
Z8	0.48	4.36	95.86
Z9	0.32	2.87	98.73
Z10	0.13	1.14	99.87
Z11	0.09	0.13	100.00

Source: Authors' calculations.

Table 4. **Factor Loadings of Financial Variables after Direct Oblimin Rotation**

Variables (Financial Ratios)	Component			
	Z1	**Z2**	**Z3**	**Z4**
Equity_TL	0.009	0.068	0.113	**0.705**
TL_Tassets	−0.032	**−0.878**	0.069	−0.034
Cash_Tassets	−0.034	−0.061	**0.811**	0.098
WoC_Tassets	−0.05	**0.762**	0.044	0.179
Cash_Sales	**−0.937**	0.021	0.083	0.009
EBIT_Sales	**0.962**	0.008	0.024	−0.004
Rinc_Tassets	0.014	**0.877**	0.015	−0.178
Ninc_Sales	**0.971**	−0.012	0.015	0.014
EBIT_IE	0.035	0.045	**0.766**	−0.098
AP_Sales	**−0.731**	−0.017	−0.037	−0.016
AR_TL	0.009	−0.041	−0.104	**0.725**

Notes: The extraction method was principal component analysis. The rotation method was direct oblimin with Kaiser normalization.
Source: Authors' calculations.

Next, we determine how many factors to use in our analysis. Table 3 reports the estimated factors and their eigenvalues. Only those factors accounting for more than 10% of the variance (eigenvalues >1) are kept in the analysis. As a result, only the first four factors were finally retained. Taken together, Z1 through Z4 explain 71% of the total variance of the financial ratios.

In running the PCA, we used direct oblimin rotation. Direct oblimin is the standard method to obtain a non-orthogonal (oblique) solution—that is, one in which the factors are allowed to be correlated. In order to interpret the revealed PCA information, the pattern matrix must then be studied. Table 4 presents the pattern matrix of factor loadings by the use of the direct oblimin rotation method, where variables with large loadings, absolute value (>0.5) for a given factor, are highlighted in bold.

Table 5. **Component Correlation Matrix**

Component	Z1	Z2	Z3	Z4
Z1	1	0.037	−0.031	−0.005
Z2	0.037	1	0.106	0.102
Z3	−0.031	0.106	1	0.033
Z4	−0.005	0.102	0.033	1

Note: The extraction method is principal component analysis. The rotation method is direct oblimin with Kaiser normalization.
Source: Authors' calculations.

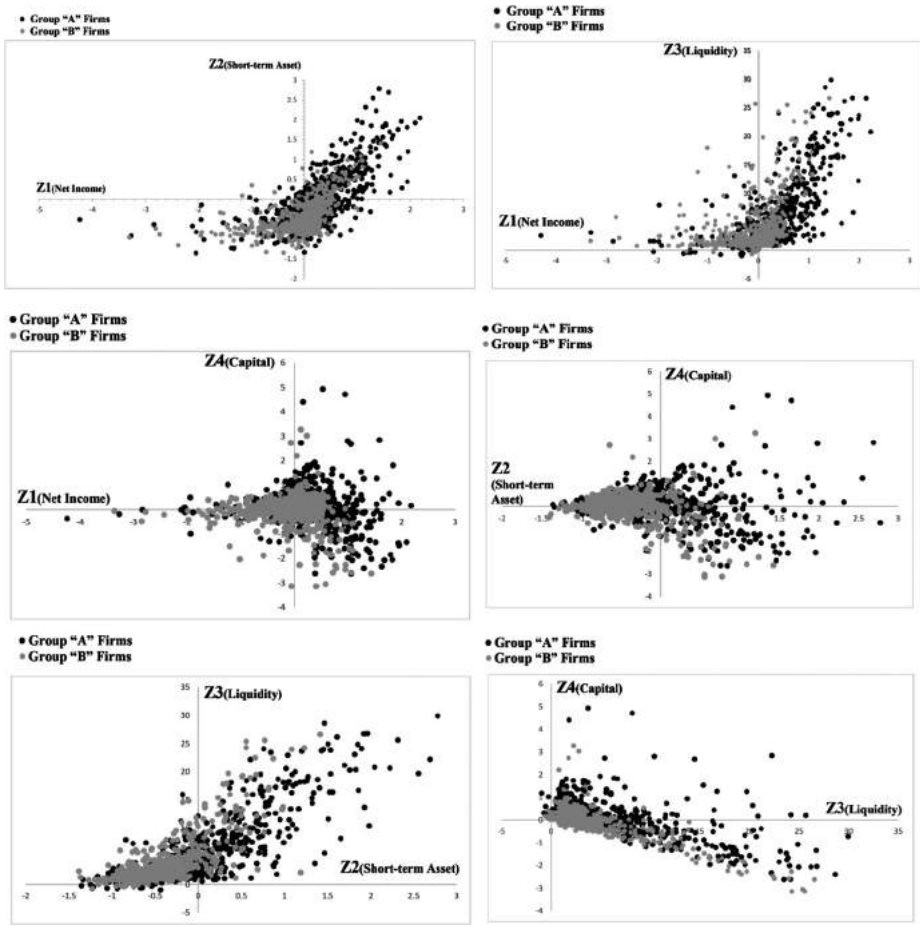
As can be seen in Table 4, the first component, Z1, has four variables with an absolute value (>0.5), of which two are positive (ebit/sales and net income/sales) and two are negative (cash/net sales and account payable/sales). For Z1, the variables with large loadings are mainly net income and earnings. Hence, Z1 generally reflects the net income of an SME. As this factor explains the most variance in the data, it is the most informative indicator of an SME's overall financial health. Z2 reflects short-term assets. This component has three major loading variables: (i) liabilities/total assets, which is negative, meaning that an SME has few liabilities and mainly relies on its own assets; (ii) working capital/total assets, which is positive, meaning an SME has short-term assets; (iii) retained earnings/total assets, which is positive, meaning an SME has some earnings that it keeps with the company or in the bank. These three variables indicate an SME whose reliance on borrowings is small and which is rich in working capital and retained earnings, and therefore has plenty of short-term assets. Z3 reflects the liquidity of SMEs. This factor has two variables with large loadings (cash/total assets and ebit/interest expenses), both with positive values, which shows an SME that is cash-rich and has high earnings. Hence, it mainly reflects an SME's liquidity. The last factor, Z4, reflects capital. This factor has two variables with large loadings, both with positive values: equity (book value)/total liabilities and accounts receivable/total liabilities, meaning an SME with few liabilities that is rich in equity.

Table 5 shows the correlation matrix of the components and shows there is no correlation between these four components. This means we could have used a regular orthogonal rotation approach to force an orthogonal rotation, although in this survey, we used an oblique rotation method, which still provided basically an orthogonal rotation factor solution because these four components are not correlated with each other and are distinct entities.

Figure 6 shows the distribution of the four components (Z1, Z2, Z3, and Z4) for Group A, which comprises financially sound SMEs, and Group B, which comprises unsound SMEs.

It is clear from all six graphs in this figure that Group A SMEs can generally be found in the positive areas of the graphs and Group B SMEs in the negative areas in most cases. This is evidence that these four defined components (Z1, Z2, Z3, and Z4) are able to separate SMEs, suggesting they represent a good measure for showing the financial soundness of SMEs.

Figure 6. **Distribution of Factors for SME Groups A and B**

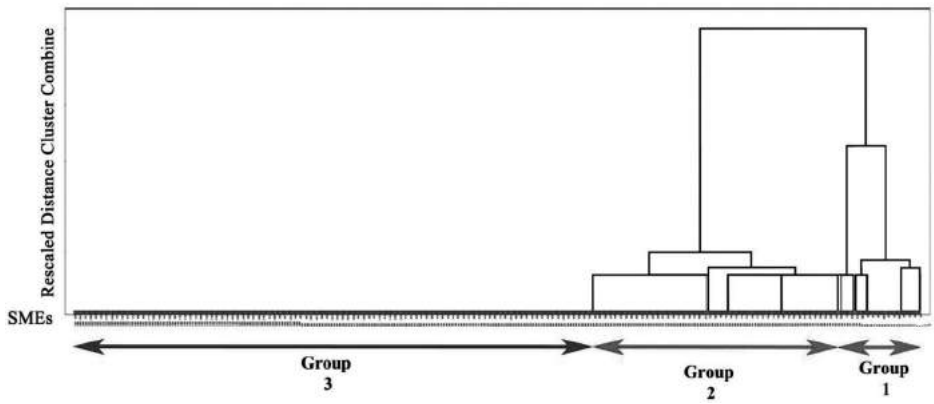


SME = small and medium-sized enterprise.
Notes: Group A = sound SMEs, group B = unsound SMEs. The firms considered to be unsound in this study have risk-weighted assets greater than their shareholders' equity.
Source: Authors' calculations.

C. Cluster Analysis

In this section we take the four components that were used in the previous section and identify those SMEs that have similar traits. We then generate clusters and place the SMEs in distinct groups. To do this, we employ cluster analysis, which organizes a set of data into groups so that observations from a group with similar characteristics can be compared with those from a different group (Martinez and Martinez 2005). The result of the cluster analysis tells us how much each individual SME is close to others and it looks at the distance between two companies based on their financial statements. If they are close to each other in the cluster analysis, it

Figure 7. **Dendrogram Using Average Linkage**



SME = small and medium-sized enterprise.
Source: Authors' calculations.

means their financial statements are similar; if two SMEs are different, it means their financial statements are completely different. Thus, the similarities and differences between two companies are statistically analyzed.

In this case, SMEs were organized into distinct groups according to the four components derived from the PCA used in the previous section. Cluster analysis techniques can themselves be broadly grouped into three classes: hierarchical clustering, optimization clustering, and model-based clustering.[6] We used the most prevalent method of these in the literature, hierarchical clustering. This produced a nested sequence of partitions by merging (or dividing) clusters. At each stage of the sequence, a new partition is optimally merged (or divided) from the previous partition according to some adequacy criterion. The sequence of partitions ranges from a single cluster containing all the individuals to a number of clusters (n) containing a single individual. The series can be described by a tree display called the dendrogram (Figure 7). Agglomerative hierarchical clustering proceeds by a series of successive fusions of the n objects into groups. By contrast, divisive hierarchical methods divide the n individuals into progressively finer groups. Divisive methods are not commonly used because of the computational problems they pose (Everitt, Landau, and Leese 2001; Landau and Chis Ster 2010). Below, we use the average linkage method, which is a hierarchical clustering technique.

[6]The main difference between the hierarchical and optimization techniques is that in hierarchical clustering the number of clusters is not known beforehand. The process consists of a sequence of steps where two groups are either merged (agglomerative) or divided (divisive) according to the level of similarity. Eventually, each cluster can be subsumed as a member of a larger cluster at a higher level of similarity. The hierarchical merging process is repeated until all subgroups are fused into a single cluster (Martinez and Martinez 2005). Optimization methods on the other hand do not necessarily form hierarchical classifications of the data as they produce a partition of the data into a specified or predetermined number of groups by either minimizing or maximizing some numerical criterion (Feger and Asafu-Adjaye 2014).

The Average Linkage Method

The average linkage method defines the distance between clusters as the average distance from all observations in one cluster to all points in another cluster. In other words, it is the average distance between pairs of observations, where one is from one cluster and one is from the other. The average linkage method is relatively robust and also takes the cluster structure into account (Martinez and Martinez 2005, Feger and Asafu-Adjaye 2014, and Yoshino and Taghizadeh-Hesary 2014b, 2014c). The basic algorithm for the average linkage method can be summarized in the following manner:

- N observations start out as N separate groups. The distance matrix $D = (dij)$ is searched to find the closest observations, for example, Y and Z.

- The two closest observations are merged into one group to form a cluster (YZ), producing $N - 1$ total groups. This process continues until all observations are merged into one large group.

Figure 7 shows the dendrogram that results from this hierarchical clustering.

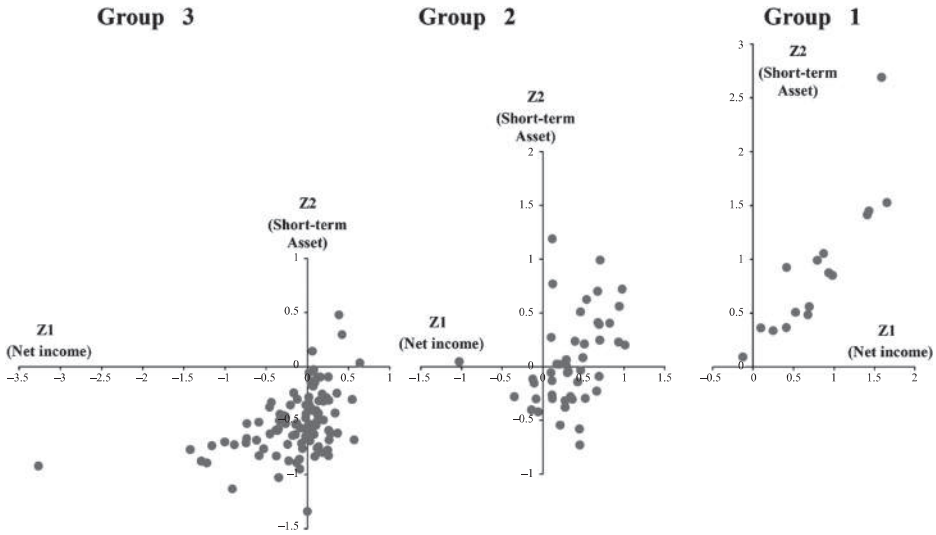
The resultant dendrogram (hierarchical average linkage cluster tree) provides a basis for determining the number of clusters by sight. In the dendrograms shown in Figure 7, the horizontal axis shows 1,363 SMEs. Because of the large number of SMEs in this survey, they have not been identified by number in the dendrogram, although this is how they are identified in this survey. Rather, the dendrogram categorizes the SMEs in three main clusters (Groups 1, 2, and 3), but it does not show which of these three clusters contains the financially healthy SMEs, which contains unhealthy SMEs, and which contains intermediate SMEs. Hence, there is one more step to go.

Figure 7 shows the 1,363 SMEs categorized into three major clusters. Using their components, which were derived from the PCA described in Section IV.B, we can plot the distribution of factors for each member of the three major clusters. Figure 8 shows the distribution of Z1–Z2 for these three cluster members separately.[7]

As it is clear in Figure 8, Group 1 comprises the healthiest SMEs, Group 3 the least healthy SMEs, and Group 2 the in-between SMEs. Interestingly, when we do this grouping using the other components (Z1–Z3, Z1–Z4, Z2–Z4, Z2–Z3, and Z3–Z4), the grouping is similar in most cases, which implies that this analysis is an effective way of grouping SMEs.

[7]The dendrogram shows us the major and minor clusters. One useful feature of this tree is that it identifies a representative SME of most of the minor groups, which has the average traits of the other members of the group. For simplification, in Figure 8, we have only used data from these representative SMEs, which explains the whole group's traits. This is why the total number of observations in Figure 8 is lower than the 1,363 observations in this survey.

Figure 8. **Grouping Based on Principal Component Analysis (Z1–Z2) and Cluster Analysis**



Notes: Group 1 comprises the healthiest SMEs. Group 2 represents the in-between SMEs. Group 3 represents the least healthy SMEs.
Source: Authors' calculations.

Table 6. **Average of Financial Ratios for Each Group of SMEs**

Variables (Financial Ratios)	SME Groups		
	Group 1	Group 2	Group 3
Equity_TL	1.11	0.77	0.33
TL_Tassets	0.56	0.62	0.78
Cash_Tassets	0.08	0.03	0.05
WoC_Tassets	0.15	0.11	0.04
Cash_Sales	0.06	0.05	0.05
EBIT_Sales	0.24	0.26	0.13
Rinc_Tassets	0.28	0.17	0.06
Ninc_Sales	0.20	0.25	0.18
EBIT_IE	22.88	7.74	2.04
AP_Sales	0.49	0.50	0.60
AR_TL	0.61	0.44	0.41

SME = small and medium-sized enterprise.
Notes: Group 1 comprises the healthiest SMEs. Group 2 represents the in-between SMEs. Group 3 represents the least healthy SMEs. For the definition of each variable (financial ratios) see Table 2.
Source: Authors' calculations.

For a robustness check of classfications based on the aforementioned method, we have done one more step and the results are summarized in Table 6.

Table 6 shows the average of the 11 financial ratios based on our classifications, which categorized 1,363 SMEs into three groups. The healthiest group of SMEs (Group 1) in all ratios had a relatively better performance in comparison with

the two other groups. The performance of the in-between SMEs (Group 2) in most cases was better than the least healthy SMEs (Group 3). On the other hand, 59% of firms in Group 3 are unsound firms, which means they have risk-weighted assets greater than their shareholders' equity. This percentage is higher than the share of unsound SMEs in either Group 1 or Group 2, demonstrating that the rationale of our method is acceptable and we can retain the results.

V. Concluding Remarks

SMEs play a significant role in all Asian economies. They are responsible for very high shares of employment and output. However, they find it difficult to borrow money from banks and other financial institutions. Using accumulated data on SMEs, we can carry out statistical analysis on their quality in a way that can facilitate bank financing for SMEs.

We applied 11 financial variables of 1,363 SMEs who are customers of Asian banks and subjected them to PCA and cluster analysis. The results showed that four variables (net income, short-term assets, liquidity, and capital) are the most important for describing the general characteristics of SMEs. Three groups of SMEs were then differentiated based on financial health.

The policy implications of this research are that if Asian governments can provide a comprehensive SME database—such as the CRD in Japan—and apply analytical techniques similar to those presented in this paper, then a comprehensive and efficient credit rating system for SMEs can be created. Accordingly, financially healthy SMEs could borrow more money from banks at lower interest rates because of their lower default risk, while SMEs in poor financial health would have to pay higher interest rates and have a lower borrowing ceiling. By using such a credit rating mechanism, banks could reduce the amount of nonperforming loans made to SMEs, which would improve the creditworthiness of the financial system and help healthy SMEs to raise money more easily from banks while contributing to economic growth.

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Rates of Return to Schooling in Thailand

KAEWKWAN TANGTIPONGKUL*

Using 2007–2010 data from Thailand's National Labor Force Survey, this paper examines the rates of return to schooling. The Mincer-type rate of return to investment in schooling was estimated. The rates of return to schooling for work experience are significantly positive, but at a decreasing rate. Region of residence and variation in gross provincial product per capita are significant factors in determining the private rate of return. The rates of return to schooling by type of industry reveal higher earnings in mining, utilities, construction, manufacturing, and services than in agriculture. The private and social returns on vocational secondary education attainment are greater than on general secondary education. Finally, the private returns on university attainment for women exceed men by about 1.5 percentage points.

Keywords: education, education policy, social rates of return to schooling, Thailand
JEL codes: I20, I21, I28

I. Introduction

This paper addresses the rate of return to formal education in Thailand. Human capital investment is essential to turn technical change and physical capital investment into productivity gains (Schultz 1975, Rosenzweig 1995, McMahon 1999). Progress in the Thai economy has shifted from agriculture to manufacturing and services (Krongkaew 1995; Krongkaew, Chamnivickorn, and Nitithanprapas 2006). In 1960, 82.3% of the Thai population was engaged in agriculture, while only 17.7% were engaged in nonagriculture activities in the manufacturing and services sector. In contrast, more than 50% of the labor force has been employed outside agriculture since 2000 (Table 1, Figure 1). Economic growth and restructuring have fundamentally changed the Thai labor force. The increasing demand for labor in the manufacturing and services sectors will require workers to gain more human capital. Workers need to apply knowledge and specific skills to perform tasks in nonagriculture sectors. Several studies have been done on the returns to education in Thailand. Amornthum and Chalamwong (2001) find that every additional year of education after the upper primary level leads to an increase in earnings, with males

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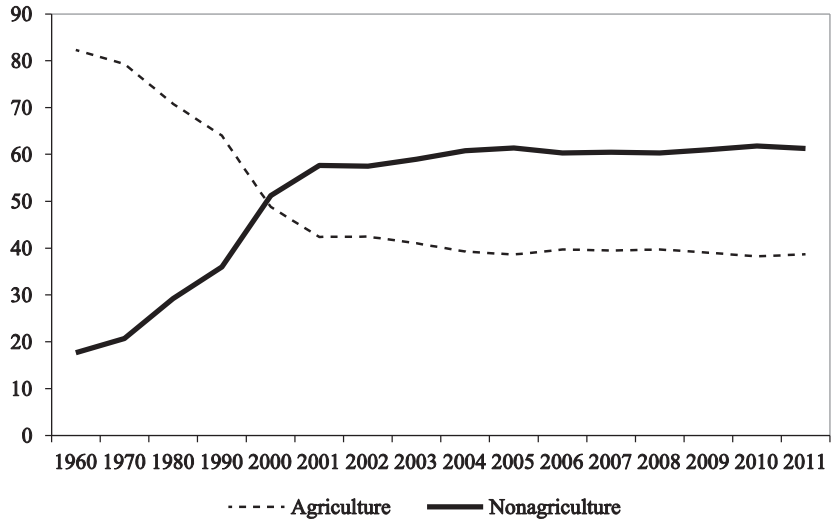
Table 1. **Sectoral Shares of Employment** (%)

	1960	**1970**	**1980**	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
Agriculture	82.3	79.3	70.8	64	48.8	42.40	42.47	41.02	39.26	38.6	39.7	39.5	39.7	39.0	38.2	38.7
Nonagriculture	17.7	20.7	29.2	36	51.2	57.60	57.53	58.98	60.74	61.4	60.3	60.5	60.3	61.0	61.8	61.3

Sources: Adapted from Krongkaew, M. and N. Kakwani. 2003. The Growth–Equity Trade-Off in Modern Economic Development: The Case of Thailand. *Journal of Asian Economics*. 14 (5). pp. 735–57; Tinakorn, P. 2002. Income Inequalities during Four Decades of National Development: 1961–2001. *Thammasat Economic Journal*. 20 (2/3). pp. 141–208; Figures for 2001–2011 are from the Government of Thailand, National Statistical Office. http://web.nso.go.th/

Figure 1. **Sectoral Shares of Employment**



Sources: Adapted from Krongkaew, M. and N. Kakwani. 2003. The Growth–Equity Trade-Off in Modern Economic Development: The Case of Thailand. *Journal of Asian Economics*. 14 (5). pp. 735–57; Tinakorn, P. 2002. Income Inequalities during Four Decades of National Development: 1961–2001. *Thammasat Economic Journal*. 20 (2/3). pp. 141–208; Figures for 2001–2011 are from the Government of Thailand, National Statistical Office. http://web.nso.go.th/

usually receiving higher returns than females. Hawley (2004) finds that completing an additional year of schooling provides an additional 11%–12% of monthly log earnings for both men and women. The impact of an additional year of schooling for urban residents is higher than for rural residents (Warunsiri and McNown 2010, Hawley 2004). Hawley (2003) and Moenjak and Worswick (2003) find that vocational secondary education provides higher earnings returns than general secondary education. Mehta et al. (2013) reveal that high-skilled services helped to lift college returns moderately in Thailand. Furthermore, Mehta et al. (2011) find little evidence of overeducation in unskilled jobs in Thailand. There is still limited evidence to answer the following questions: If students decide not to continue to higher education, which option between vocational education or general education will give higher private and social returns? And, if students decide to continue higher education, what are the private and social returns on a university degree?

This study's objective is to investigate the rates of return to schooling in Thailand based on a Mincerian earnings function. The empirical results suggest that schooling has a positive and significant impact on private and social returns to schooling. Secondary vocational education gives much higher private and social returns to schooling than secondary general education. However, after secondary education, evidence shows that completing higher education (e.g., bachelor's degree) gives private returns of 37.2% and social returns of 21.3%. These findings call into question the belief that aggregate demand for the college-educated increases rapidly.

Table 2. **Level of Education—Description and Goal**

Level of Education	Description
Pre-elementary	• A 2- or 3-year course in public or private pre-elementary school • Aims to nurture and prepare physical, mental, intellectual, and emotional skills of students for their elementary education
Elementary	• Grades 1–6 • Emphasizes basic literacy, numerical skills, and the cultivation of desirable behavior
Lower secondary	• Grades 7–9 • Allows students to explore their needs, areas of interests, and aptitudes; enables them to meet the demands of appropriate careers
Upper secondary	• Grades 10–12 • Aims to prepare students to meet labor market needs and promote their entrepreneurial skills through ➢ vocational and technical colleges for students with such skills, or ➢ academic colleges offering a general education
Diploma	• 1–4 years of study for students who have completed upper-secondary education • Aims to develop learners' knowledge and vocational skills at the semiskilled level, and enable them to initiate entrepreneurial activities
Undergraduate	• A 4-year course with some exceptions (e.g., architecture and medical science require 5–6 years of study; students who have received a diploma and passed an entrance examination can take a 2-year course to pursue at higher technological and educational institutions) • Aims to develop students' abilities to apply theories toward the country's development and capacity to meet international challenges
Graduate	• 1–3 years of study at the graduate diploma, master's degree, or doctoral degree levels • stimulates specialization and bringing theories into practice; focuses on the learners' perspective in looking at the world and improving the country's international competitiveness

Source: Government of Thailand, Ministry of Education. http://www.moe.go.th/moe.html

The paper is organized as follows. Section II discusses Thailand's educational system, policies, and planning. Section III gives an overview of the data. Section IV describes the empirical strategy. Section V discusses empirical results. Section VI highlights the policy implications and concludes.

II. Background on Thailand's Education System, Policies, and Planning

A. Thailand's Education System

Formal education in Thailand—which is based on the National Education Act, 1999 (revised 2002) and the Compulsory Education Act, 2002—is divided into two levels: basic and higher education. Basic education includes pre-elementary, elementary, and secondary levels. Higher education, or postsecondary education, includes diploma and degree levels. Table 2 presents goals and a description for each level of education. The pre-elementary level is a 2- or 3-year course that aims

Table 3. **Number of Students Enrolled by Level of Education**

	Number of Students		
Level of Education	**2007**	**2008**	**2009**
Pre-elementary	1,754,371	1,772,439	1,771,351
Elementary	5,561,937	5,342,794	5,166,379
Lower secondary	2,790,837	2,786,819	2,786,067
Upper secondary general	1,176,484	1,204,321	1,256,572
Secondary vocational	772,305	766,925	750,646
Higher vocational certificate	346,880	360,774	364,679
Diploma	23,569	23,509	22,836
Undergraduate degree	1,802,672	1,827,044	1,831,141
Graduate diploma	18,036	20,168	20,168
Master's degree	181,634	178,309	178,471
Higher graduate diploma	764	2,364	2,364
Doctorate degree	16,202	16,247	16,247
Total	**14,447,698**	**14,303,721**	**14,168,930**

Note: Data as of 10 June each year.
Source: Government of Thailand, Ministry of Education. http://www.moe.go.th/moe.html

to develop physical, mental, intellectual, and emotional skills among students. The elementary level is a 6-year course emphasizing basic literacy and numerical skills, and cultivating desirable behavior. The lower-secondary level is a 3-year course allowing students to explore their needs and areas of interest, and enabling them to meet the demands of appropriate careers. The upper-secondary level is a 3-year course, comprising either vocational or general education, aiming to prepare students for the labor market. Mandatory schooling includes the pre-elementary level to the upper-secondary level. Higher education includes diploma, undergraduate, and graduate programs. A diploma program is 1–4 years of study aiming to develop knowledge and vocational skills (semiskilled level), and enable students to initiate entrepreneurial activities. An undergraduate degree offers 4–6 years of study aiming to develop students' abilities by encouraging them to apply theories in practice toward the country's development. A graduate degree offers 1–3 years of study focusing on learners' broader perspectives of the world in order to improve the country's international competitiveness.

Table 3 shows the number of students enrolling in each level of education in 2007–2009. The number of students enrolling increases at the upper-secondary general level, mainly resulting from the government's 15-Year Free Education with Quality Policy launched in 2009. The number of students enrolling in higher education, including undergraduate degrees and higher vocational certificate programs, also increases due to the availability of student loan program and access to private universities.

B. Thailand's Education Policies and Planning

Thailand's education reform started in 1999. The National Education Act, 1999 was implemented during the first phase of education reform, which mandated

children aged 7 years old to enroll in primary and secondary education until they turn 16 years old or complete Grade 9. In 2009, implementation of the 15-Year Free Education with Quality Policy was initiated to lessen the financial burden of parents as well as to stimulate the economy. Students are provided with education from kindergarten through Grade 12, including general and vocational education. The policy covers tuition fees and expenses for books, utensils, uniforms, school equipment, and extracurricular activities. The second phase of education reform was implemented between 2010 and 2012. The investment plans under the second stimulus package of education included 11 projects: (i) teacher quality improvement, (ii) education support, (iii) modernized vocational education, (iv) transformation of Thailand into an education hub in Southeast Asia, (v) investment in education and general sciences and mathematics, (vi) school improvement, (vii) boosting moral and "Thai-ness" for the sustainable development of Thai children, (viii) school quality standardization, (ix) promotion of university research and national research universities, (x) education reform, and (xi) capacity building of internal sectors of the Ministry of Education.

III. Data and Sample

This study is based on 2007–2010 data from Thailand's National Labor Force Survey conducted by the National Statistical Office. The sample is drawn randomly from different households throughout the country. Each year of the survey consists of four quarterly sets of data: (i) January–March (dry or nonagricultural season), (ii) April–June (the period in which a large group of new workers enter the labor force after graduation), (iii) July–September (rainy and agricultural season), and (iv) October–December. The measure of education collected in the data relates to the level of education the respondent has completed. Because of the focus on private returns to education in this paper, only individuals who studied in the general or vocational education system and reported their monthly salary are included in the analysis. Those who are in religious schools are excluded. The analysis is limited to individuals aged 16–60 years at the time of the survey. The sample is further restricted to individuals who work as employees in either the government, a state enterprise, or a private sector business; individuals classified as employers or self-employed, or those whose work is restricted to household work were excluded. The data includes information gathered from (i) 209,999 individuals in 2007, (ii) 210,810 individuals in 2008, (iii) 209,260 individuals in 2009, and (iv) 191,593 individuals in 2010.

Variable names, means, and standard deviations are summarized in Table 4. The dependent variable for the estimation is the log of monthly earnings. Monthly earnings are the summation of monthly salary, average monthly bonus, and additional earnings each month. The explanatory variables include geographic region,

Table 4. **Descriptive Statistics of Dependent and Explanatory Variables**

Variable	Description	2007 Mean (Standard Deviation)	2008 Mean (Standard Deviation)	2009 Mean (Standard Deviation)	2010 Mean (Standard Deviation)
Sample size (N)		209,999	210,810	209,260	191,593
Dependent variables					
Log earnings	Natural logarithm of monthly earnings	8.86 (0.84)	8.92 (0.83)	8.92 (0.83)	8.97 (0.79)
Explanatory variables					
Bangkok$^{\psi}$	Living in Bangkok (yes = 1, no = 0)	0.08 (0.28)	0.09 (0.28)	0.09 (0.28)	0.08 (0.27)
North$^{\psi}$	Living in the northern region (yes = 1, no = 0)	0.18 (0.39)	0.18 (0.39)	0.18 (0.39)	0.18 (0.39)
Northeast$^{\psi}$	Living in the northeast region (yes = 1, no = 0)	0.18 (0.39)	0.18 (0.38)	0.18 (0.38)	0.18 (0.39)
South$^{\psi}$	Living in the southern region (yes = 1, no = 0)	0.16 (0.37)	0.16 (0.37)	0.16 (0.37)	0.17 (0.37)
Municipal$^{\psi}$	Living in a municipal area (yes = 1, no = 0)	0.66 (0.47)	0.65 (0.48)	0.65 (0.48)	0.65 (0.48)
Log gross provincial product per capita	Natural logarithm of gross provincial product per capita	11.49 (0.85)	11.57 (0.85)	11.59 (0.79)	11.69 (0.77)
Divorced, Widowed, or Separated$^{\psi}$	Marital status (divorced, widowed, or separated = 1, otherwise = 0)	0.07 (0.26)	0.08 (0.27)	0.08 (0.27)	0.08 (0.28)
Married$^{\psi}$	Marital status (married = 1, otherwise = 0)	0.68 (0.47)	0.67 (0.47)	0.67 (0.47)	0.66 (0.47)
Male$^{\psi}$	Gender (male = 1, otherwise = 0)	0.53 (0.50)	0.54 (0.50)	0.53 (0.50)	0.53 (0.50)
Years of schooling	Years of schooling	9.81 (4.91)	9.89 (4.93)	9.96 (4.94)	10.03 (4.93)
Primary education level$^{\psi}$	Education level (Finished primary education level = 1, otherwise = 0)	0.19 (0.39)	0.19 (0.39)	0.18 (0.39)	0.19 (0.39)
Lower secondary education level$^{\psi}$	Education level (Finished lower secondary education level = 1, otherwise = 0)	0.15 (0.35)	0.15 (0.35)	0.15 (0.36)	0.15 (0.36)
Upper secondary education level$^{\psi}$	Education level (Finished upper secondary education level = 1, otherwise = 0)	0.10 (0.30)	0.10 (0.30)	0.10 (0.30)	0.11 (0.31)
Higher vocational education level$^{\psi}$	Education level (Higher vocational certificate = 1, otherwise = 0)	0.06 (0.24)	0.06 (0.24)	0.06 (0.24)	0.06 (0.24)

Continued.

Table 4. *Continued.*

Variable	Description	2007 Mean (Standard Deviation)	2008 Mean (Standard Deviation)	2009 Mean (Standard Deviation)	2010 Mean (Standard Deviation)
Diploma$^{\psi}$	Education level (diploma = 1, otherwise = 0)	0.003 (0.06)	0.003 (0.06)	0.003 (0.05)	0.003 (0.06)
Bachelor $^{\psi}$	Education level (bachelor's degree = 1, otherwise = 0)	0.21 (0.41)	0.21 (0.41)	0.22 (0.41)	0.22 (0.41)
Master or higher$^{\psi}$	Education level (Master's degree or higher = 1, otherwise = 0)	0.03 (0.16)	0.03 (0.17)	0.03 (0.18)	0.03 (0.18)
Experience	Years of working experience	21.21 (12.27)	21.39 (12.33)	21.65 (12.45)	21.64 (12.52)
Experience squared	Years of working experience squared	600.42 (587.33)	609.51 (592.39)	623.69 (603.34)	624.93 (607.90)
Public$^{\psi}$	Working in the public sector (public sector = 1, otherwise = 0)	0.26 (0.44)	0.26 (0.44)	0.26 (0.44)	0.26 (0.44)
State enterprise$^{\psi}$	Work in the state-enterprise sector (state enterprise = 1, otherwise = 0)	0.02 (0.16)	0.03 (0.16)	0.02 (0.16)	0.02 (0.15)
Legislator$^{\psi}$	Occupation 1 (legislator, senior official, or manager = 1, otherwise = 0)	0.03 (0.18)	0.03 (0.18)	0.03 (0.18)	0.03 (0.18)
Professional$^{\psi}$	Occupation 2 (professional = 1, otherwise = 0)	0.13 (0.33)	0.13 (0.33)	0.13 (0.33)	0.13 (0.33)
Technician$^{\psi}$	Occupation 3 (technician or associated professional = 1, otherwise = 0)	0.09 (0.29)	0.09 (0.29)	0.09 (0.29)	0.09 (0.28)
Clerk$^{\psi}$	Occupation 4 (clerk = 1, otherwise = 0)	0.09 (0.28)	0.09 (0.28)	0.09 (0.29)	0.09 (0.29)
Service workers$^{\psi}$	Occupation 5 (service workers and shop or market sales worker = 1, otherwise = 0)	0.07 (0.25)	0.07 (0.25)	0.07 (0.26)	0.07 (0.26)
Skilled agricultural$^{\psi}$	Occupation 6 (skilled agricultural or fishery worker = 1, otherwise = 0)	0.06 (0.23)	0.06 (0.24)	0.06 (0.24)	0.06 (0.23)
Craft$^{\psi}$	Occupation 7 (craft and related trade worker = 1, otherwise = 0)	0.16 (0.37)	0.16 (0.37)	0.16 (0.37)	0.16 (0.37)

Continued.

Table 4. *Continued.*

Variable	Description	2007 Mean (Standard Deviation)	2008 Mean (Standard Deviation)	2009 Mean (Standard Deviation)	2010 Mean (Standard Deviation)
Machine operator$^{\psi}$	Occupation 8 (plant and machine operator or assembler = 1, otherwise = 0)	0.13 (0.34)	0.13 (0.34)	0.13 (0.33)	0.13 (0.33)
Agriculture$^{\psi}$	Industry 1 (agriculture, including fishing, hunting, and forestry = 1, otherwise = 0)	0.11 (0.31)	0.11 (0.32)	0.12 (0.32)	0.11 (0.31)
Mining$^{\psi}$	Industry 2 (mining and quarrying = 1, otherwise = 0)	0.002 (0.05)	0.003 (0.05)	0.002 (0.05)	0.003 (0.05)
Utilities$^{\psi}$	Industry 3 (utilities = 1, otherwise = 0)	0.01 (0.09)	0.01 (0.09)	0.01 (0.09)	0.01 (0.09)
Construction$^{\psi}$	Industry 4 (construction = 1, otherwise = 0)	0.10 (0.30)	0.10 (0.29)	0.10 (0.29)	0.10 (0.30)
Low-skill manufacturing$^{\psi}$	Industry 5 (low-skilled manufacturing = 1, otherwise = 0)	0.14 (0.35)	0.13 (0.34)	0.13 (0.34)	0.13 (0.33)
High-skill manufacturing$^{\psi}$	Industry 6 (high-skilled manufacturing = 1, otherwise = 0)	0.09 (0.29)	0.09 (0.29)	0.09 (0.29)	0.09 (0.29)
Low-skill services$^{\psi}$	Industry 7 (low-skilled services = 1, otherwise = 0)	0.21 (0.41)	0.21 (0.41)	0.22 (0.41)	0.22 (0.41)
High-skill services$^{\psi}$	Industry 8 (High-skilled services = 1, otherwise = 0)	0.34 (0.47)	0.34 (0.47)	0.34 (0.47)	0.34 (0.47)
Quarter 2$^{\psi}$	Quarter 2 dataset	0.25 (0.43)	0.25 (0.43)	0.25 (0.43)	0.28 (0.45)
Quarter 3$^{\psi}$	Quarter 3 dataset	0.24 (0.43)	0.25 (0.43)	0.24 (0.43)	0.18 (0.38)
Quarter4$^{\psi}$	Quarter 4 dataset	0.25 (0.43)	0.25 (0.43)	0.25 (0.43)	0.27 (0.44)

Source: Author's computations.

gross provincial product (GPP) per capita, gender, marital status, education level, type of occupation, type of industry, and years of experience. Geographic region is generated as a dummy variable and classified into four groups: (i) Bangkok, (ii) north, (iii) northeast, and (iv) south. There are 76 provinces in Thailand and each province is divided into municipal and nonmunicipal areas. An area of residence

dummy variable is equal to 1 for a municipal area and 0 for a nonmunicipal area. GPP per capita is included to account for economic variation among provinces. GPP is defined as the sum of what accrues to the various factors of production present in a given economy for their part in the productive process that leads to the final market value of a good or service. A dummy variable has been introduced for the gender of the respondent and is equal to 1 for a male and equal to 0 otherwise. A marital status variable was included in anticipation that married individuals were more motivated, worked harder, and earned higher incomes (Byron and Manaloto 1990). Marital status is generated as a dummy variable and classified into two groups: (i) married; and (ii) divorced, widowed, or separated. Education level is generated as a dummy variable and classified into eight groups: (i) primary education, (ii) lower general secondary education, (iii) upper general secondary education, (iv) vocational certificate, (v) higher vocational certificate, (vi) diploma, (vii) bachelor's degree, and (viii) higher than bachelor's degree. Type of occupation is used to capture the work characteristics' effect and is generated as a dummy variable and classified into nine groups: (i) legislators, senior officials, and managers; (ii) professionals; (iii) technicians and associated professionals; (iv) clerks; (v) service workers and shops and market sales workers; (vi) skilled agricultural and fishery workers; (vii) craft and related trades workers; (viii) plant and machine operators and assemblers; and (ix) elementary occupations. Type of industry is generated as a dummy variable and classified into eight industries according to the definitions of Mehta et al. (2013) and shown in Table 5. These include (i) agriculture, (ii) mining, (iii) utilities, (iv) construction, (v) low-skill manufacturing, (vi) high-skill manufacturing, (vii) low-skill services, and (viii) high-skill services. Sector of work is generated as a dummy variable and classified into three sectors: (i) public, (ii) state enterprise, and (iii) private. Actual years of experience of current and previous jobs are not reported. The potential years of experience variable is generated as a proxy and defined as the age reported at the time of the survey minus the age at time of leaving school minus 6 years. Thus, potential years of working experience is calculated by the following equation:

$$\text{years of working experience} = \text{age reported at the time of survey} - \text{age at time of leaving school} - 6 \text{ years}$$

Experience squared is included in the model to reflect that the life cycle of earnings is not a linear pattern of growth (Mincer 1974).

IV. Empirical Strategy and Methodology

The ordinary least squares method was used to describe factors associated with the returns to schooling. The following regression allows an estimate to be

Table 5. **Classification by Industry**

Sector	Description
Agriculture	(i) Agriculture
	(ii) Fishing
	(iii) Hunting
	(iv) Forestry
Mining	(i) Mining
	(ii) Quarrying
Utilities	(i) Electricity
	(ii) Water supply
	(iii) Gas
Construction	
Low-skill manufacturing	(i) Food products
	(ii) Tobacco
	(iii) Textiles
	(iv) Footwear
	(v) Apparel
	(vi) Nonwearing textile products
	(vii) Wood and cork products
	(viii) Furniture and fixtures
	(ix) Leather and fur products not for wearing
	(x) Rubber products
	(xi) Petroleum products
	(xii) Other nonmetallic mineral products
	(xiii) Metal products, excluding machines
	(xiv) Transport equipment
	(xv) Miscellaneous
High-skill manufacturing	(i) Paper and paper products, printing, publishing
	(ii) Chemicals and chemical products
	(iii) Basic metals
	(iv) Machinery
	(v) Electrical machinery
	(vi) Medical and scientific equipment
	(vii) Photographic and optical products
	(viii) Watches and clocks
Low-skill services	(i) Retail trade
	(ii) Transportation
	(iii) Personal and household services
	(iv) Hotels and restaurants
	(v) Wholesale trade
	(vi) Recreational and cultural and cultural services
	(vii) Warehousing
	(viii) Sanitary and similar activities
High-skill services	(i) Public administration and defense
	(ii) Education, scientific, and research
	(iii) Health and medical services
	(iv) Social work and other social and community services
	(v) Communications
	(vi) Financial intermediation
	(vii) Real estate
	(viii) Business activities, including renting
	(ix) Insurance

Sources: Government of Thailand, National Statistical Office 2001–2011; Mehta et al. 2013.

made of the monetary return by completed schooling level separate from the effect of postschool experience and other individual characteristics. The log earnings is a function of years of schooling, years of experience, and years of experience squared, as shown in equation (1). The regressions are based on Mincer (1974):

$$\ln W_i = \gamma_1 + \gamma_2 \textit{Yrs of schooling}_i + \beta_4 E_i + \beta_4 E_i^2 + u_i \tag{1}$$

where $\ln W_i$ is the log of monthly earnings of individual i, *Yrs of schooling*$_i$ represents years of schooling of individuals, E_i is a potential year of working experience of individual i, E_i^2 is a potential year of working experience squared, and u_i is the random disturbance term.

An extended earnings function which replaces *Year of schooling*$_i$ with levels of schooling and individual characteristics is shown in equation (2):

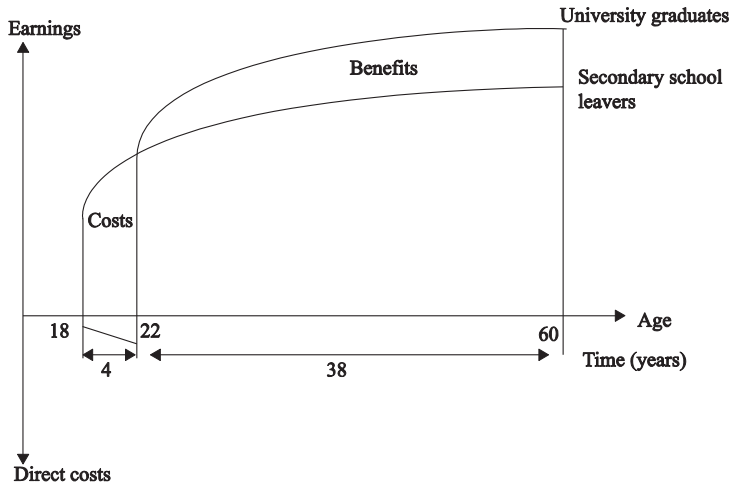
$$\ln W_i = \beta_1 + \beta_2 X_i + \beta_3 S_i + \beta_4 E_i + \beta_4 E_i^2 + u_i \tag{2}$$

where $\ln W_i$ is the log of monthly earnings of individual i, X_i represents a vector of background characteristics of individuals and control variables, S_i is a vector of completion of education attainment level of individual i, E_i is a potential year of working experience of individual i, E_i^2 is a potential year of working experience squared, and u_i is the random disturbance term. Experience is included to adjust the education coefficients for the impact of work experience in the labor market (Griliches 1977). All regression models are fitted by methods that generate White's standard errors, which account for potential failures of the assumption of residual heteroscedasticity. Sampling weights are included in the estimation of all models.

The internal rate of return of education is estimated in terms of both private and social rate of returns. The private rate of return is used to describe the demand for education and assess the equity effects of public education expenditures (Psacharopoulos 1994, 1995). On the other hand, the social rate of return reviews the costs and benefits of the education investment from the government's viewpoint (Psacharopoulos 1994, 1995). Psacharopoulos (1995) states that a key assumption in a social rate of return calculation is that observed wages are a good proxy for the marginal product of labor, especially in a competitive economy using data from the private sector of the economy. The first method to compute the private rate of return to an investment in a given level of education is finding the rate of discount (r) that equalizes the stream of discounted benefits to the stream of costs at a given point in time as shown in equation (3):

$$\sum_{t=1}^{38} \frac{(W_U - W_s)_t}{(1+r)^t} = \sum_{t=1}^{4} (W_S - C_U)_t (1+r)^t \tag{3}$$

Figure 2. **Stylized Age–Earnings Profiles**



Source: Adapted from Psacharopoulos, G. 1995. The Profitability of Investment in Education: Concepts and Methods. Human Capital Development and Operations Policy Working Paper No. 15280. Washington, DC: World Bank.

where $W_U - W_s$ is the earnings differential between a university graduate (subscript U) and a secondary general school graduate (subscript s, the control group), C_U represents the direct costs of university education (e.g., tuition, fees, books), and W_s denotes the student's foregone earnings or indirect costs (Psacharopoulos 1995). Figure 2 illustrates the stylized age–earning profiles between university graduates and secondary school leavers. Psacharopoulos (1995) stated that the main computation difference between private and social rates of return is that, for a social rate of return calculation, the costs include the government's large spending on education such as professorial salaries and the rental of buildings.

The second method is the shortcut method to approximate the private returns to education based on Psacharopoulos (1995):

$$private\ r = \frac{\bar{W}_U - \bar{W}_s}{4(\bar{W}_s)} \tag{4}$$

where $\bar{W}$ refers to the mean earnings of an individual with the subscripted education level, $\bar{W}_U$ is the mean earnings of an individual with a university education, $\bar{W}_s$ is the mean earnings of an individual with a general secondary education, and 4 years is the length of the university cycle. The social rate of return in this case is shown in equation (5):

$$social\ r = \frac{\bar{W}_U - \bar{W}_s}{4(\bar{W}_s + C_U)} \tag{5}$$

where C_U is the annual direct cost of university education.

Table 6. **Mincer-Type Returns to Education**

	Log Monthly Earnings			
Explanatory Variable	**2007**	**2008**	**2009**	**2010**
Constant	6.8274***	6.8884***	6.8628***	6.9836***
	(0.0098)	(0.0098)	(0.0093)	(0.0098)
Years of schooling	0.1376***	0.1337***	0.1322***	0.1263***
	(0.0005)	(0.0005)	(0.0005)	(0.0006)
Experience	0.0501***	0.0503***	0.0514***	0.0506***
	(0.0007)	(0.0006)	(0.0006)	(0.0006)
Experience squared	−0.0006***	−0.0006***	−0.0006***	−0.0006***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Number of observations	209,999	210,810	209,260	191,593
R-squared	0.4497	0.4577	0.4601	0.4575

Notes: Robust standard errors in parentheses. *** = significant at 1% level, ** = significant at 5% level.
Source: Author's computations.

V. Empirical Results

Table 6 gives means of the regression coefficient on years of schooling in a semilog earnings function from equation (1). These figures are interpreted as private returns to the typical year of education. The private returns on average are 13.8%, 13.4%, 14.2%, and 12.6% in 2007, 2008, 2009, and 2010, respectively. The rates of return to schooling for work experience were significantly positive, but at a decreasing rate. Table 7 gives means of the regression coefficient on levels of schooling in a semilog earnings function from equation (2) without control variables. An extended earnings function method (Psacharopoulos 1995) is fitted in the data set, where the educational variable enters as a set of education dummy variables, the set of rates of return to investment in the different levels of education reported in Table 8. The rate of return to investment in primary education in 2010 is only 1.8%. The rate of return to investment in secondary vocational education is higher than secondary general education. The rate of return to investment in a bachelor's degree in 2010 remained high at 20.8%.

The full estimated earnings regression functions from equation (2) are shown in Table 9. Earnings functions are estimated by regressing the log of monthly earnings on a vector of education dummies, regional residence, area of residence, GPP per capita, gender, marital status, type of occupation, type of industry, work experience, and work experience squared. In order to capture differences in rates of pay across regions, the model included region of residence and area of residence. Individuals in Bangkok earn on average about 2% more than individuals in the central region. Residents in the northern and northeastern regions earn on average about 10% less than residents in the central region. Per capita household income generally grew faster in the capital city and much more gradually in the northern and northeastern region between the late 1980s and the early 1990s, according to Thailand's

Table 7. **Determinants of Earnings (dependent variable: log monthly earnings)**

	Log Monthly Earnings			
Explanatory Variable	**2007**	**2008**	**2009**	**2010**
Constant	8.2439***	8.3047***	8.3176***	8.4071***
	(0.0049)	(0.0051)	(0.0049)	(0.0049)
Education attainment				
Primary education	0.1403***	0.1319***	0.1175***	0.1065***
	(0.0070)	(0.0070)	(0.0066)	(0.0069)
Lower secondary	0.3549***	0.3223***	0.2881***	0.2698***
	(0.0076)	(0.0076)	(0.0074)	(0.0072)
Upper secondary	0.5098***	0.4754***	0.4373***	0.4071***
	(0.0088)	(0.0084)	(0.0079)	(0.0083)
Secondary vocational	0.8165***	0.7445***	0.6937***	0.6442***
	(0.0117)	(0.0114)	(0.0122)	(0.0127)
Higher vocational	0.9015***	0.8494***	0.8112***	0.7586***
	(0.0099)	(0.0103)	(0.0096)	(0.0096)
Diploma	0.9417***	0.8324***	0.8667***	0.8014***
	(0.0508)	(0.0503)	(0.0442)	(0.0470)
Bachelor's	1.3888***	1.3404***	1.2997***	1.2371***
	(0.0071)	(0.0071)	(0.0070)	(0.0072)
Master's or higher	2.0688***	1.9743***	1.9650***	1.8829***
	(0.0147)	(0.0122)	(0.0119)	(0.0147)
Number of observations	209,999	210,810	209,260	191,593
R-squared	0.4071	0.4152	0.4145	0.4101

Notes: Robust standard errors in parentheses. *** = significant at 1% level, ** = significant at 5% level.
Source: Author's computations.

Table 8. **Returns to Education in Thailand: Extended Earnings Function Method** (%)

Education Level	**2007**	**2008**	**2009**	**2010**
Primary	2.3	2.2	1.9	1.8
Secondary (General)	6.2	5.7	5.3	5.0
Secondary (Vocational)	11.3	10.2	9.6	8.9
Bachelor's	21.9	21.6	21.6	20.8

Note: Computations are based on extended earnings function method described in Psacharopoulos, G. 1995. The Profitability of Investment in Education: Concepts and Methods. Human Capital Development and Operations Policy Working Papers No. 15280. Washington, DC: World Bank.

Household Socio-Economic Surveys conducted by the National Statistical Office (Krongkaew 1993, Krongkaew and Kakwani 2003). Residents in municipal areas earn about 8% more than residents living in nonmunicipal areas. GPP per capita is included to account for economic variation among provinces. GPP is defined as the sum of what accrues to the various factors of production present in a given economy for their part in the productive process that leads to the final market value of a good or service. In 2010, an increase in log GPP per capita by 10% on average would increase monthly earnings by 1.5%.

Table 9. **Determinants of Earnings (dependent variable: log monthly earnings)**

	Log Monthly Earnings			
Explanatory Variable	**2007**	**2008**	**2009**	**2010**
Constant	5.3086***	5.4360***	5.4913***	5.608***
	(0.0427)	(0.0391)	(0.0417)	(0.0399)
Education attainment				
Primary education	0.2070***	0.1834***	0.1602***	0.1601***
	(0.0071)	(0.0076)	(0.0071)	(0.0069)
Lower secondary	0.4107***	0.3759***	0.3367***	0.3512***
	(0.0082)	(0.0085)	(0.0080)	(0.0079)
Upper secondary	0.5452***	0.5058***	0.4659***	0.4730***
	(0.0091)	(0.0095)	(0.0088)	(0.0092)
Secondary vocational	0.6794***	0.6371***	0.5805***	0.5981***
	(0.0109)	(0.0108)	(0.0107)	(0.0116)
Higher vocational	0.8562***	0.8084***	0.7480***	0.7637***
	(0.0108)	(0.0110)	(0.0102)	(0.0103)
Diploma	0.8207***	0.7175***	0.7580***	0.7209***
	(0.0420)	(0.0460)	(0.0347)	(0.0353)
Bachelor's	1.1560***	1.1082***	1.0343***	1.0498***
	(0.0110)	(0.0108)	(0.0103)	(0.0107)
Master's or higher	1.6239***	1.5312***	1.4745***	1.4810***
	(0.0171)	(0.0151)	(0.0144)	(0.0167)
Region of residence				
Bangkok	0.0020	0.0194***	0.0255***	0.0250***
	(0.0057)	(0.0052)	(0.0049)	(0.0054)
North	−0.1419***	−0.1469***	−0.1342***	−0.1173***
	(0.0064)	(0.0060)	(0.0057)	(0.0055)
Northeast	−0.1188***	−0.1030***	−0.1094***	−0.1044***
	(0.0074)	(0.0071)	(0.0068)	(0.0067)
South	0.0057	0.0163***	−0.0213***	−0.0179***
	(0.0056)	(0.0053)	(0.0052)	(0.0054)
Area of residence				
Municipal	0.0834***	0.0855***	0.0977***	0.0854***
	(0.0032)	(0.0031)	(0.0031)	(0.0033)
Log gross provincial product per capita	0.1604***	0.1570***	0.1559***	0.1505***
	(0.0034)	(0.0032)	(0.0034)	(0.0032)
Male	0.1631***	0.1672***	0.1659***	0.1555***
	(0.0040)	(0.0039)	(0.0037)	(0.0039)
Marital status				
Married	0.0535***	0.0604***	0.0734***	0.0777***
	(0.0049)	(0.0044)	(0.0043)	(0.0046)
Divorced, separated, or widowed	−0.0107	−0.0067	−0.0034	−0.0053
	(0.0086)	(0.0077)	(0.0075)	(0.0076)
Work characteristics				
Experience	0.0350***	0.0336***	0.0330***	0.0336***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Experience squared	−0.0004***	−0.0004***	−0.0004***	−0.0004***
	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Public	0.1500***	0.1354***	0.1592***	0.1298***
	(0.0072)	(0.0071)	(0.0067)	(0.0075)

Continued.

Table 9. *Continued.*

	Log Monthly Earnings			
Explanatory Variable	**2007**	**2008**	**2009**	**2010**
State enterprise	0.3921***	0.3685***	0.3743***	0.4020***
	(0.0158)	(0.0140)	(0.0147)	(0.0166)
Legislator	0.3547***	0.3828***	0.3896***	0.4115***
	(0.0151)	(0.0150)	(0.0150)	(0.0150)
Professional	0.4674***	0.4945***	0.5012***	0.5018***
	(0.0102)	(0.0094)	(0.0094)	(0.0104)
Technician	0.3686***	0.3544***	0.3454***	0.3461***
	(0.0087)	(0.0077)	(0.0076)	(0.0085)
Clerk	0.2145***	0.2096***	0.2125***	0.2022***
	(0.0076)	(0.0071)	(0.0072)	(0.0074)
Service workers	0.1415***	0.1444***	0.1454***	0.1354***
	(0.0075)	(0.0089)	(0.0071)	(0.0077)
Skilled agricultural	0.1138***	0.1817***	0.0878***	0.1182***
	(0.0125)	(0.0112)	(0.0106)	(0.0116)
Craft	0.0594***	0.0635***	0.0683***	0.0811***
	(0.0065)	(0.0063)	(0.0060)	(0.0062)
Machine operator	0.2254***	0.2220***	0.2115***	0.2078***
	(0.0066)	(0.0061)	(0.0059)	(0.0063)
Mining	0.6015***	0.6067***	0.5466***	0.5099***
	(0.0419)	(0.0327)	(0.0368)	(0.0368)
Utilities	0.4870***	0.3958***	0.4488***	0.3329***
	(0.0304)	(0.0307)	(0.0266)	(0.0280)
Construction	0.3653***	0.3454***	0.3380***	0.2697***
	(0.0105)	(0.0103)	(0.0099)	(0.0098)
Low-skill manufacturing	0.3463***	0.3374***	0.3061***	0.2789***
	(0.0105)	(0.0098)	(0.0097)	(0.0094)
High-skill manufacturing	0.4645***	0.4386***	0.4021***	0.3702***
	(0.0105)	(0.0098)	(0.0098)	(0.0097)
Low-skill services	0.4135***	0.3888***	0.3814***	0.3314***
	(0.0098)	(0.0092)	(0.0091)	(0.0090)
High-skill services	0.3487***	0.3389***	0.3379***	0.2765***
	(0.0103)	(0.0101)	(0.0099)	(0.0099)
Survey quarter				
Quarter 2	0.0136***	−0.0040	−0.0065	0.0099**
	(0.0051)	(0.0049)	(0.0047)	(0.0046)
Quarter 3	0.0146***	0.0196***	0.0243***	0.0365
	(0.0052)	(0.0050)	(0.0047)	(0.0052)
Quarter 4	0.0271***	0.0122***	0.0190***	0.0347
	(0.0053)	(0.0049)	(0.0047)	(0.0046)
Number of observations	209,999	210,810	209,260	191,593
R-squared	0.6116	0.6282	0.6332	0.6176

Notes: Robust standard errors in parentheses. *** = significant at 1% level, ** = significant at 5% level.
Source: Author's computations.

In addition, these findings show that men on average receive significantly higher monthly earnings than women. In contrast, Warunsiri and McNown (2010) find that, using the pseudo-panel approach on Thailand's National Labor Force Surveys from 1986 through 2005, females have higher returns than males. Nakavachara

(2010) shows that higher levels of education among females did not result in them earning more than males in Thailand. Married workers on average earned about 7% more than single workers in 2009 and 2010. The differences in monthly earnings for workers with divorced, widowed, or separated marital status were not statistically significant.

The rates of return to schooling for work experience were significantly positive, but at a decreasing rate. The Mincer-type earnings function shows that if students decide not to continue to higher education then vocational education attainment will return higher earnings than general education attainment. The sample is restricted to individuals who work as employees in either the government, private sector businesses, or state enterprises, excluding individuals classified as employers or self-employed, or individuals whose work is restricted to household work. The private sector is the base category for sector of occupation variables. Individuals who work as employees in the public sector on average earned 13% more than private sector employees in 2010. Individuals who worked as employees in state enterprises on average earned 40.2% more than private sector employees in 2010.

The rates of return to schooling for all types of occupations are significant. The elementary occupations are the omitted category for type of occupation variables. Examples of elementary occupations include cleaners, doormen, messengers, drivers, and laborers. Legislators, senior officers, and managers had higher earnings on average of about 41% than those in elementary occupations in 2010. Professionals had higher earnings on average of about 50% than those in elementary occupations in both 2009 and 2010. Technicians and associated professionals had higher earnings on average of about 35% than those in elementary occupations in years 2008, 2009, and 2010. Clerks had higher earnings on average of about 20% than those in elementary occupations in year 2010. Service workers and sales workers had higher earnings on average of about 14% than elementary occupations in years 2007, 2008, 2009, and 2010. Skilled agricultural and fishery workers had higher earnings on average of 12% than those in elementary occupations in year 2010. Individuals with work in crafts and related trades had higher earnings on average of about 8% than those in elementary occupations in year 2010. Plant and machine operators and assemblers had higher earnings on average of about 21% than those in elementary occupations in years 2009 and 2010. All types of occupations received higher monthly earnings when compared with elementary occupations in years 2007, 2008, 2009, and 2010.

The rates of return to schooling for all types of industry are significant. The agriculture industry is the omitted category for type of industry variables. Examples from the agriculture industry include agriculture, fishery, hunting, and forestry. Workers in the mining industry had higher earnings on average of about 50% than agriculture industry workers in 2010. Workers in the utilities industry had higher earnings on average of about 33% than agriculture industry workers in 2010. Workers in the construction industry had higher earnings on average of

Table 10. **Mean Earnings and Direct Cost by Level of Education, 2010**

Education Level	Mean Earnings Cycle (B/year)	Length of School (years)	Annual Direct Cost per Public School Year (B)
No education	51,302.5	n.a.	n.a.
Primary	66,449.5	6	40,970
Secondary (General)	90,258.8	6	29,600
Secondary (Vocational)	122,657.4	3	29,600
		3	40,242
University	224,654.5	4	67,885

B = baht, n.a. = not applicable.
Note: $1 = B35.65 as of 28 August 2015.
Sources: Government of Thailand, National Statistical Office. National Labor Force Survey (Table 2: Number and Percentage of Employed Persons by Industry, 2001–2011). http://service.nso.go.th/nso/nso_center /project/search_center/23project-th.htm (accessed 30 May 2011); National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/699

Table 11. **Returns to Education—Full Discounting Method** (%)

Education Level	Social Returns
Primary	3.4
Secondary (General)	5.7
Secondary (Vocational)	8.0
University	11.3

Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/699

about 27% than agriculture industry workers in 2010. Individuals with work in low-skill manufacturing had higher earnings on average of about 28% than agriculture industry workers in 2010. Individuals with work in high-skill manufacturing had higher earnings on average of about 37% than agriculture industry workers in 2010. Individuals with work in low-skill services had higher earnings on average of about 33% than agriculture industry workers in 2010. Individuals with work in high-skill services had higher earnings on average of about 28% than agriculture industry workers in 2010. Workers in all types of industries received higher monthly earnings when compared with those in the agriculture industry. However, the gap between average monthly earnings in these particular industries and the agriculture industry tended to narrow between 2007 and 2010.

The mean earnings and annual direct cost by level of education irrespective of age are illustrated in Table 10. The annual direct cost for public schools by level of education is taken from the National Education Account of Thailand. On the basis of information provided in Tables 10, A.1, and A.2, it is possible to estimate private and social returns to different levels of education based on equation (3) as shown in Table 11. The availability on earnings profile is only for individuals aged 16–60 years old. Due to the data limitation, the missing earnings information for individuals with

Table 12. **Shortcut Estimates of the Returns to Education** (%)

Education Level	Private Returns	Social Returns
Primary	4.9	2.7
Secondary (General)	6.0	4.1
Secondary (Vocational)	14.1	8.8
University	37.2	21.3

Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File /DownloadFile/699

no education and primary education aged 15 years or below will be replaced with the average earnings at 16 years old. Psacharopoulos (1994) and Psacharopoulos and Patrinos (2004) state that the difference between the private and social rates of return reflects the degree of public subsidization of education. The social returns on primary education are approximately 3.4%. The social returns on general secondary education are approximately 5.7%. The social returns on vocational secondary education are approximately 8%. Unlike the previous studies (Psacharopoulos 1994, Psacharopoulos and Patrinos 2004), both private and social returns on vocational secondary education are more than on general secondary education. This may be due to the data availability on the average annual direct cost for vocational secondary education. The average annual direct cost for vocational secondary education is the average cost from eight fields including industrial, commerce, agriculture, applied arts, home economics, textile, tourism industry, and information and communications technology. The social returns on university education are 11.3%. Among the four main levels of education, university education exhibits the highest social profitability in Thailand.

Using only the information provided in Table 10, it is possible to estimate private and social returns to different levels of education using the shortcut method of Psacharopoulos (1995) as shown in equations (4) and (5). This gives the results shown in Table 12. Psacharopoulos (1995) mentions that the weakness of the shortcut method lays in the abstraction that age–earnings profiles are concave, and that the discounting process is sensitive to the values of the early-working ages entering the calculation.

The mean earnings and direct cost by level of education and gender irrespective of age are shown in Table 13. The mean annual earnings for women are less than men at all education levels. The shortcut estimates of the returns to education are shown in Table 14. The private and social returns on secondary general education and secondary vocational education are dissimilar between women and men. Women receive lower private and social returns than men. The difference in private and social returns is not greater than 1 percentage point. However, the private returns on a university education for women exceed men by about 1.5 percentage points. Psacharopoulos (1995) suggested that the additional private returns to women may

Table 13. **Mean Earnings and Direct Cost by Level of Education and Gender**

Education Level	Mean Earnings (B/year)		Length of School Cycle (years)	Annual Direct Cost per Public School Year (B)
	Male	Female		
No education	56,338.8	46,840.7	n.a.	n.a.
Primary	71,254.0	59,399.4	6	40,970
Secondary (General)	97,279.9	80,897.9	6	29,600
Secondary (Vocational)	132,224.3	108,986.7	6	40,242
University	247,880.8	210,802.3	4	67,885

B = baht, n.a. = not applicable.
Note: $1 = B35.65 as of 28 August 2015.
Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/

Table 14. **Shortcut Estimates of the Returns to Education by Gender** (%)

Education Level	Private Returns		Social Returns	
	Male	Female	Male	Female
Primary	4.41%	4.47%	2.55%	2.38%
Secondary (General)	6.09%	6.03%	4.30%	4.03%
Secondary (Vocational)	14.26%	13.91%	9.11%	8.29%
University	38.70%	40.14%	22.80%	21.83%

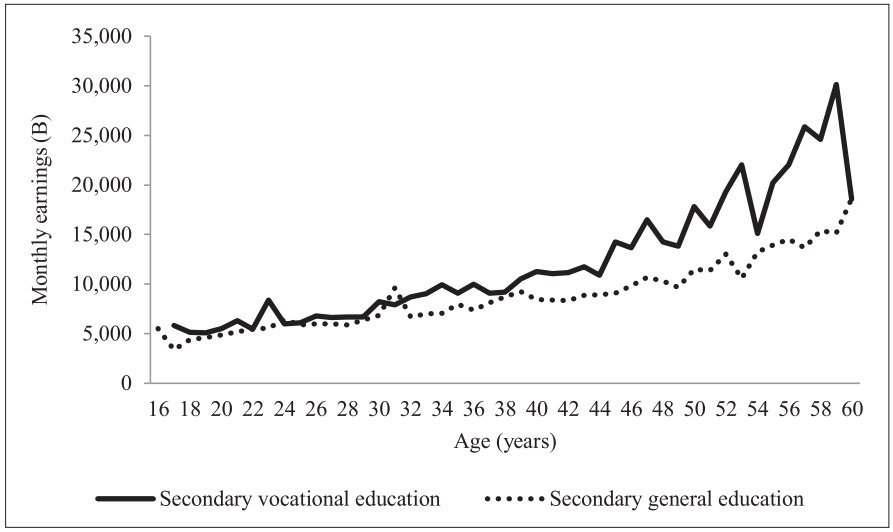
Sources: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm; National Education Account of Thailand. seminar.qlf.or.th/File/DownloadFile/699

be an underestimation because the rate of return to investment in women's education does not take into account the increased probability of more educated women participating in the labor force.

Figure 3 displays the average monthly earnings for secondary vocational education attainment and secondary general education attainment. Suppose an individual made the decision to end his or her education investment after the completion of a secondary education. This graph gives a comparison of the payoff between vocational–technical and general education. The sample is restricted to individuals who complete secondary education as their highest education attainment. The highest attainment of secondary general education is the omitted category for the level of education variable. The average monthly earnings for the secondary vocational education attainment are higher than the secondary general education from the age profile of 16–60 years old. The descriptive statistics confirm that secondary vocational education attainment gives a higher private rate of return than secondary general education. These findings support the research conducted by Hawley using data from earlier years of Thailand's National Labor Force Survey (Hawley 2003, 2004; Moenjak and Worswick 2003).

Figure 4 displays the average monthly earnings for attainment of a general diploma, higher vocational–technical education, bachelor's degree, and master's or

Figure 3. **Average Monthly Earnings for Secondary Vocational Education Attainment and Secondary General Education Attainment**



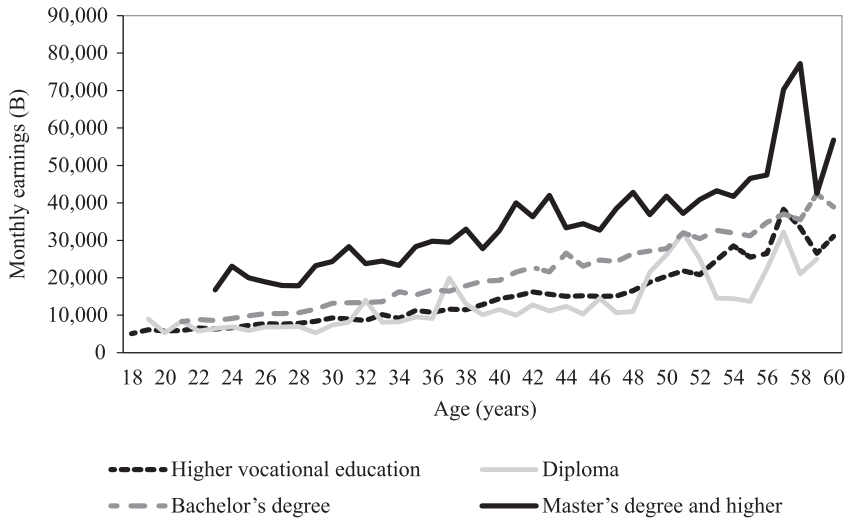
B = baht.
Source: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm

higher degree. Suppose that an individual made the decision to continue on to higher education after completion of the secondary education level. Figure 4 gives a comparison of the payoff between a general diploma, higher vocational–technical certificate, bachelor's degree, and master's or higher degree. The sample is restricted to individuals who have received either a general diploma, higher vocational–technical certificate, bachelor's degree, or master's or higher degree as their highest level of educational attainment. This graph shows that the average monthly earnings for bachelor's degree attainment are higher than for vocational–technical education attainment for 18–60 year olds. Based on both regression analysis and descriptive statistics, these findings show that bachelor's degree attainment gives a higher private rate of return than either a general diploma or higher vocational–technical education attainment. These findings call into question the belief that aggregate demand for the college-educated increases more rapidly than demand for those with higher vocational–technical education or a general diploma. In addition, the average monthly earnings for master's degree and higher are the highest compared with other degrees.

VI. Policy Implications and Conclusions

Human capital investment is an essential tool to promote labor productivity amid the transformation of the Thai economy from agriculture to manufacturing and

Figure 4. **Average Monthly Earnings for Higher Vocational Education Attainment, Bachelor's Degree Attainment, and Master's Degree or Higher Attainment**



B = baht.
Source: Government of Thailand, National Statistical Office. Labor Force Survey, 2010. http://web.nso.go.th/eng/stat/lfs_e/lfse.htm

services. The government launched its 15-Year Free Education with Quality Policy in 2009, aiming to lessen the financial burden of parents and stimulate the economy. Students covered by the program range from kindergarten to Grade 12 and include both general and vocational education students. This policy promotes accessibility to basic education for everyone.

The empirical results of this study suggest that years of schooling has a positive and significant impact on returns to schooling. Comparing between vocational secondary education and general secondary education, the Mincer-type earnings function shows that if students decide not to continue to higher education then vocational education attainment will give higher earnings than general education attainment. These results are comparable to those of Hawley (2003) and Moenjak and Worswick (2003) who used data from earlier years of the National Labor Force Survey. With regard to the private and social returns to different levels of education, using the shortcut method of Psacharopoulos (1995) shows that secondary vocational education attainment is about 8.1 percentage points higher on private returns and 4.7 percentage points higher on social returns than secondary general education. The rates of return to schooling outcomes and the high demand for semiskilled labor in Thailand provide strong incentives to the Ministry of Education and Ministry of Labor to develop medium- to long-term strategic plans.

Regarding the private and social returns to different levels of higher education, using the full discounting method of Psacharopoulos (1995) show that private and social returns on a bachelor's degree are 46.2% and 11.3%, respectively. A bachelor's

degree gives the highest private and social returns among all education levels. The results are somewhat different than for developing economies in the 1990s when primary education gave the highest private and social returns (Psacharopoulos 1994, Psacharopoulos and Patrinos 2004). Growth in private higher education is expected to change the rates of return because the annual direct cost per private school is generally higher. The private and social rates of return for higher education are expected to decline.

The mean annual earnings for women are less than for men at all education levels. The private and social returns on primary, secondary general education, and secondary vocational education are dissimilar between women and men. Women receive lower private and social returns than men. However, the private returns on university for women exceed those for men. Psacharopoulos (1995) suggested that the additional private returns for women may be an underestimation because the rate of return to investment in women's education does not take into account the increased probability of more educated women participating in the labor force.

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Appendix

Table A.1. **Age–Earnings Profiles and Direct Costs by Level of Education, 2010** (B/year)

Age	No Education	Primary	Secondary (General)	Secondary (Vocational)	Bachelor
16	3,736.7	4,177.7	0.0	0.0	0.0
17	4,200.6	4,015.3	0.0	0.0	0.0
18	3,885.0	4,226.3	4,395.9	5,123.4	0.0
19	4,523.5	4,558.8	4,582.6	5,048.7	0.0
20	4,684.7	4,469.0	4,840.9	5,508.8	0.0
21	4,987.6	4,719.2	5,194.8	6,314.9	0.0
22	4,189.0	4,698.0	5,426.8	5,474.0	8,825.8
23	4,463.9	4,895.6	5,571.7	8,395.3	8,585.0
24	4,493.4	4,671.8	6,420.1	5,995.4	9,121.1
25	4,528.0	4,907.3	5,897.3	6,104.6	9,821.5
26	4,809.0	5,038.8	5,986.3	6,795.2	10,445.1

Continued.

Table A.1. *Continued.*

Age	No Education	Primary	Secondary (General)	Secondary (Vocational)	Bachelor
27	4,891.1	4,865.0	5,984.9	6,645.8	10,412.7
28	4,635.8	5,112.3	5,881.1	6,690.8	10,640.9
29	4,377.9	4,977.6	6,357.8	6,675.1	11,627.6
30	4,485.7	5,425.6	6,856.8	8,200.9	13,172.4
31	4,629.5	5,523.9	9,606.8	7,876.2	13,312.6
32	4,763.3	5,420.3	6,682.7	8,722.8	13,381.8
33	4,259.2	5,283.2	6,987.3	9,025.6	13,583.6
34	6,269.9	5,456.7	7,071.6	9,935.3	16,313.3
35	5,192.4	5,459.8	7,932.0	9,051.6	15,387.8
36	4,787.0	5,694.9	7,380.6	9,987.4	16,768.1
37	4,095.7	5,443.7	8,100.4	9,051.2	16,447.7
38	4,338.0	5,590.5	8,691.0	9,160.1	17,887.7
39	3,828.6	5,470.1	9,252.7	10,533.8	19,092.4
40	4,257.7	6,167.2	8,457.7	11,274.4	19,283.4
41	4,331.7	5,664.6	8,387.6	11,030.2	21,495.8
42	4,398.3	5,800.1	8,333.7	11,149.1	22,727.9
43	3,789.9	5,889.9	8,860.3	11,744.9	21,613.1
44	4,314.5	5,665.9	8,917.0	10,880.0	26,611.5
45	4,170.5	6,032.1	9,065.7	14,261.0	23,061.3
46	3,487.5	6,592.6	9,801.0	13,658.3	24,759.9
47	4,425.2	6,844.5	10,687.3	16,505.7	24,361.5
48	3,874.4	6,462.3	10,298.6	14,264.3	26,483.3
49	4,111.6	6,426.8	9,678.5	13,798.5	27,180.2
50	4,110.3	6,519.9	11,499.3	17,840.3	27,790.9
51	3,979.9	8,105.5	11,345.5	15,847.3	32,009.8
52	4,301.5	7,811.2	13,045.1	19,323.8	30,417.6
53	3,677.5	7,528.2	10,550.1	22,022.8	32,651.9
54	3,836.6	6,880.0	13,214.6	15,099.0	31,982.1
55	3,520.5	7,974.0	13,903.9	20,223.4	31,210.7
56	4,288.8	9,226.9	14,490.4	22,024.8	34,781.4
57	4,211.5	7,585.1	13,673.0	25,887.4	37,045.6
58	3,616.6	9,341.8	15,357.4	24,580.0	35,456.2
59	3,570.6	9,594.4	15,154.6	30,155.9	42,383.2
60	3,698.1	7,063.5	18,645.5	18,540.7	38,882.5

B = baht.
Source: Author's computations.

Table A.2. **Age–Earnings Profiles and Direct Costs by Level of Education—Input to Social Rate of Return Calculation, 2010** (B/year)

Age	No Education	Primary	Secondary (General)	Secondary (Vocational)	Bachelor
6	Not available	−40,970	0	0	0
7	Not available	−40,970	0	0	0
8	Not available	−40,970	0	0	0
9	Not available	−40,970	0	0	0
10	Not available	−40,970	0	0	0
11	Not available	−40,970	0	0	0
12	Not available	Not available	−29,600	−29,600	0

Continued.

Table A.2. *Continued.*

Age	No Education	Primary	Secondary (General)	Secondary (Vocational)	Bachelor
13	Not available	Not available	−29,600	−29,600	0
14	Not available	Not available	−29,600	−29,600	0
15	Not available	Not available	−29,600	−40,242	0
16	3,736.7	4,177.7	−29,600	−40,242	0
17	4,200.6	4,015.3	−29,600	−40,242	0
18	3,885.0	4,226.3	4,395.9	5,123.4	−67,885
19	4,523.5	4,558.8	4,582.6	5,048.7	−67,885
20	4,684.7	4,469.0	4,840.9	5,508.8	−67,885
21	4,987.6	4,719.2	5,194.8	6,314.9	−67,885
22	4,189.0	4,698.0	5,426.8	5,474.0	8,825.8
23	4,463.9	4,895.6	5,571.7	8,395.3	8,585.0
24	4,493.4	4,671.8	6,420.1	5,995.4	9,121.1
25	4,528.0	4,907.3	5,897.3	6,104.6	9,821.5
26	4,809.0	5,038.8	5,986.3	6,795.2	10,445.1
27	4,891.1	4,865.0	5,984.9	6,645.8	10,412.7
28	4,635.8	5,112.3	5,881.1	6,690.8	10,640.9
29	4,377.9	4,977.6	6,357.8	6,675.1	11,627.6
30	4,485.7	5,425.6	6,856.8	8,200.9	13,172.4
31	4,629.5	5,523.9	9,606.8	7,876.2	13,312.6
32	4,763.3	5,420.3	6,682.7	8,722.8	13,381.8
33	4,259.2	5,283.2	6,987.3	9,025.6	13,583.6
34	6,269.9	5,456.7	7,071.6	9,935.3	16,313.3
35	5,192.4	5,459.8	7,932.0	9,051.6	15,387.8
36	4,787.0	5,694.9	7,380.6	9,987.4	16,768.1
37	4,095.7	5,443.7	8,100.4	9,051.2	16,447.7
38	4,338.0	5,590.5	8,691.0	9,160.1	17,887.7
39	3,828.6	5,470.1	9,252.7	10,533.8	19,092.4
40	4,257.7	6,167.2	8,457.7	11,274.4	19,283.4
41	4,331.7	5,664.6	8,387.6	11,030.2	21,495.8
42	4,398.3	5,800.1	8,333.7	11,149.1	22,727.9
43	3,789.9	5,889.9	8,860.3	11,744.9	21,613.1
44	4,314.5	5,665.9	8,917.0	10,880.0	26,611.5
45	4,170.5	6,032.1	9,065.7	14,261.0	23,061.3
46	3,487.5	6,592.6	9,801.0	13,658.3	24,759.9
47	4,425.2	6,844.5	10,687.3	16,505.7	24,361.5
48	3,874.4	6,462.3	10,298.6	14,264.3	26,483.3
49	4,111.6	6,426.8	9,678.5	13,798.5	27,180.2
50	4,110.3	6,519.9	11,499.3	17,840.3	27,790.9
51	3,979.9	8,105.5	11,345.5	15,847.3	32,009.8
52	4,301.5	7,811.2	13,045.1	19,323.8	30,417.6
53	3,677.5	7,528.2	10,550.1	22,022.8	32,651.9
54	3,836.6	6,880.0	13,214.6	15,099.0	31,982.1
55	3,520.5	7,974.0	13,903.9	20,223.4	31,210.7
56	4,288.8	9,226.9	14,490.4	22,024.8	34,781.4
57	4,211.5	7,585.1	13,673.0	25,887.4	37,045.6
58	3,616.6	9,341.8	15,357.4	24,580.0	35,456.2
59	3,570.6	9,594.4	15,154.6	30,155.9	42,383.2
60	3,698.1	7,063.5	18,645.5	18,540.7	38,882.5

B = baht.
Source: Author's computations.

Rural Nonfarm Employment, Income, and Inequality: Evidence from Bhutan

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Using the 2012 Bhutan Living Standard Survey, this paper finds that rural nonfarm activities comprise 60.7% of rural household income in Bhutan and this contribution increases with higher income and education levels. The poor and less educated participate less in the nonfarm sector. When they do, they are self-employed in petty nonfarm activities, which require little investment and little or no skills. Accounting for endogeneity and sample selection issues, we estimate the determinants of participation in nonfarm activities and nonfarm incomes. We find that a household's education and labor supply play an important role in accessing more remunerative nonfarm employment. Interestingly, we find that women play an important role in self-employment in nonfarm activities. Decomposition shows that nonfarm income has a disequalizing effect and farm income has an equalizing effect, indicating the need to increase the endowment of poor households to enable them to access the lucrative rural nonfarm sector. Further decomposition reveals that self-employment in petty nonfarm activities reduces inequality.

Keywords: Bhutan, employment, income, inequality, nonfarm, rural
JEL codes: D33, J24, J46, O17, O18

I. Introduction

Over the last 3 decades, Bhutan has achieved remarkable growth and development. Gross domestic product (GDP) at current prices has increased from Nu1,154 million ($17.5 million) in 1981/82 to Nu99,455 million ($1,507 million) in 2012/13. Real annual GDP growth averaged 8.4%, 6.7%, and 8.2% during 1981/82–1990/91, 1991/92–2000/01, and 2001/02–2012/13, respectively. Agriculture has traditionally been the main source of income for most of the population. However, as a result of the slow growth of the agriculture sector and a decline in the contribution of agriculture to GDP from 41.3% in 1980/81 to 27.8% in 2000/01, and further to 17% in 2012/13,

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the Bhutanese economy has gone through massive structural changes. Average annual growth in the agriculture sector declined from 5.5% in 1981/82–1985/86 to 1.3% in 2006/07–2012/13. Thus, participation in nonfarm sectors is of paramount importance for growth, livelihoods, and poverty reduction. An important question is whether the rural labor market has moved in the direction of increased participation in the rural nonfarm sector. This study takes a comprehensive look at the sources of income that rural households in Bhutan rely upon.

This paper attempts to understand the determinants of participation in nonfarm activities and of the levels of incomes derived from these activities in order to answer the following research questions: (i) What types of nonfarm activities do rural households engage in? Do they mainly engage in self-employment or work for wages? (ii) What determines participation in nonfarm employment? (iii) What is the impact of rural nonfarm activities on inequality? (iv) What should be the main focus of strategies aimed at supporting the growth of nonfarm activities in rural Bhutan?

Recent literature has shifted attention toward the heterogeneity of rural nonfarm sectors (Barrett et al. 2005; Micevska and Rahut 2008; Rahut et al. 2014; Rahut and Micevska Scharf 2012a, 2012b). Thus, this paper differentiates between nonfarm self-employment and employment with respect to wages. Heterogeneity is further addressed by differentiating between self-employment in business and petty self-employment (e.g., handicrafts and pottery). By taking into account the heterogeneity of the nonfarm sector, we aim to refine our knowledge of factors that have an impact on the labor allocation of rural households.

The importance of education for participation in rural nonfarm sectors has been widely recognized, particularly high-return, nonfarm employment. However, the empirical evidence that accounts for endogeneity is scant. In examining the impact of education on the employment decisions of households, this paper adopts a different approach.

To identify the structural relationship between education and participation in the nonfarm sector, we estimate probit and Tobit models with endogenous education by using the education of the spouse and marriage at an early age as instruments for education. Furthermore, when estimating income from economic activities, we recognize the existence of both simultaneity and self-selection issues, and estimate sample selection models with endogenous education.

This paper decomposes inequality by income sources to examine the marginal effect of the income sources on inequality, taking into account the heterogeneity of rural nonfarm income.

The remainder of this article is organized as follows. Section II briefly discusses the empirical literature on rural nonfarm employment. Section III presents the dataset and the variables employed in our analysis. Section IV describes the extent and nature of nonfarm employment in rural Bhutan. In Sections V and VI, we report the results of an empirical enquiry of the determinants of participation in

nonfarm activities and of income derived from these activities. Robustness checks are presented in Section VII and inequality decomposition in Section VIII. In the last section, we present our concluding thoughts and reflect on the policy implications.

II. Literature Review

Against the backdrop of widespread and deep-rooted poverty, rural–urban migration driven by poverty, and the inability of the agriculture sector to employ a growing population, there has been increasing interest among policy makers and researchers in rural nonfarm sectors in developing economies (Janvry and Sadoulet 2001; Lanjouw and Lanjouw 2001; Micevska and Rahut 2008; Reardon, Berdegué, and Escobar 2001; Haggblade, Hazell, and Reardon 2009), including with regard to improving welfare and decreasing poverty (Ruben 2001; Holden, Shiferaw, and Pender 2004).

Unlike traditional beliefs that rural households are mainly farm households, recent literature points out that rural households have several sources of income (Dercon and Krishnan 1996; Ellis 1998; Barrett, Reardon, and Webb 2001). Rural households diversify into nonfarm sectors for several reasons, including to cope with a shock in the agriculture sector (Alderman and Paxson 1992, Collier and Gunning 1999) and to maximize the return on assets (Rahut and Micevska Scharf 2012a).

Livelihood diversification studies in rural Africa confirm that poor households are less diversified despite the fact that they should be more risk-averse (Dercon and Krishnan 1996, Reardon 1997, Barrett et al. 2005), which makes it difficult to assess the role of risk as a factor in their participation in nonfarm activities. Therefore, the current paper focuses on the role of factors other than household risk aversion on participation in the rural nonfarm sector. Although a rural household would like to participate in rural nonfarm activities, not all households have the capacity to participate because of several impeding factors.

Education is one of the most important factors determining a household's ability to participate in nonfarm activities. Using case studies from 11 Latin American economies, Reardon, Berdegué, and Escobar (2001) concluded that education is the key factor determining participation and success in rural nonfarm employment. In the introduction to seven studies on income diversification in rural Africa, Barrett, Reardon, and Webb (2001) argue that educational attainment is one of the most important determinants of nonfarm earnings, especially in more remunerative employment. Interestingly, Micevska and Rahut (2008) found a differential role for education on participation in high-return and low-return nonfarm employment in the foothills of Sikkim and Darjeeling in India.

In Asia, there are several studies that have highlighted the association between education and participation in the rural nonfarm sectors. Fafchamps and Quisumbing (1999, 2003) argue that better-educated males in rural Pakistan earn higher nonfarm

incomes and are more likely to undertake nonfarm work. Yang and An (2002) show that education improves the allocation of household resources between agricultural and nonagricultural activities in rural parts of the People's Republic of China. Micevska and Rahut (2008) conducted an enquiry on participation in nonfarm activities in the Himalayas and showed that education plays a major role in accessing more remunerative nonfarm employment.

The effect of physical assets (land and nonland) on participation in nonfarm activities is ambiguous (Reardon, Delgado, and Matlon 1992). A negative impact of landholdings on participation in nonfarm employment has been reported in Thailand (Rief and Cochrane 1990) and Viet Nam (Van de Walle and Cratty 2004), while a positive impact was found in Burkina Faso (Reardon, Delgado, and Matlon 1992) and India (Lanjouw and Shariff 2004). In the current study, we have divided land into three categories—wetlands, drylands, and orchard—to assess if a differential role for land exists with respect to participation in rural nonfarm activities.

Larger households are more easily able to meet the demand for subsistence agriculture and supply their surplus labor for nonfarm activities. Several studies across the globe have confirmed the correlation of participation in nonfarm activities and the size and composition of the household (Reardon 1997, Fafchamps and Quisumbing 2003, Rahut and Micevska Scharf 2012b).

Literature on the role of gender has been mixed: while some studies find that males dominate the nonfarm sectors (see, for example, Fafchamps and Quisumbing 2003), other research observes that, in certain types of nonfarm activities, women are more heavily represented than men (Corral and Reardon 2001, Elbers and Lanjouw 2001). In Cambodia, female-headed households participate more in all types of nonfarm activities (Rahut and Micevska Scharf 2012b). Thus, the mixed findings on the role of gender vary across economies depending on social norms and the status of female members in the household and in society.

Although one can find several studies exploring participation in rural nonfarm activities in other Asian economies (see, for example, Fafchamps and Quisumbing 2003; Lanjouw and Shariff 2004; Micevska and Rahut 2008; Rahut et al. 2014; Rahut and Micevska Scharf 2012a, 2012b; Rief and Cochrane 1990; Van de Walle and Cratty 2004; Zhang, Huang, and Rozelle 2002), there is a lack of empirical research on nonfarm sectors in rural Bhutan.

The literature on the impact of nonfarm income on income inequality is divergent. Some researchers have found that nonfarm income increases inequality (Reardon and Taylor 1996; Canagarajah, Newman, and Bhattamishra 2001; Kung and Lee 2001), while others have found that it decreases inequality (Adams and He 1995, Janvry and Sadoulet 2001, Zhu and Luo 2006). Such contradictory results could be related to aggregation of different nonfarm activities with different returns to labor (Dercon and Krishnan 1996). Low-return, nonfarm employment has an inequality-decreasing effect and high-return, nonfarm employment has an increasing effect (Scharf and Rahut 2014).

In this paper, we take a detailed look at nonfarm activities in rural Bhutan using the most recent and nationally representative dataset collected by the National Statistical Bureau of Bhutan. The major contribution of this paper is fourfold. First, we estimate probit and Tobit models with endogenous education by using the education of the spouse and age of marriage as instruments for education. Furthermore, when estimating income from economic activities, we recognize the existence of both simultaneity and self-selection issues and estimate sample selection models with endogenous education. Second, while the study of rural nonfarm employment and income is very important for poverty reduction and improving the well-being of the rural population because of the rapid structural transformation of the Bhutanese economy in recent decades, there is no such study at present. Third, we estimate the role of peer effects on participation in nonfarm employment and the role of concentration in nonfarm income. Fourth, we estimate the effect of sources of income on income inequality.

III. Data and Variables

This study uses data from the 2012 Bhutan Living Standard Survey (BLSS 2012) (NSB and ADB 2012) to explore the determinants and impacts of nonfarm employment on income inequality in Bhutan. The data were collected by the National Statistics Bureau of Bhutan with funding from the Asian Development Bank. The BLSS 2012 followed the methodology of the World Bank's Living Standards Measurement Study. The selection of sample households was based on two mutually exclusive sampling frames for rural and urban areas. Since this paper focuses on rural nonfarm employment and its impact on inequality, the sampling methodology for rural households is described below.

The 2005 Population and Housing Census of Bhutan—conducted at the village level and updated after a more recent listing of activities such as those in the Bhutan Multiple Indicator Survey—was used to construct the sampling frame of primary sampling units for rural areas. Rural villages with fewer than 10 households were combined with adjacent villages; the total sample size for rural areas was 4,986. Primary sampling units were selected in proportion to size, and households in a selected primary sampling unit were drawn randomly so that the selection probability was constant within a group or stratum and selection probabilities across strata did not vary widely within the rural strata. The BLSS 2012 collected information from the selected households for the year preceding the interview through an integrated household questionnaire covering consumption, expenditure, assets, housing, education, health, fertility, and prices for different commodities.

The dependent variables of interest in this study are related to participation in nonfarm activities and the levels of income derived from these activities. To account for the heterogeneity of the nonfarm sector, we distinguish between two main types

of nonfarm activities: self-employment and wage employment. It is important to differentiate between these two types of economic activity because self-employment income includes returns to entrepreneurship, risk-taking, and capital, while wage income does not. It is also important to take into account the returns to labor in nonfarm employment. To do this, we use information from the survey to further classify self-employment in nonfarm activities into two types: business activities and other activities such as handicrafts and pottery. Self-employment in business provides relatively higher returns, while self-employment in handicrafts and pottery usually provides low returns and is physically demanding.

We use the following explanatory variables in the analysis life-cycle effects, which are captured by age and the age-squared of the household head; and the demand for farm labor by households, which is measured by farm size in acres. We have divided the land into three categories: wetlands, drylands, and orchard.

The supply of labor by households is captured by the household size (total members in the household). This study also uses the number of men and women of prime working age (15–65 years old) separately to capture the differentiated impact of gender on participation in nonfarm activities. We included the number of children under the age of 15 years and adults older than 65 years to measure the impact of dependency on the choice of livelihood. Level of education within the household is measured in different ways. First, we use years of education of the household head. Then, taking into account differences in education levels and the diversification of farm tasks by gender, we consider specifications of education that allow for different gender effects. In particular, we use the average education level of adult males and females and the highest level of schooling completed by adult males and females separately. In addition, to account for the nonlinearity of educational effects, we divide the household into several categories according to the highest level of education attained by the household head: no formal schooling, less than primary, completed primary, completed high school, and tertiary education. We regard the results of educational effects as robust when they are present in all specifications. An important limitation of household surveys, such as the BLSS 2012, is that they generate cross-sectional data that are usually not adequate to establish causal relationships between education and nonfarm employment since the optimal education decision depends on the expected labor market outcomes. In addition, education and nonfarm employment tend to be correlated with unobserved factors, such as intelligence and motivation. Fortunately, the BLSS 2012 provides information on instrumental variables that can be used to account for the endogeneity of education, such as age of first marriage of the household head and the education level of the spouse of the household head. The rationale for using marriage at an early age as an instrument is that it is correlated with educational choices but not correlated with current employment choices and earnings. Using the education level of the age of marriage as an instrument should reduce concerns that the correlation between education and nonfarm activities actually depicts family background.

Table 1. **Contribution to Rural Household Incomes by Income Quintile** (%)

	Income Quintile					
Sector of Employment	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Average**
Agriculture	**45.7**	**43.4**	**37.4**	**29.4**	**16.9**	**23.7**
Cropping	34.5	32.6	26.4	22.6	12.5	17.6
Livestock	11.2	10.8	10.9	6.8	4.5	6.1
Nonfarm	**32.1**	**36.7**	**48.5**	**57.7**	**67.0**	**60.7**
Wage	27.6	29.2	39.9	48.8	51.3	47.9
Business	2.0	3.5	5.3	6.3	14.0	10.7
Handicrafts	2.5	4.0	3.2	2.5	1.6	2.1
Remittances	12.2	11.1	6.0	3.2	1.5	3.0
Forestry	1.0	0.9	0.6	1.0	0.9	0.8
Others	8.9	7.9	7.6	8.7	13.8	11.7
Household income ($)	**154**	**534**	**1,054**	**1,867**	**5,781**	**1,871**

Source: Authors' calculations.

In order to account for accessibility to markets, we use a distance-to-market measure in terms of the time taken to reach the market. Interregional disparities are captured by classifying the households into 20 districts and Thimphu, which as the capital city of Bhutan is used as a base category. Although we include only rural households in the analysis, it is still important to control for regional differences as access to nonfarm sectors probably varies with geography. District dummy variables should capture differences in economic development and account for differences in agricultural potential, institutional arrangements, infrastructure, prices, and other unobserved region-specific characteristics as well.

One of the major contributions of this study is the endeavor to capture the role of peer effects on participation in nonfarm employment. The peer effect is measured by the number of household members excluding oneself pursuing rural nonfarm activities, wage employment in nonfarm activities, self-employment in business, and self-employment in handicrafts and pottery. This paper also captures the effects of the concentration of nonfarm activities in the village on the level of income from particular sources. The effects of the concentration of nonfarm activities contribute to higher incomes overall because of competition, and higher incomes from business as the competition attracts large numbers of customers to the village.

IV. Descriptive Statistics

Table 1 shows the contribution to total rural household income by income source across income quintiles. Nonfarm employment contributes 60.7% to rural household incomes across all income quintiles, while agriculture contributes only 23.7%. Within nonfarm income, wages contribute 47.9% to household income, business (self-employment) contributes 11.7%, and handicrafts and pottery contribute only 2.1%. This indicates that wage employment arising from industries

Table 2. **Contribution to Income by Level of Education of Household Head** (%)

Sector of Employment	Level of Education				
	No formal education	**Less than primary school**	**Primary school completed**	**High school completed**	**University completed**
Agriculture	**32.5**	**24.6**	**16.0**	**4.9**	**0.8**
Cropping	24.6	18.3	10.8	1.7	0.8
Livestock	7.9	6.3	5.2	3.2	0.0
Nonfarm	**50.8**	**51.4**	**70.0**	**79.4**	**96.8**
Wage	35.6	36.4	55.5	72.8	93.4
Business	12.4	13.3	12.8	6.0	2.7
Handicrafts	2.8	1.7	1.7	0.6	0.6
Remittances	4.2	2.0	0.9	1.4	1.0
Forestry	1.3	0.7	0.1	0.0	0.0
Others	11.2	21.3	13.0	14.3	1.3
Household income ($)	**1,467**	**2,167**	**2,443**	**4,173**	**5,192**

Source: Authors' calculations.

and infrastructure development plays an important role in rural livelihoods, and that only a small section of rural Bhutanese households are engaged in business (self-employment).

The share of agriculture in household income declines and the share of nonfarm income increases as income rises across quintiles, indicating the importance of nonfarm sectors to richer households. The share of agriculture in household income in the lowest (first) quintile is 45.7% and it falls to only 16.9% in the top (fifth) quintile. The contribution of nonfarm income to household income is 32.1% in the lowest quintile and 67% in the top quintile.

Table 2 shows the relation between income sources and the level of education of the household head. With an increase in the level of education, the share of agriculture in household income decreases. The share of agricultural income is 32.5% for households whose heads do not have any formal education, 4.9% for households whose heads have completed high school, and 0.8% for households whose heads have completed university. The contribution of nonfarm activities to income rises with an increase in the level of education of the household head. The contribution of nonfarm activities to income is 50.8% for households whose heads do not have any formal education and 96.8% for households whose heads have completed university. This analysis reiterates the importance of education for employment in nonfarm activities, particularly wage employment.

V. Determinants of Participation in Nonfarm Activities

We estimated the determinants of participation in nonfarm activities using a probit model. Unlike many previous studies, we recognize that the level of education of the household head is endogenous to nonfarm participation because the optimal

education decision depends on expected labor market outcomes. We use instrumental variable probit regressions to remove the potential endogeneity problems in the first stage of the regression; the level of education of the household head is regressed on all exogenous variables and the following instruments: the education of the spouse of the household head and the age of first marriage. The null hypothesis of exogeneity is rejected in all regressions, except for self-employment in nonfarm activities (business). Thus, correcting for endogeneity bias is appropriate in most cases.

The result from the instrumental variable probit in Table 3 shows that education plays a fundamental and differential role in a household's participation in nonfarm activities. Higher levels of education enable households to participate in nonfarm wage employment, while education is negatively associated with participation in self-employment in petty nonfarm activities (e.g., handicrafts and pottery). Education is insignificant for participation in nonfarm self-employment, highlighting the fact that self-employment in nonfarm activities does not require prior education. A strong preference for wage employment among the more educated households arises from the fact that wage employment pays more and is less risky compared with self-employment.

For wage employment, we observe a U-shaped relation: with the increase in age, the probability of participation in wage employment decreases initially and increases later. Participation in nonfarm self-employment does not show any relation to age.

With regard to gender, we observe a negative effect of female headship on the probability of participation in wage employment and self-employment in petty nonfarm activities (handicrafts and pottery), but a positive effect on participation in self-employment in nonfarm business. This result suggests that female-headed households engage themselves in business in contributing to family incomes.

As expected, a larger labor supply in a household is associated with a higher probability of participation in nonfarm activities as a larger household has surplus labor and can more easily allocate workers to nonfarm employment. A similar result is observed for working-age males and females for participation in nonfarm activities. A working-age female has a positive effect on participation in self-employment in nonfarm business and petty nonfarm activities such as handicrafts and pottery, while a working-age male has a positive effect for participation in nonfarm wage employment. Women in Bhutan are enterprising and run small businesses such as shops and vegetable vending to support their families, while most of the men seek wage employment. This finding also reflects gender-differentiated economic roles in rural Bhutan.

Reconfirming the findings from previous studies, the results show that households with less land are more likely to work for wages off the farm; we find a negative effect for wetlands, drylands, and orchard on participation in wage employment in nonfarm activities. We also observed a negative association with orchard land and

Table 3. **Probit Estimations with Endogenous Regressors for Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Demographic characteristics				
Age of the household head	−0.0315***	−0.0445***	0.0153	−0.0251
	(0.0122)	(0.0118)	(0.0144)	(0.0161)
Age-squared of the household head	0.0002**	0.0003***	−0.0002	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0002)
Female-headed household[a]	0.0039	−0.1043*	0.1554**	−0.2035***
	(0.0591)	(0.0567)	(0.0699)	(0.0799)
Labor assets and human capital				
Number of children under 15 years	0.0487***	0.0456***	0.0080	0.0104
	(0.0168)	(0.0167)	(0.0217)	(0.0231)
Number of adult males > 15 and < 65 years	0.1162***	0.1290***	0.0370	−0.0532
	(0.0246)	(0.0245)	(0.0313)	(0.0368)
Number of adult females > 15 and < 65 years	0.0825***	0.0168	0.1089***	0.1187***
	(0.0256)	(0.0253)	(0.0326)	(0.0345)
Number of aged > 65 years	0.0145	−0.0340	0.0655	−0.0617
	(0.0438)	(0.0434)	(0.0555)	(0.0655)
Number of years of schooling	0.1428***	0.1246***	0.0226	−0.0570***
	(0.0199)	(0.0172)	(0.0193)	(0.0223)
Physical (land) assets				
Wetlands owned (acres)	−0.0034	−0.0178*	0.0092	0.0143
	(0.0096)	(0.0099)	(0.0132)	(0.0132)
Drylands owned (acres)	−0.0140*	−0.0139*	0.0043	−0.0088
	(0.0082)	(0.0082)	(0.0096)	(0.0112)
Orchard land owned (acres)	−0.0288**	−0.0378**	0.0322**	−0.1141**
	(0.0152)	(0.0161)	(0.0148)	(0.0470)
Access to market				
Time taken to reach market (minutes)	0.0001	0.0001	−0.0001	−0.0002
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Peer effect (concentration of activities)				
Percentage of household in nonfarm (excl. itself)	0.0160***			
	(0.0015)			
Percentage of household in wage nonfarm (excl. itself)		0.0152***		
		(0.0015)		
Percentage of household in business nonfarm (excl. itself)			0.0188***	
			(0.0035)	
Percentage of household in petty nonfarm (excl. itself)				0.0300***
				(0.0026)
Locational variable (district dummy)				
Bumthang[a,c]	−0.3488*	−0.4162**	−0.2248	0.1601
	(0.1982)	(0.1864)	(0.2100)	(0.2208)
Chhukha[a,c]	−0.0552	0.1228	0.0432	0.0673
	(0.1733)	(0.1551)	(0.1633)	(0.2084)

Continued.

Table 3. *Continued.*

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Dagana[a,c]	−0.2389	−0.0828	−0.2689	−0.1974
	(0.1839)	(0.1686)	(0.1907)	(0.2424)
Gasa[a,c]	−0.5710*	−0.7698*	0.2161	−0.0436
	(0.3180)	(0.4405)	(0.3375)	(0.5249)
Haa[a,c]	−0.6059**	−0.3572	−0.6297**	−0.2556
	(0.2453)	(0.2377)	(0.3073)	(0.3560)
Lhuentse[a,c]	−0.2083	−0.1072	−0.7377***	0.1917
	(0.1821)	(0.1677)	(0.2616)	(0.2140)
Monggar[a,c]	0.0504	0.3330**	−0.3634**	−0.1316
	(0.1662)	(0.1482)	(0.1747)	(0.2071)
Paro[a,c]	−0.0884	0.1445	−0.1872	0.1150
	(0.1691)	(0.1518)	(0.1625)	(0.1976)
Pema Gatshel[a,c]	0.4426**	0.6025***	−0.4349**	0.2836
	(0.1832)	(0.1627)	(0.2035)	(0.2072)
Punakha[a,c]	−0.2533	0.0347	−0.3259*	−0.3670
	(0.1845)	(0.1669)	(0.1940)	(0.2914)
Samdrup Jongkhar[a,c]	−0.0680	0.0548	−0.0710	0.1837
	(0.1715)	(0.1530)	(0.1666)	(0.1997)
Samtse[a,c]	0.3283**	0.5730***	−0.3073*	−0.1263
	(0.1646)	(0.1498)	(0.1652)	(0.1970)
Sarpang[a,c]	−0.1029	0.1048	−0.2403	0.1218
	(0.1714)	(0.1536)	(0.1774)	(0.2014)
Trashigang[a,c]	−0.1330	0.1013	−0.5272***	0.1147
	(0.1632)	(0.1443)	(0.1832)	(0.1898)
Trashi Yangtse[a,c]	−0.1540	0.1721	−0.8053***	0.0314
	(0.1796)	(0.1635)	(0.2531)	(0.2216)
Trongsa[a,c]	−0.0749	0.2013	−0.3971*	−0.2009
	(0.1977)	(0.1792)	(0.2271)	(0.2803)
Tsirang[a,c]	−0.5761***	−0.4139**	−0.4505**	−0.1344
	(0.1912)	(0.1755)	(0.2011)	(0.2443)
Wangdue Phodrang[a,c]	−0.0843	0.2487	−0.5214***	−0.1912
	(0.1745)	(0.1550)	(0.1974)	(0.2373)
Zhemgang[a,c]	0.1491	0.3520**	−0.0910	0.1083
	(0.1927)	(0.1732)	(0.1879)	(0.2391)
Number of observations	4,169	4,169	4,169	4,169
Wald chi2(32)	873.1	921.01	180.79	336.17
Prob. > chi2	0.000	0.000	0.000	0.000
Log pseudolikelihood	−12508	−12612.4	−11501.7	−11322.9
Wald test of exogeneity	14.4***	9.95**	1.16	3.43*
Prob. > chi2	0.0001	0.0016	0.2813	0.064

Notes: Robust standard errors in parentheses. All regressions include a constant term. The number of observations in each regression is 4,169. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: male head
[c]excluded category: Thimphu district
[d]Instrumented variable using age of first marriage and education level of the spouse
Source: Authors' calculations.

participation in self-employment in petty nonfarm activities, while orchard land has a positive association with participation in self-employment in nonfarm business because households with an orchard generally earn large incomes and do not need to participate in petty nonfarm activities for their livelihood.

Distance to market does not seem to influence participation in nonfarm activities. Peer effects, as measured by the percentage of households in the village participating in nonfarm activities (excluding the household itself), shows a positive association with participation in all nonfarm activities. In communities and villages, a household's behavior and activities are heavily influenced by their neighbors; rural households adopt livelihood strategies and technologies based on what their neighbors are doing.

Spatial analysis shows that participation in wage employment in nonfarm activities is positive and significant in three districts—Pema Gatshel, Samtse, and Zhemgang—while it is either insignificant or negative for the rest when compared with the capital city, Thimpu. Pema Gatshel and Zhemgang are poor districts with degraded land. As a result, households in these districts explore nonfarm employment opportunities. Samtse is a vibrant district bordering the Indian state of West Bengal with lots of opportunities for trade because there is a concentration of industries like mining, juice factories, and cement factories. Households in Thimphu are more likely to participate in nonfarm self-employment because of the city's large population, higher incomes, and proximity to markets.

To gain further insight, we analyze the determinants of the intensity of participation. The intensity of participation in nonfarm activities is measured by the share of income from a particular activity in total household income. As the dependent variable is bound between 0 and 1, the equations are estimated as an instrumental variable Tobit. The findings in Table 4 reinforce those of Table 3.

Education has a differentiated impact on participation in nonfarm employment. The association between education and wage employment is positive and significant, while it is negative and significant with self-employment in petty nonfarm activities. Similarly a household's male labor supply (between 15 and 65 years old) is positive and significant for wage employment in nonfarm activities, and negative and significant for self-employment in petty nonfarm activities. The female labor supply is positive and significant for self-employment in nonfarm business and self-employment in petty nonfarm activities. The gender of the labor force available in the household influences participation in different activities differently. The number of children under 15 years old is positive for wage employment in nonfarm activities, indicating the existence of child labor. Female-headed households are less likely to participate in nonfarm wage employment and more likely to participate in nonfarm self-employment. Ownership of drylands is negatively associated with wage employment. The ownership of an orchard is negatively associated with wage employment and petty nonfarm self-employment, while it is positively associated

Table 4. **Tobit Estimations with Endogenous Regressors for Intensity of Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Demographic characteristics				
Age of the household head	−0.0166***	−0.0224***	0.0188	−0.0132
	(0.0042)	(0.0049)	(0.0156)	(0.0093)
Age-squared of the household head	0.0001***	0.0002***	−0.0002	0.0000
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Female-headed household[a,b]	−0.0220	−0.0626**	0.1640**	−0.0835*
	(0.0228)	(0.0264)	(0.0752)	(0.0472)
Labor assets and human capital				
Number of children under 15 years	0.0197***	0.0260***	0.0065	−0.0071
	(0.0069)	(0.0078)	(0.0231)	(0.0137)
Number of adult males > 15 and < 65 years	0.0390***	0.0576***	0.0337	−0.0485**
	(0.0101)	(0.0115)	(0.0339)	(0.0221)
Number of adult females > 15 and < 65 years	0.0144	−0.0113	0.1027***	0.0713***
	(0.0105)	(0.0120)	(0.0344)	(0.0195)
Number of aged > 65 years	−0.0078	−0.0284	0.0843	−0.0288
	(0.0188)	(0.0214)	(0.0600)	(0.0382)
Number of years of schooling	0.0491***	0.0586***	0.0183	−0.0350***
	(0.0050)	(0.0059)	(0.0203)	(0.0131)
Physical (land) assets				
Wetlands owned (acres)	−0.0025	−0.0088	0.0109	0.0089
	(0.0046)	(0.0055)	(0.0143)	(0.0076)
Drylands owned (acres)	−0.0100***	−0.0106**	0.0018	−0.0041
	(0.0038)	(0.0044)	(0.0102)	(0.0066)
Orchard owned (acres)	−0.0238***	−0.0293***	0.0300**	−0.0743**
	(0.0073)	(0.0088)	(0.0148)	(0.0296)
Access to market				
Time to reach market (minutes)	0.0000	0.0000	−0.0001	−0.0001
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Peer effect or concentration of activities				
Percentage of household in nonfarm (excl. itself)	0.0085***			
	(0.0007)			
Percentage of household in wage nonfarm (excl. itself)		0.0083***		
		(0.0007)		
Percentage of household in business nonfarm (excl. itself)			0.0197***	
			(0.0037)	
Percentage of household in petty nonfarm (excl. itself)				0.0171***
				(0.0013)
Locational variable (districts dummy)				
Bumthang[a,c]	−0.1303*	−0.2206**	−0.2801	0.2158
	(0.0758)	(0.0994)	(0.2277)	(0.1386)
Chhukha[a,c]	−0.0824	−0.0679	−0.0387	0.0298
	(0.0578)	(0.0714)	(0.1700)	(0.1350)

Continued.

Table 4. *Continued.*

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Dagana[a,c]	−0.1547**	−0.1249	−0.3510*	−0.1068
	(0.0738)	(0.0875)	(0.2059)	(0.1592)
Gasa[a,c]	−0.2457	−0.4432*	0.2172	−0.0558
	(0.1599)	(0.2467)	(0.3587)	(0.3057)
Haa[a,c]	−0.2950**	−0.2508*	−0.7127**	−0.1847
	(0.1214)	(0.1398)	(0.3437)	(0.2157)
Lhuentse[a,c]	−0.0018	−0.0612	−0.8747***	0.2378*
	(0.0703)	(0.0876)	(0.2885)	(0.1359)
Monggar[a,c]	−0.0151	0.0845	−0.4412**	−0.0985
	(0.0546)	(0.0683)	(0.1883)	(0.1366)
Paro[a,c]	−0.0713	−0.0242	−0.2228	0.0529
	(0.0553)	(0.0687)	(0.1734)	(0.1305)
Pema Gatshel[a,c]	0.0175	0.1025	−0.5967***	0.1637
	(0.0565)	(0.0716)	(0.2178)	(0.1309)
Punakha[a,c]	−0.1374**	−0.0688	−0.4059**	−0.2234
	(0.0703)	(0.0818)	(0.2089)	(0.1872)
Samdrup Jongkhar[a,c]	−0.0865	−0.0382	−0.1378	0.0894
	(0.0577)	(0.0723)	(0.1765)	(0.1308)
Samtse[a,c]	−0.0232	0.0913	−0.4159**	−0.0848
	(0.0509)	(0.0666)	(0.1759)	(0.1316)
Sarpang[a,c]	−0.0395	0.0279	−0.2838	0.0402
	(0.0595)	(0.0735)	(0.1914)	(0.1289)
Trashigang[a,c]	−0.0204	0.0472	−0.6404***	0.1134
	(0.0566)	(0.0692)	(0.1976)	(0.1275)
Trashi Yangtse[a,c]	0.0108	0.1066	−0.9432***	0.0571
	(0.0668)	(0.0786)	(0.2816)	(0.1474)
Trongsa[a,c]	−0.0172	0.0782	−0.4576*	−0.1143
	(0.0676)	(0.0809)	(0.2497)	(0.1778)
Tsirang[a,c]	−0.2766***	−0.2917***	−0.5179**	−0.0758
	(0.0817)	(0.0936)	(0.2200)	(0.1589)
Wangdue Phodrang[a,c]	−0.0647	0.0301	−0.6315***	−0.0876
	(0.0668)	(0.0765)	(0.2148)	(0.1582)
Zhemgang[a,c]	0.1052*	0.1974**	−0.2333	0.1044
	(0.0637)	(0.0791)	(0.1937)	(0.1556)
Number of observations	4169	4169	4169	4169
Wald chi2(32)	1401.52	1497.03	208.59	374.99
Prob. > chi2	0.000	0.000	0.000	0.000
Log pseudolikelihood	−13584.4	−13561.1	−11672.2	−11271.5
Wald test of exogeneity	17.43	15	0.85	3.31
Prob. > chi2	0.000	0.0001	0.3559	0.0689

Notes: Robust standard errors in parentheses. All regressions include a constant term. The number of observations in each regression is 4,169. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: male head
[c]excluded category: Thimphu district
[d]Instrumented variable using age of first marriage and education level of the spouse
Source: Authors' calculations.

with self-employment in nonfarm business, indicating the differential impact of wealth on the choice of participation in rural nonfarm employment.

VI. Determinants of Nonfarm Income

Analysis of employment participation in rural nonfarm sectors merely tells us whether the household participates in nonfarm activities or not. Therefore, in this section, we endeavor to understand the determinants of household income from different nonfarm activities. We estimate the income equation using a sample selection model with an endogenous education variable because not all households derive income from nonfarm activities (Wooldridge 2002).

In addition to instrumenting education, we use two variables to identify restrictions at the first stage of the regressions: land (see, for example, Fafchamps and Quisumbing 1999) and the peer effect percentage of households in nonfarm activities in the village (excluding the household itself). In the second stage, we use the variable percentage of the household in nonfarm activities to measure the effect of the concentration of activities and competition on income. In the first stage, we estimate exactly the same probit model specified in Tables 3 and 4. The income equations in the second stage are estimated in logs and the results are presented in Table 5.

The result shows a U-shaped relationship between age and earnings from wage employment; initially, the wage income decreases with age and after a certain minimum it increases. A similar association is observed between age and earnings from self-employment in petty nonfarm activities. The earnings from self-employment in nonfarm business activities increase with an increase in age and decrease after a certain point.

Female-headed households earn 4.6 times less income from wage employment and 11.7 times more income from self-employment in nonfarm business activities than male-headed households, indicating that while rural women in Bhutan are disadvantaged in the nonfarm wage labor market, they are highly enterprising. The male labor force is positively associated with earnings from nonfarm wage employment and nonfarm self-employment, while it is negatively associated with income from self-employment in petty nonfarm activities. The female labor force is positively associated with income from self-employment in nonfarm business activities and petty nonfarm self-employment. The number of elderly is negatively associated with earnings from nonfarm wage employment and nonfarm petty self-employment, while it is positively associated with income from nonfarm self-employment in business activities.

Education is associated with higher nonfarm income and it is positively associated with income from nonfarm wage employment and nonfarm business self-employment, but negatively associated with earnings from self-employment in

Table 5. **Estimations of Income with Selection Correction (Instrumented)**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Demographic variable				
Age of the household head	−1.1606***	−1.6140***	1.2119***	−0.4331***
	(0.1430)	(0.2062)	(0.2367)	(0.1148)
Age-squared of the household head	0.0075***	0.0120***	−0.0120***	0.0021***
	(0.0012)	(0.0017)	(0.0023)	(0.0008)
Female-headed household[a]	−0.9567	−4.6295***	11.6757***	−2.9680***
	(0.6797)	(0.7558)	(2.0610)	(0.7162)
Labor assets and human capital				
Number of children under 15 years	1.7330***	1.7169***	0.6376***	0.1714
	(0.3211)	(0.3518)	(0.1801)	(0.1276)
Number of adult males > 15 and < 65 years	3.9046***	4.4419***	3.0341***	−0.9413***
	(0.5914)	(0.7376)	(0.5520)	(0.2466)
Number of adult females > 15 and < 65 years	2.7173***	0.4991	8.1342***	1.8833***
	(0.4811)	(0.3515)	(1.3341)	(0.3472)
Number of aged > 65 years	0.0066	−1.7112***	5.1855***	−1.1120***
	(0.5713)	(0.6058)	(0.9502)	(0.3569)
Number of years of schooling	2.9304***	3.1795***	1.6609***	−0.9074***
	(0.4852)	(0.5727)	(0.3752)	(0.2192)
Access to market				
Time taken to reach market (minutes)	0.0018**	0.0045***	−0.0073***	−0.0022***
	(0.0009)	(0.0011)	(0.0013)	(0.0006)
Peer effect or concentration of activities				
Percentage of household in nonfarm (excl. itself)	0.7484***			
	(0.0713)			
Percentage of household in wage nonfarm (excl. itself)		0.7194***		
		(0.0777)		
Percentage of household in business nonfarm (excl. itself)			1.6341***	
			(0.2096)	
Percentage of household in petty nonfarm (excl. itself)				12.4375***
				(2.9079)
Locational variable (districts dummy)				
Bumthang[a,c]	−6.7418***	−13.5002***	−12.6665***	3.1194***
	(2.6615)	(3.9235)	(2.8546)	(1.6235)
Chhukha[a,c]	0.4742	2.0964	5.2363***	0.5883
	(1.8837)	(2.1103)	(1.9656)	(1.0844)
Dagana[a,c]	−3.8438*	−3.5813	−15.4002***	−2.5840**
	(2.3319)	(2.3969)	(3.0265)	(1.2682)
Gasa[a,c]	−12.8063*	−24.7577***	12.2866***	1.0061
	(5.0553)	(6.2488)	(3.6310)	(2.2280)
Haa[a,c]	−17.6251***	−12.7077***	−41.1798***	−3.8812**
	(4.4332)	(3.9771)	(7.3171)	(1.5902)
Lhuentse[a,c]	−2.2886	−2.9452	−51.2314***	2.4872*
	(2.1815)	(2.3763)	(9.0037)	(1.4529)

Continued.

Table 5. *Continued.*

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Monggar[a,c]	3.3297*	8.1063***	−23.5985***	−1.4747
	(1.8792)	(2.4801)	(4.2692)	(1.0713)
Paro[a,c]	2.0785	4.8010**	−10.5151***	1.7901*
	(1.8647)	(2.1246)	(2.4399)	(1.0630)
Pema Gatshel[a,c]	13.3984***	16.5214***	−28.3334***	2.9854**
	(2.7664)	(3.5923)	(5.0817)	(1.4243)
Punakha[a,c]	−1.6837	3.0310	−22.2391***	−3.3301**
	(2.3141)	(2.2936)	(4.1048)	(1.3525)
Samdrup Jongkhar[a,c]	0.5010	0.4339	−1.3711	1.5421
	(1.9049)	(2.0913)	(1.6602)	(1.1604)
Samtse[a,c]	8.0642***	11.5122***	−17.5173***	−2.0207*
	(2.2276)	(3.0499)	(3.4601)	(1.1078)
Sarpang[a,c]	1.0832	3.1474	−13.4581***	0.9509
	(1.9624)	(2.1874)	(2.7672)	(1.1810)
Trashigang[a,c]	0.2681	3.1103	−35.3584***	1.7142
	(1.8275)	(2.0622)	(6.2910)	(1.0916)
Trashi Yangtse[a,c]	−0.4078	4.4582*	−55.7196***	0.9732
	(2.1140)	(2.3810)	(9.8422)	(1.1371)
Trongsa[a,c]	0.4544	4.8869*	−26.4543***	−1.6109
	(2.2285)	(2.6014)	(4.9070)	(1.2339)
Tsirang[a,c]	−13.7553***	−13.2688***	−28.5624***	−1.5622
	(3.5508)	(3.7893)	(5.1348)	(1.1665)
Wangdue Phodrang[a,c]	3.0252	9.3401***	−35.4880***	−1.3016
	(2.0809)	(2.4785)	(6.2027)	(1.0865)
Zhemgang[a,c]	4.3406**	7.7591***	−4.6380**	0.8545
	(2.2197)	(2.7105)	(1.8695)	(1.2263)
Lambda	40.2918***	37.5874***	83.1318***	0.6803
	(7.9866)	(8.6131)	(14.5035)	(0.0656)
Number of observations	4169	4169	4169	4169
F(30, 4138)	72.62	79.02	12.61	16.61
Prob. > F	0.000	0.000	0.000	0.000
R-squared	0.280	0.288	0.195	0.197
Root MSE	17.563	18.077	11.271	10.374

Notes: Robust standard errors in parentheses. All regressions include a constant term. The dependent variable is annual income. In the first stage, the identifying restrictions are land assets (wetlands, drylands, and orchard). The number of observations in each regression is 4,169. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.

[a]dummy variables

[b]excluded category: male head

[c]excluded category: Thimphu district

[d]Instrumented variable using age of first marriage and education level of the spouse

Source: Authors' calculations.

petty nonfarm activities. This is not surprising as petty self-employment mostly comprises simple activities with low returns that require little or no skill.

The concentration of rural nonfarm activities is likely to have a strong positive influence on income from different sources of rural nonfarm activities because

of competition. Compared to Thimphu, income from wages in nonfarm activities are higher for those households in Monggar, Paro, Pema Gatshel, Samtse, Trashi Yangtse, Trongsa, Wangdue, and Zhemgang, while it is negative or insignificant for the rest. The earnings from self-employment in nonfarm business activities are lower for all the districts compared with Thimphu. Income from self-employment in petty nonfarm activities (handicrafts and pottery) is positive only for Pema Gatshel and Lhuentse, while it is either negative or insignificant for the rest.

VII. Robustness Check

In order to establish the robustness of the key results reported in the preceding section, we estimate a model with alternative specifications and present selected results in Tables 6, 7, and 8. Since the analysis in Section VI shows that the education level of the household head is a key determinant of participation in and income from nonfarm activities, we present estimates from alternative specifications in which education is measured as the level of education of the oldest member of the household, average level of schooling, and maximum level of schooling completed by an adult of the household. To account for the differences in the role of males and females separately, we also estimate the equation with the average level of schooling and the highest level of schooling completed by an adult male and adult female member of the household. The estimates are qualitatively similar to the corresponding estimates in Tables 3, 4, and 5: education has a positive impact on participation in nonfarm wage employment and nonfarm business self-employment, and a negative impact on self-employment in petty nonfarm activities.

To account for the nonlinearity of education, we divided the level of education into no formal education, less than primary, completed primary, completed high school, and completed university, and estimated the determinants of participation in and income derived from nonfarm employment. The result shows that the marginal effect is positive and progressively increasing for participation in and income derived from wage employment, while it is positive and significant for participation in self-employment in nonfarm business only for less than primary and completed primary, and it is negative for completed high school, and negative and significant for completed university. Participation in self-employment in petty nonfarm activities is insignificant for less than primary and completed primary, and it is negative and significant for completed high school and completed university.

We replaced the number of adult males and females with household size (total number of household members) and found a strong and positive relationship with participation in nonfarm employment. Wealth status, as measured by a dummy of households with a flush toilet, shows a positive association with participation in nonfarm self-employment.

The income from nonfarm wages and self-employment are positively associated with the level of education attained by the eldest member of the household and

Table 6. **Robustness Check—Probit Estimation for Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Specification A				
Education of the eldest	0.0222***	0.0286***	−0.0010	−0.0026**
member of the household	(0.0026)	(0.0028)	(0.0013)	(0.0012)
Specification B				
Mean education of	0.0252***	0.0246***	0.0037***	−0.0023**
working-age member	(0.0027)	(0.0028)	(0.0013)	(0.0011)
Specification C				
Maximum education of	0.0131***	0.0115***	0.0033***	0.0000
working-age member	(0.0017)	(0.0018)	(0.0009)	(0.0008)
Specification D				
Mean education of	0.0156***	0.0164***	0.0014	0.0006
working-age men	(0.0023)	(0.0024)	(0.0011)	(0.0010)
Mean education of	0.0166***	0.0144***	0.0034***	−0.0041***
working-age women	(0.0031)	(0.0031)	(0.0013)	(0.0013)
Specification E				
Maximum education of	0.0126***	0.0124***	0.0022**	0.0007
working-age men	(0.0019)	(0.0020)	(0.0010)	(0.0009)
Maximum education of	0.0091***	0.0081***	0.0021**	−0.0024***
working-age women	(0.0021)	(0.0022)	(0.0010)	(0.0009)
Specification F: Nonlinearity of education				
Less than primary[a,b]	0.0482	0.0176	0.0488***	0.0076
	(0.0294)	(0.0326)	(0.0199)	(0.0143)
Completed primary[a,b]	0.1164***	0.1113***	0.0518***	0.0125
	(0.0282)	(0.0323)	(0.0212)	(0.0149)
Completed high school[a,b]	0.2049***	0.2599***	−0.0003	−0.0328**
	(0.0276)	(0.0327)	(0.0207)	(0.0107)
Completed university[a,b]	0.2899***	0.3867***	−0.0444**	−0.0421***
	(0.0219)	(0.0253)	(0.0163)	(0.0103)
Specification G				
Toilet type—wealth status[a,c]	0.0418	−0.0859	0.3812***	0.3114***
	(0.0694)	(0.0646)	(0.0824)	(0.0861)
Specification H				
Household size	0.0931***	0.0671***	0.0711***	0.0246
	(0.0159)	(0.0154)	(0.0192)	(0.0209)

Notes: Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 3. Robust standard errors in parentheses. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: no formal schooling
[c]excluded category: nonflush toilet, open toilet
Source: Authors' calculations.

the maximum education of working-age members, confirming that the earnings from all categories of nonfarm activities increase with education. The mean of education of the working-age member is positively associated with income from wage employment, while it is negatively associated with income from self-employment in petty nonfarm activities. The mean and the maximum education of the working-age male

Table 7. **Robustness Check—Tobit Estimation for Intensity of Participation in Nonfarm Activities**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Specification A				
Education of the eldest member of the household	0.0275*** (0.0021)	0.0362*** (0.0024)	−0.0114 (0.0096)	−0.0154*** (0.0056)
Specification B				
Mean education of working-age member	0.0349*** (0.0025)	0.0383*** (0.0029)	0.0256*** (0.0096)	−0.0109* (0.0058)
Specification C				
Maximum education of working-age member	0.0205*** (0.0018)	0.0206*** (0.0021)	0.0248*** (0.0066)	0.0004 (0.0038)
Specification D				
Mean education of working-age men	0.0211*** (0.0022)	0.0236*** (0.0026)	0.0096 (0.0085)	0.0026 (0.0050)
Mean education of working-age women	0.0206*** (0.0027)	0.0222*** (0.0032)	0.0235** (0.0101)	−0.0194*** (0.0066)
Specification E				
Maximum education of working-age men	0.0176*** (0.0020)	0.0184*** (0.0023)	0.0164** (0.0073)	0.0030 (0.0041)
Maximum education of working-age women	0.0135*** (0.0022)	0.0147*** (0.0025)	0.0143** (0.0074)	−0.0104** (0.0046)
Specification F				
Less than primary[a,b]	0.0478 (0.0342)	0.0102 (0.0394)	0.3045*** (0.1073)	0.0316 (0.0646)
Completed primary[a,b]	0.1834*** (0.0322)	0.1875*** (0.0379)	0.3056*** (0.1130)	0.0190 (0.0613)
Completed high school[a,b]	0.3378*** (0.0336)	0.4346*** (0.0407)	−0.0444 (0.1564)	−0.2427*** (0.0919)
Completed university[a,b]	0.4268*** (0.0309)	0.5645*** (0.0364)	−0.4996** (0.2306)	−0.3414*** (0.1256)
Specification G				
Toilet type—wealth status[a,c]	0.0731*** (0.0245)	−0.0057 (0.0288)	0.4054*** (0.0859)	0.1805*** (0.0516)
Specification H				
Household size	0.0245*** (0.0064)	0.0207*** (0.0073)	0.0685*** (0.0207)	0.0084 (0.0125)

Notes: Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 4. Robust standard errors in parentheses. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: no formal schooling
[c]excluded category: nonflush toilet, open toilet
Source: Authors' calculations.

member is positive and significant for income from nonfarm wage employment, nonfarm self-employment, and petty nonfarm self-employment, while the mean and the maximum education of the adult female member is positive and significant only for nonfarm wage employment. Specification with nonlinearity of education shows

Table 8. **Robustness Check—Heckman Estimation for Determinants of Nonfarm Income**

	Employment Nonfarm	Wage Employment Nonfarm	Self-Employment Nonfarm (Business)	Self-Employment Nonfarm (Petty)
Specification A				
Education of the eldest member of the household	0.0744*** (0.0113)	0.0603*** (0.0140)	0.0420* (0.0249)	0.0565** (0.0260)
Specification B				
Mean education of working-age member	0.0697*** (0.0078)	0.0622*** (0.0073)	0.0236*** (0.0091)	−0.0236** (0.0099)
Specification C				
Maximum education of working-age member	0.0782*** (0.0079)	0.0718*** (0.0086)	0.0365 (0.0240)	0.0354*** (0.0139)
Specification D				
Mean education of working-age men	0.0735*** (0.0086)	0.0648*** (0.0102)	0.0361* (0.0205)	0.0527*** (0.0167)
Mean education of working-age women	0.0498*** (0.0101)	0.0465*** (0.0114)	−0.0263 (0.0301)	0.0281 (0.0363)
Specification E				
Maximum education of working-age men	0.0651*** (0.0075)	0.0557*** (0.0086)	0.0404** (0.0199)	0.0391*** (0.0151)
Maximum education of working-age women	0.0358*** (0.0073)	0.0332*** (0.0083)	−0.0261 (0.0208)	0.0162 (0.0238)
Specification F				
Less than primary[a,b]	0.2292** (0.1035)	0.2013* (0.1143)	−0.0730 (0.3606)	0.0300 (0.2403)
Completed primary[a,b]	0.4338*** (0.1114)	0.4327*** (0.1207)	−0.0125 (0.3462)	−0.0291 (0.2279)
Completed high school[a,b]	0.9774*** (0.1487)	0.8644*** (0.1752)	0.3063 (0.3420)	0.7232* (0.4351)
Completed university[a,b]	1.3130*** (0.1870)	1.1052*** (0.2242)	1.4394* (0.7557)	1.2497** (0.6179)
Specification G				
Toilet type—wealth status[a,c]	2.1793*** (0.6998)	−2.6828** (1.0971)	30.0143*** (3.4089)	5.0317*** (1.1648)
Specification H				
Household size	3.0591*** (0.4442)	2.2537*** (0.4040)	5.6890*** (0.9288)	0.2865** (0.1139)

Notes: Each specification is estimated by a separate regression. The other regressors (not reported) are defined as in Table 5. Robust standard errors in parentheses. *** = 1% level of significance, ** = 5% level of significance, * = 10% level of significance.
[a]dummy variables
[b]excluded category: no formal schooling
[c]excluded category: nonflush toilet, open toilet
Source: Authors' calculations.

that the earnings from wage employment progressively increase with the increase in the level of education. In the case of income from nonfarm self-employment, it is positive and significant only after the completion of university, while it is significant and positive after the completion of high school for self-employment in petty nonfarm activities.

Table 9. **Rural Inequality Decomposition by Income Source**

Source	Income (Nu)	Contribution to Income (%)	Contribution to Gini (%)	Elasticity
Agriculture	17,552	17.6%	12.3	−5.3***
Livestock	6,099	6.1%	4.3	−1.8***
Wage nonfarm	47,856	47.9%	51.4	3.5***
Self-employment nonfarm	10,740	10.7%	14.1	3.4***
Handicrafts	2,105	2.1%	1.5	−0.6***
Remittances	3,047	3.0%	1.0	−2.0***
Forestry	848	0.8%	0.9	0.1**
Others	11,696	11.7%	14.4	2.7***
Total income	99,943	100.0%	59.4	

Nu = Ngultrum.
Notes: $1 = Nu66.14 on 31 August 2015. Contribution refers to the contribution of each income component to the overall Gini coefficient. Elasticity refers to the elasticity of the overall Gini coefficient to small changes in income components.
Source: Authors' calculations.

We replaced the number of adult males and females with the household size (total number of household members) and found a strong and positive relation with income from nonfarm employment. Wealth status, as measured by the dummy of households with flush toilets and without flush toilets, shows a positive association of wealth and income from nonfarm self-employment.

VIII. Nonfarm Income and Inequality

We decomposed income inequality by income components to determine the contribution of a particular income source to total income inequality based on the methodology proposed by Lerman and Yitzhaki (1985). Table 9 shows the income from each source, the contribution of each component to the overall Gini coefficient, and the elasticity of the overall Gini coefficient to small changes in income components. We divided the total income into three major components: farm income; nonfarm income; and income from other sources such as transfers, remittances, pension receipts, and other sources of unearned income. The contribution of nonfarm income to overall income inequality of about 67% is quite high, compared with only about a 17% contribution from farm income. The elasticity of 0.63 indicates that an increase in nonfarm income increases overall inequality, as opposed to an increase in farm income, which decreases the overall Gini coefficient. However, on further disaggregation of rural nonfarm income sources, we find that not all nonfarm sources of income are associated with higher income inequality. An increase in income from self-employment in handicrafts and pottery actually decreases overall inequality. Thus, even if self-employment in handicrafts and pottery activities offer very low remuneration levels and therefore no realistic prospects

for upward income mobility, such income sources are obviously important from a social welfare perspective. For poorer subgroups of the population, these nonfarm incomes may offer the only means to some level of economic security. On the other hand, income from wage labor in nonfarm and self-employment in nonfarm business activities contributes significantly to overall inequality. This suggests that entry barriers impede the less educated and poor from accessing nonfarm wages and nonfarm business self-employment, thereby causing nonfarm sectors to have distributionally regressive effects on incomes.

IX. Conclusions and Recommendations

Bhutan has gone through a remarkable structural transformation during the last 3 decades that has resulted in an increase in the contribution of the secondary and tertiary sectors to GDP, and to the declining role of agriculture in the economy. Against the backdrop of these structural changes, it is important to explore if the rural labor market has moved in the direction of increased participation in rural nonfarm sectors.

Rural nonfarm sectors have been widely recognized as an important source of income in the drive for growth and poverty reduction in developing economies. This paper has endeavored to examine the importance of rural nonfarm employment and income in Bhutan, and the determinants of participation in income generation activities in rural nonfarm sectors.

Rural nonfarm sectors contribute 60.7% of total rural household income in Bhutan, while the agriculture sector contributes only 23.7%. Among nonfarm activities, nonfarm wage employment is the most important, contributing 47.9% of total rural household income. The analysis shows that the importance of the agriculture sector declines sharply across income quintiles, while the contribution of nonfarm sectors increases, indicating the importance of nonfarm income for richer households. Likewise, we find that the contribution of the agriculture sector decreases with an increase in the education level of the household head, while the contribution of nonfarm sectors increases exponentially with the increase in the level of education. The poor and the less educated participate less in rural nonfarm sectors than richer households. As in most previous studies, we find that education is a key determinant of participation in rural nonfarm sectors and the subsequent income generated.

The probit and Tobit model estimation with endogenous regression confirms the importance and differential role of education for participation in rural nonfarm sectors. In addition, the instrumented selection estimation reinforces the level of education on the return from different types of nonfarm activities. To check the robustness of the result, the model was estimated with different specifications for education, which yielded similar results.

The results confirm that Bhutanese women play an important role in the family and in society; female-headed households, the number of adult females in the household, and female education systematically influence the labor allocation and income from nonfarm sectors. In fact, women are engaged in self-employment in nonfarm activities and contribute to family incomes. In addition, the results show that ownership of an orchard positively influences participation in nonfarm business self-employment. We find that wealth status is key to assessing nonfarm business self-employment.

The policy implications from the analysis are obvious and important: First, raising education levels should be a high priority for improving access to rural nonfarm sectors and reducing poverty. Second, there are significant direct and indirect costs of education that create a critical barrier to access for the rural poor; therefore, providing free education alone is not enough. Third, it is questionable whether the Bhutanese education sector equips rural youth with the skills necessary for successful participation in modern nonfarm sectors. The Bhutanese government policy of compulsory and free education, and equal opportunities to access formal and nonformal education, is a step in the right direction. But while education is free and compulsory, households are expected to pay for the cost of dress and other miscellaneous expenses. In addition to the direct costs, there exists an opportunity cost for sending children to school, which is particularly high for poor families as their children contribute to the livelihood of the family by fetching water and firewood, helping on the farm, selling vegetables, and completing other tasks. During vacation, children from poor Bhutanese families tend to work in the construction sector and as potters on horticulture farms to generate cash income to support their education. Therefore, education policy should provide extra support and incentives to children from low-income families.

Returns on investment in education accrue only after a certain level of education is attained; hence, households will invest in education if families can continue to send their children to school beyond high school (Rahut and Micevska Scharf 2012a). In Bhutan, the number of seats available for students significantly decreases after secondary and higher secondary school, making it challenging to get a place for higher secondary, technical, and tertiary education. (See Appendix 1 for more details.) Children of those families who are not able to be placed in government schools and colleges are forced to look for seats in private schools in Bhutan and in India, which is beyond the capacity of poor Bhutanese households. Such a situation creates disincentives for the Bhutanese to send their children to school. The other pressing issue in Bhutan is increasing unemployment among educated Bhutanese, which also creates disincentives for investment in education.

Although a major focus of this paper is on demand-side analysis of nonfarm employment, a small part of the analysis investigates the supply side, which is crucial for the transformation of the economy from reliance on the primary sector to the secondary and tertiary sectors. In the probit, Tobit, and Heckman models,

we included a variable—peer effect, supply, and concentration of activities—as a proxy to analyze the supply side of nonfarm employment. Results from all three models confirm the importance of the supply of nonfarm sectors for participation in rural nonfarm employment. Therefore, government policies should focus on creating industries and enterprise to generate nonfarm employment opportunities. Given that Bhutan and India share a long and porous border (699 kilometers), as well as a preferential trade agreement, and Bhutan has an abundant supply of energy, the country is in a position to create industries and enterprises to supply employment opportunities that can absorb young Bhutanese in productive nonfarm activities. Such development of industries and enterprises can also lead to the growth of small household businesses to meet the demand for goods and services from large industries and enterprises. (See Appendix 2 for more details.) As Bhutan is increasingly viewed as a sought-after tourist destination, government policies should invest in promoting rural tourism.

The investment of resources by the government to encourage the private sector to invest in agriculture, manufacturing, and tourism in rural areas would trigger the growth of productive employment in other sectors of the rural nonfarm economy. Policies should not only encourage private investment in rural sectors, but also foster a business environment that is conducive to the growth of private sector enterprises in rural areas. Sufficient incentives are necessary to encourage manufacturing in rural areas; incentives can be in the form of providing suitable infrastructure, cheap electricity, or a tax holiday. Rural industrialization must adopt a cluster-based approach, where large and medium-sized firms utilize local resources and are linked with small businesses.

Rural manufacturing also requires investment in skill formation and entrepreneurship development. Unlike the agriculture sector, in Bhutan, rural nonfarm sectors suffer from the lack of a single institution that supports the development of the rural nonfarm economy. Single window integrated service centers to promote rural nonfarm sectors are a perquisite for the development of the rural nonfarm economy. The Government of Bhutan should also provide social security benefits to participants in unorganized sectors such as agriculture. Rural households would also indirectly benefit from linkages between the nonfarm and farm sectors.

Results from the decomposition of inequality by income source show that income from agriculture, livestock, handicrafts, and remittances has an equalizing effect, while income from wage and self-employment in nonfarm activities has a disequalizing effect. Only a small proportion of the population is able to access nonfarm wage and self-employment opportunities. Lucrative nonfarm employment requires a higher level of education, financial capital, and skills; hence, households with a low level of endowments of financial and human capital are only left with the option to engage in the agriculture sector for livelihood. Policies augmenting the endowment of poor households' resources would enable them to participate in lucrative sectors, thereby reducing the disequalizing effect of nonfarm sectors.

Increasing the supply of nonfarm employment opportunities and creating an enabling environment for small businesses would absorb the surplus labor in the farm sector and ultimately lead to equilibrium with respect to returns to labor in the farm and nonfarm sectors. However, the results also confirm the importance of the supply of nonfarm employment opportunities, which depends on forces that extend beyond the rural sector, including growth and broader macroeconomic policies.

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Appendix 1. Overview of Education in Bhutan in 2014

Bhutan has made significant progress in the education sector since it initiated its first 5-year plan in 1960. The number of students, teachers, and schools has increased significantly during last 3 decades (Table A.1).

In 2014, Bhutan has 332 public primary schools (up to grade 6) and 12 private primary schools; 87 public lower secondary schools (up to grade 8) and 1 private lower secondary school; 63 public middle secondary schools (up to grade 10) and 2 private middle secondary schools; 37 public higher secondary schools (up to grade 12) and 17 private higher secondary schools; and 13 tertiary institutes, including 1 private college. In addition, there are 107 extended classrooms and 210 early childhood care and development centers.[1] The data shows that the number of seats available for students decreases with an increase in the level of education, thereby pushing many students to either travel to India for education or drop out. For poor households, continuing education in a private school or traveling to India is almost impossible.

A similar situation is observed with the number of teachers. In 2014, there were 8,572 teachers, including 2,533 in primary schools, 1,939 in lower secondary schools, 2,148 in middle secondary schools, 1,790 in higher secondary schools, 150 in extended classrooms, and 12 in the Muenselling Institute.[2]

For the 2014 academic year, total school enrollment was 172,393, including 46,780 students in primary schools, 43,513 in lower secondary schools, 44,207 in middle secondary schools, 34,982 in higher secondary schools, 2,885 in extended classrooms, and 26 in Muenselling Institute. Total enrollment at the tertiary level was 11,089 students. Under the technical training programs, there are 1,405 trainees pursuing various technical and vocational courses in eight Ministry of Labour and Human Resources technical training institutes and one private training institute.[3]

The effects of the decline in the number of schools with an increase in the level of education are reflected in the enrollment rate (Table A.2). In 2014, the gross enrollment ratio was 113% at the primary level, 96% at the secondary level, 58% at

[1]Government of Bhutan, Department of Education. 2014. *Annual Education Statistics 2014*. http://www.education.gov.bt/documents/10180/12664/Annual+Education+Statistics+2014.pdf/f3779fb8–2cae-400c-833a-ab7140633b99?version = 1.0

[2]Ibid.

[3]Ibid.

Table A.1. **Students, Teachers, and Schools in Bhutan**

	Students		Teachers		Schools		
	1988	2014	1988	2014	1988	2014	
						Govt.	Private
Primary school	42,446	46,780	1,513	2,533	150	332	12
Lower secondary school[a]	11,835	43,513	447	1,939	21	87	1
Middle secondary school[b]	4,515	44,207	248	2,148	9	63	2
Higher secondary school[c]		34,982		1,790		37	17
Total	**58,796**	**169,482**	**2,208**	**8,410**	**180**	**519**	**32**

Notes: Does not include extended classroom and Muenselling Institute.
[a]Previously known as junior high school
[b]Previously known as high school
[c]Previously known as junior college
Source: Government of Bhutan, National Statistics Bureau. *Statistical Year Book of Bhutan 1995* and *2014*. www.nsb.gov.bt

Table A.2. **Gross Enrollment Ratios**

Key Education Indicator	Male	Female	Total
Gross enrollment ratio—Primary[a]	113%	113%	113%
Gross enrollment ratio—Basic[b]	108%	105%	107%
Gross enrollment ratio—Secondary[c]	101%	92%	96%
Gross enrollment ratio—Higher Secondary[d]	58%	59%	58%
Gross enrollment ratio—Tertiary within Bhutan[e]	27%	21%	24%
Gross enrollment ratio—Tertiary within Bhutan and outside Bhutan[f]	35%	29%	32%

Notes: [a]Grade 1–6; [b]Grade preprimary–10; [c]Grade 7–10; [d]Grade 11–12; [e]University in Bhutan (beyond Grade 12); [f]University in Bhutan and outside (beyond Grade 12).
Source: Government of Bhutan, Department of Education. 2014. *Annual Education Statistics 2014*. http://www.education.gov.bt/documents/10180/12664/Annual+Education+Statistics+2014.pdf/f3779fb8-2cae-400c-833a-ab7140633b99?version=1.0

the higher secondary level, and 24% at the tertiary level (Bhutan only). The gross enrollment rate at the tertiary level of Bhutanese students in both Bhutan and India was 32%.

The Government of Bhutan announced a loan program for students to pursue tertiary education in India and Bhutan. In 2015, 99 students were selected to receive a loan to pursue tertiary education in Bhutan and 11 students were selected for a loan to pursue tertiary education in India.

Appendix 2. Macroeconomic Policy for Rural Nonfarm Employment

Results from the analysis in this paper strongly suggest the importance of increasing the supply of nonfarm employment and of providing rural households with skills and knowledge through education. Neither increasing the level of education nor the supply of nonfarm employment opportunities can happen automatically; it depends on factors outside of the rural sector, including aggregate demand and supply, and broader macroeconomic policies.

Development policies focusing on education can help in augmenting the endowment of rural households and enable them to seek employment opportunities in nonfarm sectors that require higher levels of education and skills. The supply of education and skills development alone will not lead to livelihood diversification into lucrative nonfarm sector opportunities and increases in income and welfare. Therefore, augmenting the supply of rural nonfarm employment opportunities through a comprehensive and inclusive set of macroeconomic policies is crucial for rural industrialization and for expanding the scope of rural nonfarm-based livelihood. The rural nonfarm sector development policy should focus on providing rural infrastructure and incentives to attract investment in rural areas, like tax holidays and the provision of electricity at affordable prices, and on expanding the links between rural areas and urban centers within Bhutan, and with India.

Enjoying the Fruits of Their Labor: Redirecting Exports to Asian Consumers

WILLEM THORBECKE*

There has been an explosion in the amount of parts and components traded within East Asian production networks. The People's Republic of China (PRC) has emerged as the final assembly point for the goods produced. These goods then flow primarily outside of the region. When the global financial crisis (GFC) occurred, the decrease in Western demand led to a synchronized decline in Asian exports. If more final goods could flow to Asian consumers, it would provide insurance against another slowdown in the rest of the world. This paper uses a gravity model to investigate if emerging Asia is importing fewer consumption goods than predicted. The results indicate that since the GFC, the PRC and the Association of Southeast Asian Nations (ASEAN) have imported more final goods than expected. Nevertheless, their consumption imports per capita are orders of magnitude lower than those of developed economies. This highlights the need for further growth in emerging Asia.

Keywords: consumption, gravity models, production networks
JEL codes: F13, F14

I. Introduction

The value of intermediate goods traded among East Asian economies increased 40 times between 1980 and 2012. In 2012, more than $450 billion in intermediate goods was traded within the region.[1] This explosion in intraregional trade reflects the development of intricate production networks. Firms have exploited a comparative advantage by slicing up production processes and allocating the production modules to different locations based on variances in factor endowments across the fragmented production blocks.

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[1]These data come from the CEPII-CHELEM database. East Asia includes the PRC; Indonesia; Japan; the Republic of Korea; Malaysia; Singapore; Taipei,China; and Thailand. Of the $450 billion intermediate goods traded in 2012, 49% came from electronic components; 20% from engines, vehicle components, and rubber items such as tires; 11% from miscellaneous hardware; 6% from yarns and fabrics; and the rest from paints, paper, tubes, plastics, metallic structures, wood articles, and fertilizers.

This slicing up of the value chain began in earnest after the Japanese yen appreciated 60% following the Plaza Accord in September 1985. Japanese multinational corporations (MNCs) lost their price competitiveness and responded by shifting labor-intensive activities to the Republic of Korea and Taipei,China. However, in the late 1980s, both wages and exchange rates in these economies skyrocketed, and the locational advantage of assembling labor-intensive goods in the newly industrialized economies declined. In response, Japanese firms transferred production to member economies of the Association of Southeast Asian Nations (ASEAN). Surplus labor in ASEAN member economies held wages down and exchange rates in these economies were pegged at competitive levels relative to the United States (US) dollar. After the People's Republic of China (PRC) joined the World Trade Organization (WTO) in 2001, there was a surge in foreign direct investment (FDI) and parts and components exports from East Asian economies to the PRC. The PRC's WTO accession gave foreign investors the confidence that the PRC would sustain an FDI-friendly environment. The PRC quickly became the final assembly point of intricate production and distribution networks. It imported hundreds of billions of dollars of parts and components from East Asia and exported the final assembled products throughout the world.

The surge in final goods exports from the PRC has been breathtaking. Its exports of computers, consumer electronics goods, and telecommunications equipment increased more than 70 times between 1993 and 2012 to reach $500 billion. In 1993, only 2.5% of the world's exports of final electronics goods came from the PRC, while in 2012, 43% of the world's exports of these goods came from the PRC. The next leading exporting economy in 2012 exported only 5% of the world's final electronics goods.[2]

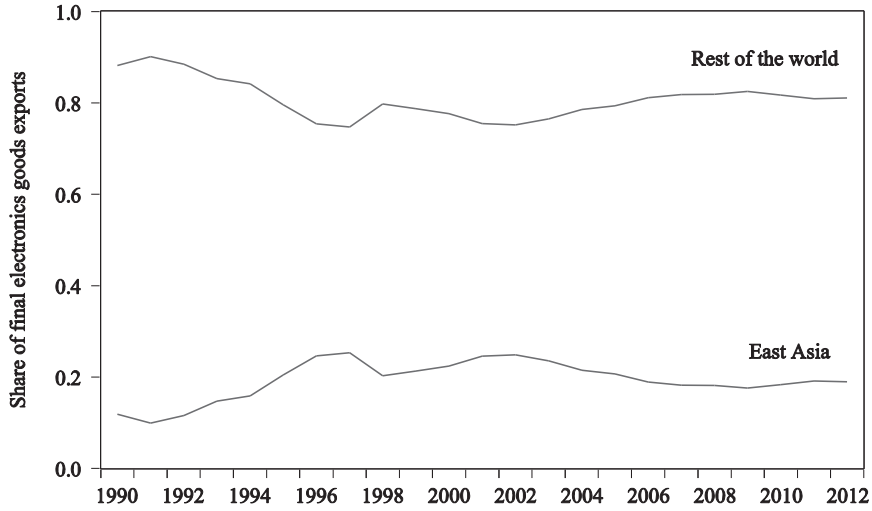
Athukorala (2014) documented that, while the intermediate goods trade in East Asia has exploded, demand for final goods produced within production networks comes primarily from outside the region. He found that the PRC did not provide a cushion against export contraction during the global financial crisis (GFC). He also observed that the decrease in demand from the rest of the world during the GFC caused a synchronized trade contraction in East Asia.

Figure 1a shows the share of final electronics goods going to East Asia and the rest of the world.[3] More than 80% of these goods flow outside the region, while East Asia's share has not increased since the 1990s. Figure 1b shows that the share going to North America has increased since the GFC to about 36%, while the share going to Europe has fallen to 23%. The share going to all other economies has increased steadily since the GFC and now exceeds the share going to Europe.

[2]These data come from the CEPII-CHELEM database.

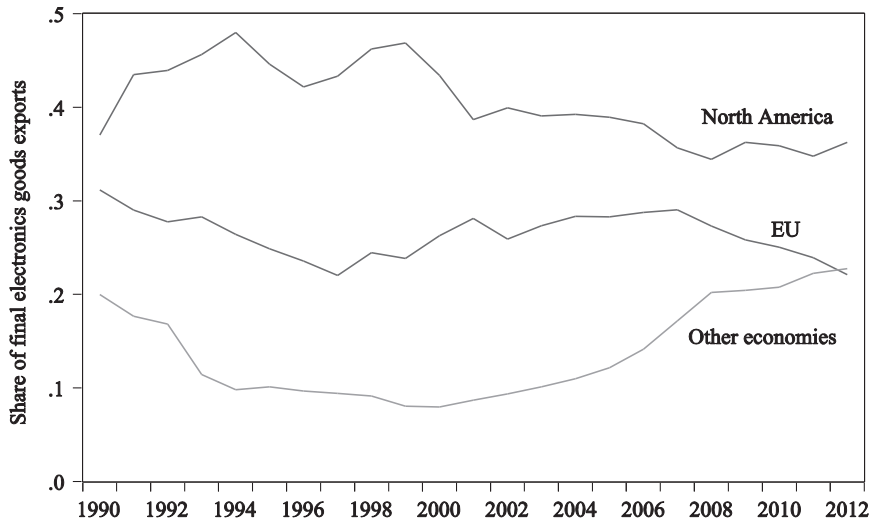
[3]East Asia in the figure includes the PRC; Indonesia; Japan; the Republic of Korea; Malaysia; Singapore; Taipei,China; and Thailand.

Figure 1a. **Share of the PRC's Final Electronics Goods Exports to East Asia and the Rest of the World**



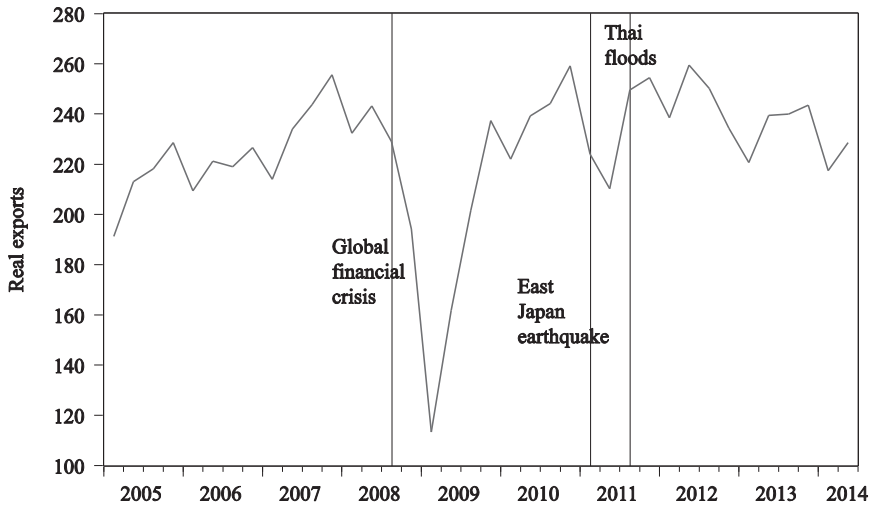
PRC = People's Republic of China.
Notes: Final electronics goods comprise the following categories: consumer electronics, telecommunications equipment, and computer equipment. East Asia includes the PRC; Indonesia; Japan; the Republic of Korea; Malaysia; Singapore; Taipei,China; and Thailand.
Source: CEPII-CHELEM database.

Figure 1b. **Share of the PRC's Final Electronics Goods Exports to Regions Outside of East Asia**



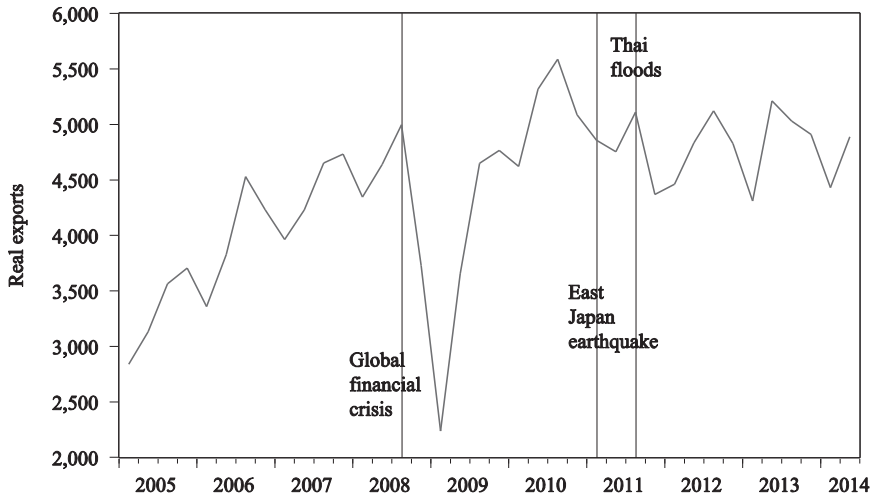
PRC = People's Republic of China.
Notes: Final electronics goods comprise the following categories: consumer electronics, telecommunications equipment, and computer equipment. East Asia includes the PRC; Indonesia; Japan; the Republic of Korea; Malaysia; Singapore; Taipei,China; and Thailand. The European Union (EU) includes 28 member countries.
Source: CEPII-CHELEM database.

Figure 2a. **Japanese Automobile Parts and Components Exports**



Source: CEIC database.

Figure 2b. **Japanese Electronics Parts and Components Exports**



Source: CEIC database.

Exports within Asian production networks are more sensitive to demand shocks caused by events such as the GFC than to supply shocks caused by events such as the Great East Japan Earthquake or the flooding in Thailand that began in 2011. Figures 2a and 2b present data on the volume of Japanese exports of automobile parts and semiconductors. These are two of the main categories of Japanese parts and components exports within regional production networks. Following the GFC, exports of both categories fell by more than 70% and took almost 2 years to return

to precrisis levels. By contrast, the drops in exports of both categories following the Great East Japan Earthquake and flooding in Thailand were an order of magnitude smaller and the recoveries rapid. Ando and Kimura (2012) have presented careful evidence indicating that the GFC had a prolonged effect on Japanese exports, while the earthquake did not.

One lesson of the GFC is that it would be desirable for regional production networks to decouple from final demand in the West. The Ministry of Economy, Trade and Industry (METI) (2009) reported that there are 930 million people in Asia in the middle class or above. Thus, there is huge potential for demand by Asian consumers to function as a second engine of growth. Channeling more final goods to the region would also allow Asian workers to enjoy more of the fruits of their own labor.

This paper investigates whether the economies involved in East Asian production networks are importing fewer final goods than one would expect. The key economies involved in these regional supply chains are the PRC; Indonesia; Japan; the Republic of Korea; Malaysia; Singapore; Taipei,China; and Thailand. To examine whether they are importing fewer consumption goods than expected, the gravity model is employed. This model is a workhorse for estimating bilateral trade flows. Traditional gravity models, as developed by Tinbergen (1962), posit that bilateral trade between two economies is directly proportional to gross domestic product (GDP) in the two economies and inversely proportional to the distance between them. As Leamer and Levinsohn (1995); and Baltagi, Egger, and Pfaffermayr (2014) discussed, gravity models yield some of the clearest and most robust findings not only in international economics but in all of economics. This model is thus used to predict consumption goods imports by Asian economies.

The results indicate that actual consumption imports into the PRC and ASEAN have increased relative to their predicted values and, in 2012, were more than predicted by the gravity model. Thus, emerging Asia is redirecting final goods to the region.

The evidence reported below also indicates that more progress is necessary. This paper considers how growth and development in the region can continue.

The next section presents the data and methodology. Section III presents the results. Section IV highlights the importance of investing in human capital to promote growth. Section V concludes.

II. Data and Methodology

The gravity model is a workhorse for estimating bilateral trade flows. As developed by Tinbergen (1962), gravity models posit that bilateral trade between two economies is directly proportional to GDP in the two economies and inversely proportional to the distance between them. In addition to GDP and distance, these

models typically include other factors affecting bilateral trade costs such as whether trading partners share a common language. The model takes the form

$$Ex_{ijt} = \beta_0 + \beta_1 Y_{it} + \beta_2 Y_{jt} + \beta_3 DIST_{ij} + \beta_4 LANG_{ij} + \beta_5 RER_{ijt} + \partial_i + \omega_j + \pi_t + \varepsilon_{ijt} \quad (1)$$

where Ex_{ijt} represents real exports from economy i to economy j; t represents time; Y represents real GDP; DIST represents the geodesic distance between the two economies; LANG is a dummy variable equaling 1 if the economies share a common language and 0 otherwise; RER is the bilateral real exchange rate between the two economies; and ∂_i, ω_j, and π_t are economy i, economy j, and time fixed effects, respectively.[4]

Data on consumption exports are obtained from the CEPII-CHELEM database. These include the following goods: beverages, carpets, cars, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.[5]

Gaulier, Lemoine, and Ünal (2011) noted that automobile imports into the PRC largely reflect purchases by rich Chinese consumers. Many of these are luxury cars imported from Germany. In one specification, these predominantly high-end imports are excluded.

Data on real GDP and real exchange rates are obtained from the CEPII-CHELEM database. The real exchange rate is the Consumer Price Index (CPI)-deflated bilateral real exchange rate between the exporting and importing economies measured in levels.

Data on distance and common language are obtained from www.cepii.fr. Distance is measured in kilometers and represents the geodesic distance between economic centers. Common language is a dummy variable equaling 1 if two economies share a common language and 0 otherwise.

The gravity model is estimated as a panel using annual data for 31 economies over the 1988–2012 sample period. The economies are Australia; Austria; Brazil; Canada; the PRC; Denmark; Finland; France; Germany; India; Indonesia; Ireland; Italy; Japan; Malaysia; Mexico; the Netherlands; Norway; the Philippines; Poland; Saudi Arabia; Singapore; the Republic of Korea; Spain; Sweden; Switzerland; Taipei,China; Thailand; Turkey; the United Kingdom; and the US.

[4] Anderson, Vesselovsky, and Yotov (2013) have shown that exchange rates can exert real effects in the context of a gravity model when there are incomplete pass-through or scale effects.

[5] The category optics is not included in consumption imports because in the case of the PRC, many optical imports are inputs into the production process rather than final consumption goods. These inputs include unworked lens blanks of plastic, unworked lens blanks of glass, fiber optic cable for live transmission of images, and photolithography equipment for the manufacture of semiconductors.

Table 1. **Descriptive Statistics**

Variable	(1) Minimum Value	(2) Maximum Value	(3) Mean	(4) Standard Deviation
Consumer goods excluding cars ($ million)	0	91,887	714	2,626
Consumer goods including cars ($ million)	0	93,389	1,004	3,678
(Log of) Real GDP	10.61	16.47	13.14	1.18
(Log of) Distance	5.75	9.84	8.59	0.93
(Log of) Bilateral real exchange rate	−1.76	1.76	0	0.62
Common language	0	1.00	0.10	0.30

GDP = gross domestic product.
Source: Author's calculations.

Equation (1) has often been estimated as a log-linear model using panel least squares methods. Santos Silva and Tenreyro (2006) showed that this approach can lead to biased estimates when there is heteroskedasticity in the data-generating process. They reported simulation results indicating that Poisson pseudo-maximum likelihood (PPML) estimators perform better both in terms of bias and efficiency in several cases. PPML techniques are thus used to estimate equation (1).

Anderson and van Wincoop (2003) have argued that exports should depend on outward and inward multilateral resistance terms. These terms capture the fact that exports and imports between two economies depend not only on trade costs between the two, but also on changing trade costs between third economies. For instance, exports from economy *i* to economy *j* can be affected if economy *i* enters into a preferential trade agreement with a third economy *k*.

Models based on Anderson and van Wincoop's (2003) approach can be estimated by the equation

$$\ln Ex_{ijt} = \beta_0 + \beta_1 \ln DIST_{ij} + \beta_2 LANG_{ij} + \beta_3 RER_{ijt} + \partial_i + \omega_j + \pi_t + \varepsilon_{ijt} \qquad (2)$$

where the variables are as defined above. Here, the distance and language variables capture trade costs for exports between economies *i* and *j*, and the exporter and importer fixed effects variables capture the multilateral resistance terms. Time-varying fixed effects can also be included. Equation (2) is estimated as a sensitivity check for the results from equation (1).

Table 1 presents descriptive statistics for the variables. Since the data cover 31 economies over a 25-year period, there is a lot of variation in the data. The first row presents basic statistics for consumption exports excluding cars and the second for consumption exports including cars. The minimum value is zero. These zero values indicate that in some years, one economy in the sample did not export consumption goods to another. These zero values occur in less than 0.4% of the observations. It is not surprising that some of the economies do not trade consumption goods with each other in some years, especially for economies that are small and located far

apart. This should not affect the findings since Santos Silva and Tenreyro (2006) reported that the PPML technique used here is robust to the presence of zero values of the dependent variable.

The first row of Table 1 also indicates that the maximum value for consumption exports excluding automobiles exceeds $90 billion. For consumption exports excluding automobiles, there are eight observations where the values exceed $60 billion. These are for the PRC's consumption exports to the US in 2005–2012. Similarly, for consumption exports including automobiles, the eight largest observations are for the PRC's exports to the US in 2005–2008, and these all exceed $60 billion.

Rows 3 through 6 report descriptive statistics for (the logs of) GDP, distance, and the real exchange rate, and for the common language dummy variable. The means and standard deviations indicate that the values are spread over a wide range. The large degree of variation in the independent variables should help make the parameter estimates more precise. For the real exchange rate, the distribution is symmetric and centered around zero. This occurs because the log of the real exchange rate for exports from economy A to economy B equals minus the log of the real exchange rate for exports from economy B and economy A, and because both sets of exchange rates are included. For a common language, the results indicate that 10% of the economy pairs in the sample share a common language.

III. Results

Table 2 presents gravity estimates. Columns (1), (3), and (5) present results using consumer goods excluding cars; columns (2), (4), and (6) present results including cars. Columns (1) and (2) present results including importer and exporter GDP; columns (3) through (6) present results excluding the GDP variables. In columns (3) and (4), time-varying exporter fixed effects and importer fixed effects are included; in columns (5) and (6), exporter and importer fixed effects are included.

The coefficients on exporter and importer real GDP are large and statistically significant. They are larger in column (2), where the dependent variable includes cars, than in column (1), where it excludes cars. This indicates that higher incomes tend to be associated with more car imports.

The coefficients on distance and common language are the expected signs and statistically significant in all cases. The results in every specification indicate that distance is an important deterrent of trade and that sharing a common language is an important facilitator of trade. The coefficient on the real exchange rate is negative in four cases and positive in two. Overall, the gravity models perform well.

The discussion that follows focuses on the estimations in columns (1) and (2) that include exporter and importer GDPs. The relation between the size of real GDP and the amount of consumption imports is something that will be discussed

Table 2. **PPML Gravity Estimates, 1988–2012**

	(1)	(2)	(3)	(4)	(5)	(6)
Exporter GDP	0.71***	0.87***				
	(0.05)	(0.04)				
Importer GDP	0.69***	0.84***				
	(0.05)	(0.03)				
Distance	−0.75***	−0.80***	−0.88***	−0.76***	−0.75***	−0.81***
	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Common language	0.09***	0.08***	0.27***	0.27***	0.10***	0.09***
	(0.03)	(0.03)	(0.00)	(0.00)	(0.03)	(0.03)
Bilateral real exchange rate	−0.10*	−0.25***	−0.04***	−0.10***	0.16***	0.04***
	(0.06)	(0.06)	(0.00)	(0.00)	(0.06)	(0.07)
Constant	−5.68***	−9.98***	15.0***	15.0***	17.5***	18.3***
	(1.16)	(0.90)	(0.00)	(0.00)	(0.11)	(0.12)
Dependent variable	Consumer goods excluding cars	Consumer goods	Consumer goods excluding cars	Consumer goods	Consumer goods excluding cars	Consumer goods
Fixed effects specification	Exporter, importer, time	Exporter, importer, time	Time-varying exporter, importer	Time-varying exporter, importer	Exporter, importer, time	Exporter, importer, time
No. of observations	23,249	23,249	23,249	23,249	23,249	23,249
Sample period	1988–2012	1988–2012	1988–2012	1988–2012	1988–2012	1988–2012

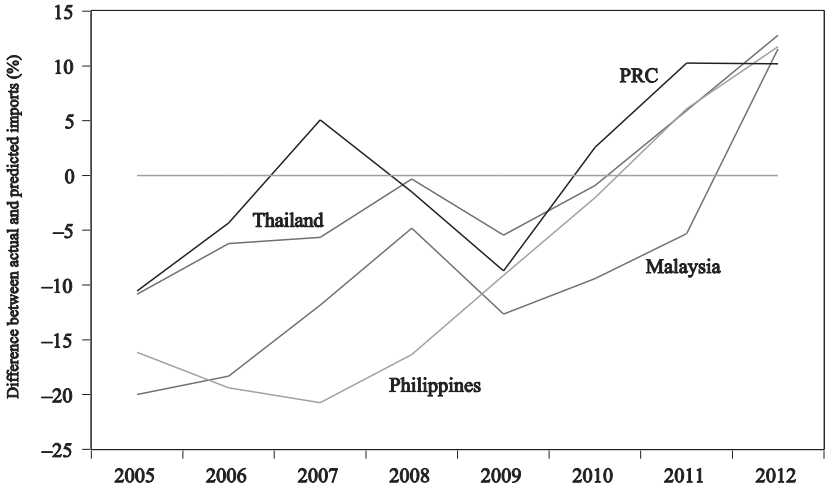
GDP = gross domestic product, PPML = Poisson pseudo-maximum likelihood.
*** = significant at 1%, ** = significant at 5%, and * = significant at 10% level.
Notes: The table contains PPML estimates of gravity models. Bilateral exports from 31 major exporters to each of the other 30 economies in 1988–2012 are included. Huber-White standard errors are in parentheses.
Source: Author's calculations.

in the next section. The results in columns (3) through (6) reveal similar patterns to those discussed below; that is, consumption imports in emerging Asia are increasing relative to predicted values.

Figures 3a and 3b present the percent difference between actual and predicted imports for the PRC and the three emerging ASEAN economies that are most involved in regional production networks: Malaysia, the Philippines, and Thailand. Figure 3a presents results for consumption imports excluding cars, and Figure 3b for consumption imports including cars. Both figures indicate that actual consumption imports have risen relative to predicted consumption imports between 2005 and 2012. For the ASEAN economies in 2012, consumption imports excluding cars were 12%–13% greater than predicted and consumption imports including cars were 12%–15% greater. For the PRC in 2012, consumption imports excluding cars were 10% greater than predicted and consumption imports including cars were 20% greater. For all four economies, actual imports have been growing relative to predicted imports since the GFC.

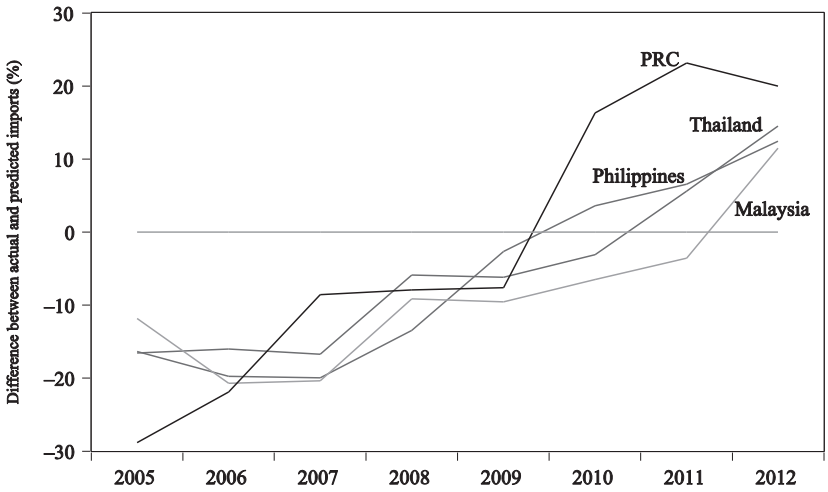
Figures 4a and 4b present the percent difference between actual and predicted imports for ASEAN; the PRC; Japan; the Republic of Korea; and Taipei,China.

Figure 3a. **Difference between Actual Consumption Imports (excluding Cars) and the Values Predicted by a Gravity Model**



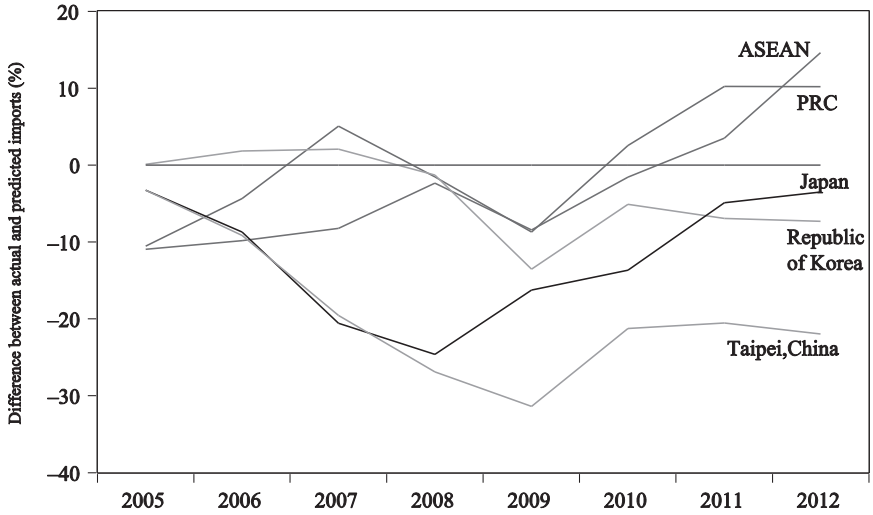
PRC = People's Republic of China.
Note: Consumption goods comprise the following categories: beverages, carpets, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.
Source: CEPII-CHELEM database and calculations by the author.

Figure 3b. **Difference between Actual Consumption Imports and the Values Predicted by a Gravity Model**



PRC = People's Republic of China.
Note: Consumption goods comprise the following categories: beverages, cars, carpets, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.
Source: CEPII-CHELEM database and calculations by the author.

Figure 4a. **Difference between Actual Consumption Imports (Excluding Cars) and the Values Predicted by a Gravity Model**



ASEAN = Association of Southeast Asian Nations, PRC = People's Republic of China.
Notes: ASEAN refers to Indonesia, Malaysia, the Philippines, and Thailand. Consumption goods comprise the following categories: beverages, carpets, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.
Source: CEPII-CHELEM database and calculations by the author.

Figure 4a presents results excluding car imports and Figure 4b including car imports. Imports into Japan and the Republic of Korea are close to their predicted values; imports into the PRC and ASEAN are well above their predicted values. For Taipei,China, on the other hand, consumption imports in both figures are far below their predicted values in every year. In Figure 4a, they are 18% below their predicted value in 2012 and in Figure 4b, they are 22% below in the same year.

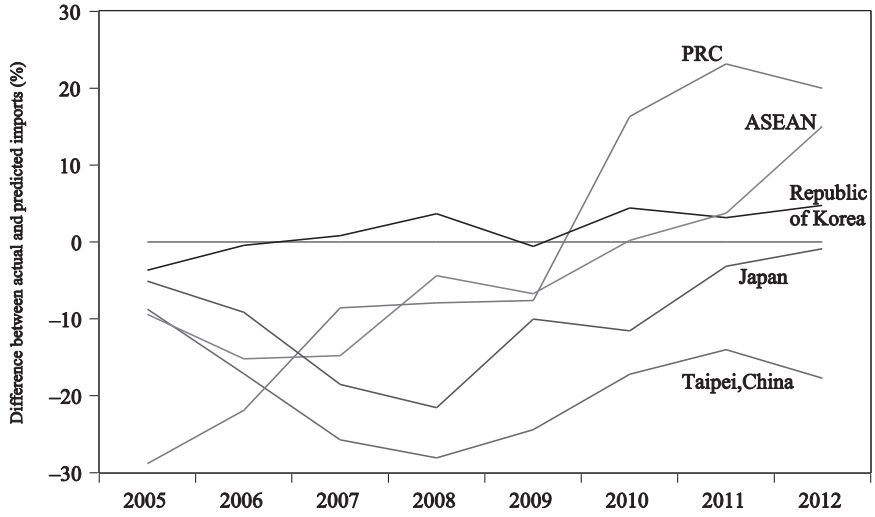
The important implication of the results presented here is that emerging Asian economies involved in regional production networks are rebalancing. More and more final goods are flowing to consumers in these economies.

On the other hand, more progress is necessary. Figure 5 shows consumption imports per capita in 2012: $2,026 for Germany; $1,755 for France; $198 for ASEAN; and $36 for the PRC.

IV. Discussion

Figure 5 indicates that emerging Asia's consumption imports are orders of magnitude smaller than consumption imports in advanced economies. Table 2 shows that there is a strong relationship between an economy's consumption imports and

Figure 4b. **Difference between Actual Consumption Imports and the Values Predicted by a Gravity Model**



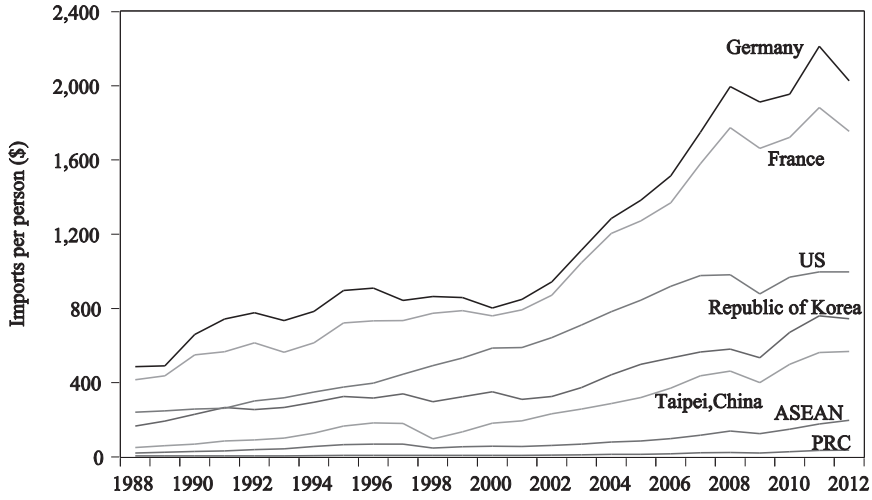
ASEAN = Association of Southeast Asian Nations, PRC = People's Republic of China.
Notes: ASEAN refers to Indonesia, Malaysia, the Philippines, and Thailand. Consumption goods comprise the following categories: beverages, carpets, cars, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.
Source: CEPII-CHELEM database and calculations by the author.

its level of real GDP. Thorbecke (2011) reported statistically significant income elasticities exceeding unity for consumption imports into Malaysia, the Philippines, the PRC, and Thailand in the context of the Bickerdike–Robinson–Metzler imperfect substitutes model. These findings imply that the populations of ASEAN and the PRC will be able to consume more if their economies continue to grow and develop. This section considers a few steps toward achieving this goal. Since innovation is crucial for growth, especially as economies develop, and since investing in education can promote innovation, the discussion below highlights human capital formation. In this regard, Rozelle (2010) emphasized that nurturing highly productive workers in poorer rural areas is essential for the PRC's development.

Figures 4a and 4b indicate that in 2012, the PRC and ASEAN imported much more than predicted and Taipei,China imported much less. One reason for the divergent results is presented in Figure 6, which shows that the real effective exchange rate (REER) has appreciated 34% in ASEAN and 38% in the PRC since 2005, while the REER of Taipei,China depreciated 21% during this time. The exchange rate appreciations increased the purchasing power of ASEAN and the PRC consumers, allowing them to import more consumption goods (Thorbecke 2011).

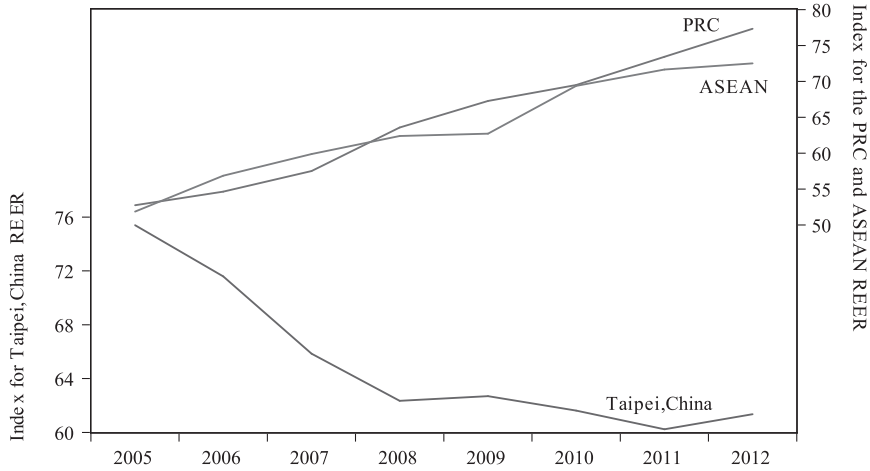
The depreciation of the REER in Taipei,China occurred despite the fact that its current account surplus averaged almost 9% of GDP between 2005 and 2013.

Figure 5. **Consumption Imports per Person**



ASEAN = Association of Southeast Asian Nations, PRC = People's Republic of China, US = United States.
Notes: ASEAN refers to Indonesia, Malaysia, the Philippines, and Thailand. Consumption goods comprise the following categories: beverages, carpets, cars, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.
Source: CEPII-CHELEM database and calculations by the author.

Figure 6. **Real Effective Exchange Rates in ASEAN; the PRC; and Taipei,China**



ASEAN = Association of Southeast Asian Nations, PRC = People's Republic of China, REER = real effective exchange rate.
Notes: ASEAN includes Malaysia, the Philippines, and Thailand. The exchange rate values in 2005 equal 75.4 for Taipei,China; 51.9 for ASEAN; and 52.8 for the PRC.
Source: CEPII-CHELEM database.

Foreign exchange reserve accumulation by the central bank kept the NT dollar from appreciating. The PRC also increased its holdings of foreign reserves by $508 billion in 2013 alone, and by $3 trillion between 2006 and 2013. The rates of return on these external reserves are low compared to the private and social rates of return available from investments in the domestic economy. Summers (2006) reported that returns on US Treasury securities are close to zero when measured in Asian currencies. Fang et al. (2012), on the other hand, reported that the return to an additional year of education in the PRC equaled 20% per year.

Investing in education is especially crucial in the rural sector. Today's rural Chinese students will be the urban workers of the future. Their families are often poor and cannot afford to send their children to school. Making education available to them would yield high returns to society.

Investing in education is also necessary because the appreciation of the renminbi and ASEAN currencies shown in Figure 6 caused a large decrease in labor-intensive exports such as furniture, footwear, toys, and sporting goods (Thorbecke and Zhang 2009). To offset this, emerging Asia needs to assimilate new technologies and move up the value chain. Urata, Matsuura, and Wei (2006) reported that technology transfer from MNCs to workers in emerging economies increases when the workforce becomes better educated. Investing in education will help companies in emerging Asia to assimilate new technologies and move up the value chain.

Rozelle (2010) underscored the importance of education in promoting innovation and productivity growth. To accomplish this goal, he noted that students in the PRC need to acquire skills in mathematics, science, English, and computers.

Rozelle (2010) also observed that the PRC should begin investing when children are young. Most rural children cannot afford preschool, and elementary school attendance is hampered by poor accessibility and long, dangerous commutes. Bad health, sanitation, nutrition, and psychology management also restrict students' ability to learn. Prevalent problems such as anemia, vitamin deficiencies, visual difficulties, and worms can be remedied inexpensively. For instance, one multivitamin with iron can address both anemia and vitamin deficiencies, and only costs about $0.03 per student per day (Rozelle 2010).

High school tuition in the PRC is expensive at 20 times the per capita annual income of the rural poor and little financial aid is available. Because of this, only one in four rural students finishes high school. In neighboring economies such as Japan; the Republic of Korea; and Taipei,China, almost 100% of students finish high school. College tuition in the PRC is prohibitively expensive at 60 times the annual per capita income of the rural poor. Only 3% of rural students are able to attend a tier 1 or tier 2 university (Rozelle 2010). Facilitating education would help the PRC to keep climbing the ladder of comparative advantage.

Investing in human capital in ASEAN is also essential to foster creative industries. These economies need to progress from labor-intensive assembly operations

to the engineering and design aspects of production. To achieve this, it is necessary for children to receive adequate nutrition, healthcare, and primary education. It is also desirable that high school students receive high quality education in science and math, and that university students receive scientific and engineering training. The educational system should focus on providing students with marketable skills that businesses need. ASEAN governments can help coordinate this process.

Thus, there is a significant need to invest in education. Rather than channeling trillions of dollars into investments in US securities, the returns to Asia and its people would be higher if they invested in rural education, nutrition, and healthcare. In addition, as the Asian Development Bank (ADB) has often argued, consumption would grow if precautionary reasons for savings, such as inadequate provision of education and healthcare, were remedied.

The investment climate in ASEAN is also plagued by corruption. The World Economic Forum (2013) surveyed more than 10,000 executives and found corruption as one of the two biggest concerns in doing business in Malaysia, the Philippines, and Thailand. For the Philippines, respondents also singled out poor infrastructure as among their biggest concerns. MNCs have shifted production out of the Philippines to other locations because of poor infrastructure and the high cost of electricity. Improving the investment climate in ASEAN could help attract and retain MNCs and lead to more technology assimilation by local workers. A detailed discussion on improving the investment climate in emerging Asia is available in Kawai and Lee (2015).

The discussion above focused on promoting economic growth as a means of increasing consumption imports.[6] Another question is whether per capita consumption imports are less than one would expect given the level of income. Table 3 presents data on consumption imports per person relative to GDP per person for all 84 economies included in the CEPII-CHELEM database. In 2012, the PRC ranked the lowest out of all 84 economies with a ratio of 0.0059, or less than 10% of the average of 0.059 for the other 83 economies. The PRC is thus an outlier.

This suggests that structural factors are leading to underconsumption and underimporting of final goods. One factor is tariffs on consumption imports into the PRC and other protectionist obstacles. At the 2014 Asia Pacific Economic Co-operation (APEC) Summit, the PRC's President Xi Jinping proposed a Free Trade Agreement for the Asia Pacific (FTAAP). This would promote freer trade among the 21 Pacific Rim nations that are members of APEC. By lowering the level of import protections, it would enable Chinese consumers to purchase more from abroad.[7]

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[6] I am indebted to two anonymous referees for the discussion in this paragraph and the two following paragraphs.

[7] Other free trade initiatives such as the Regional Comprehensive Economic Partnership among 16 East Asian economies would have a similar effect.

Table 3. **Consumption Imports per Capita Relative to GDP per Capita**

Economy	(Consumption Imports per Capita)/ (GDP per Capita)	Rank
Kyrgyz Republic	0.461	1
Malta	0.153	2
Estonia	0.152	3
Belgium	0.150	4
Cyprus	0.134	5
Latvia	0.126	6
Slovakia	0.121	7
Bosnia and Herzegovina	0.106	8
Paraguay	0.102	9
Slovenia	0.0975	10
Lithuania	0.0975	11
The Netherlands	0.0928	12
Viet Nam	0.0923	13
Czech Republic	0.0899	14
Hong Kong, China	0.0897	15
Hungary	0.0893	16
Macedonia	0.0866	17
Bulgaria	0.0832	18
Ireland	0.0803	19
Albania	0.0746	20
Austria	0.0744	21
Switzerland	0.0729	22
Serbia and Montenegro	0.0716	23
Ukraine	0.0713	24
Croatia	0.0667	25
Iceland	0.0625	26
Poland	0.0577	27
Romania	0.0570	28
Portugal	0.0567	29
Denmark	0.0556	30
Luxembourg	0.0550	31
Tunisia	0.0535	32
Uruguay	0.0529	33
Kenya	0.0516	34
Bolivia	0.0511	35
Singapore	0.0506	36
Cote d'Ivoire	0.0492	37
Malaysia	0.0490	38
Belarus	0.0486	39
Germany	0.0484	40
Finland	0.0448	41
Libya	0.0448	42
United Kingdom	0.0447	43
Kazakhstan	0.0445	44
France	0.0442	45
Spain	0.0439	46

Continued.

Table 3. *Continued.*

Economy	(Consumption Imports per Capita)/ (GDP per Capita)	Rank
Sweden	0.0434	47
Greece	0.0419	48
Cameroon	0.0405	49
Thailand	0.0388	50
Chile	0.0378	51
Taipei,China	0.0366	52
Canada	0.0366	53
Philippines	0.0363	54
Morocco	0.0356	55
Ecuador	0.0353	56
Italy	0.0351	57
New Zealand	0.0346	58
Brunei Darussalam	0.0339	59
Israel	0.0316	60
Saudi Arabia	0.0302	61
Gabon	0.0286	62
Sri Lanka	0.0286	63
Russian Federation	0.0284	64
Algeria	0.0280	65
Norway	0.0278	66
Egypt	0.0276	67
Venezuela	0.0274	68
Republic of Korea	0.0252	69
Peru	0.0247	70
Australia	0.0226	71
Nigeria	0.0217	72
Mexico	0.0214	73
Turkey	0.0202	74
United States	0.0193	75
Japan	0.0192	76
Bangladesh	0.0192	77
Colombia	0.0189	78
Argentina	0.0138	79
Indonesia	0.0124	80
Pakistan	0.0120	81
Brazil	0.00951	82
India	0.00762	83
People's Republic of China	0.00588	84

GDP = gross domestic product.

Notes: The table presents data on consumption imports per capita divided by GDP per capita. Consumption imports comprise the following categories: beverages, carpets, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.

Source: CEPII-CHELEM database.

The PRC's regulatory distortions also favor investment at the expense of consumption. The central government, in the 2013 Third Plenum blueprint, vowed to change this incentive structure. For instance, the PRC caps the interest rate that households can earn on deposits. These and other banking sector regulations have resulted in an artificially low cost of capital to large firms, stimulating investment. At the same time, as Muellbauer (2014) noted, the value of savings accounts equals four times annual disposable income and the interest rate caps suppress household income and spending. The government is determined to liberalize deposit rates.[8] As another example, large parts of the services sector are shielded from competition. Allowing open markets to play a larger role will help increase labor-intensive employment and thus raise incomes and consumption for many workers. The 2013 Third Plenum blueprint proposed that markets play a "decisive role" in allocating resources. As a third example, external costs associated with pollution in the PRC have not been internalized. Firms produce more pollution than the socially optimal amount. The PRC's citizens pay huge costs in terms of health problems and a lower life expectancy due to pollution.[9] The central government has recently attached a high priority to reducing pollution. By following through with their proposed reforms, the PRC can help to change the incentive structure that favors firms and production at the expense of consumers and consumption.

V. Conclusion

East Asia is characterized by intricate production and distribution relationships. MNCs in ASEAN; Japan; the Republic of Korea; and Taipei,China produce sophisticated, technology-intensive intermediate goods and ship them to the PRC for assembly by low-skilled workers. The finished products are then exported disproportionately to Europe and the US.

The GFC showed the danger of depending on the West as an engine of growth. When demand in Europe and the US plummeted after Q3 2008, Asia's exports collapsed. Thus, Asia was not able to decouple from the West.

ADB and others have noted the importance of channeling final goods not only to Europe and the US, but also to Asian consumers. This would provide a second growth locomotive and reduce the exposure of Asian economies to slowdowns outside of the region. It would also allow Asian workers to enjoy more of the fruits of their own labor.

[8] Huang, Li, and Wang (2015) noted that before interest rates can be liberalized, commercial bank reform is necessary to prevent the emergence of reckless competition.

[9] Researchers at Peking University have found that air pollution in the PRC reduces people's life expectancy by 5.5 years (Kaiman 2013). Others have reported that pollution has contaminated between 8% and 20% of the PRC's arable land and led to "cancer villages" where citizens die young because of exposure to toxins (Chin and Spegele 2013).

This paper investigates whether Asian economies are importing fewer final consumption goods than one would expect. To do this, it uses the gravity model, which is a workhorse for estimating bilateral trade flows.

The results indicate that the PRC and ASEAN are now importing more final goods than predicted by the model. On the other hand, emerging Asia's consumption imports are far less than the imports of developed economies. To channel more goods to consumers in the region, Asia needs to continue developing.

One key step in accomplishing this would be to invest in human capital, beginning at a young age. Private and social returns are much higher for these domestic investments than for investments in US Treasury securities. Further accumulation of foreign exchange reserves would thus lead to a misallocation of resources. If Asian central banks reduced their interventions in foreign exchange markets, any resulting exchange rate appreciations would increase the purchasing power of Asian citizens and allow them to consume more.

The Chinese character for country is a jade (a precious stone) surrounded by a boundary. We can think of the precious stone as representing the people of the PRC and the boundary the borders of the country. The PRC would receive a higher expected return and face lower risks in renminbi terms by investing in the health, education, and welfare of the people within its borders rather than by investing further in foreign exchange reserves and other external assets. The government should focus especially on rural education and on remedying economic deficiencies in ways that would benefit the nontradable sector.

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How Capital Flows in the Midst of Excess Savings Affect Macrofinancial Vulnerability

Iwan J. Azis and Damaris Yarcia*

In contrast to the period prior to the 1997/98 Asian financial crisis, emerging East Asia today is a region with excess savings, particularly corporate savings. Beginning in the mid-2000s, liquidity was further amplified by massive capital flows, particularly bank-led flows, and subsequently by debt-led flows following the introduction of quantitative easing in the United States. Both types of inflows are critical for bank-dependent Asia in need of long-term financing for infrastructure development. Yet, these two types of capital flows are also the most volatile. The surge of inflows in the midst of excess savings helped raise liquidity and growth, but also posed serious challenges to financial stability. As revealed by flow-of-funds data, the risk-taking behavior of economic agents and their preferences toward financial assets increased. Bank-led flows increased noncore liabilities and caused a credit boom, elevating the risk of procyclicality, while debt-led flows raised the vulnerability to a reversal of flows. These inflows also lowered the effectiveness of monetary policy, underscoring the need to supplement standard measures with a more effective macroprudential policy.

Keywords: capital flows, excess savings, flow-of-funds, procyclicality, risk-taking behavior
JEL codes: E44, F32

I. Introduction

Two important changes occurred in recent decades with regard to emerging East Asia's economy. First, excess investment turned into excess saving. Before 1997, emerging East Asia was a region of excess investment. Following the 1997/98 Asian financial crisis (AFC), the investment rate plunged, driving up excess saving in the region. As the investment rate picked up in the early 2000s, emerging East Asian economies steadily recovered and the savings rate also began to climb, further widening the savings–investment gap. Figure 1 illustrates the widening of this gap in emerging East Asia following the AFC. The second change was the increased availability of funds spurred by capital inflows generated by the ultra-easy money policies in advanced economies and the subsequent introduction of quantitative

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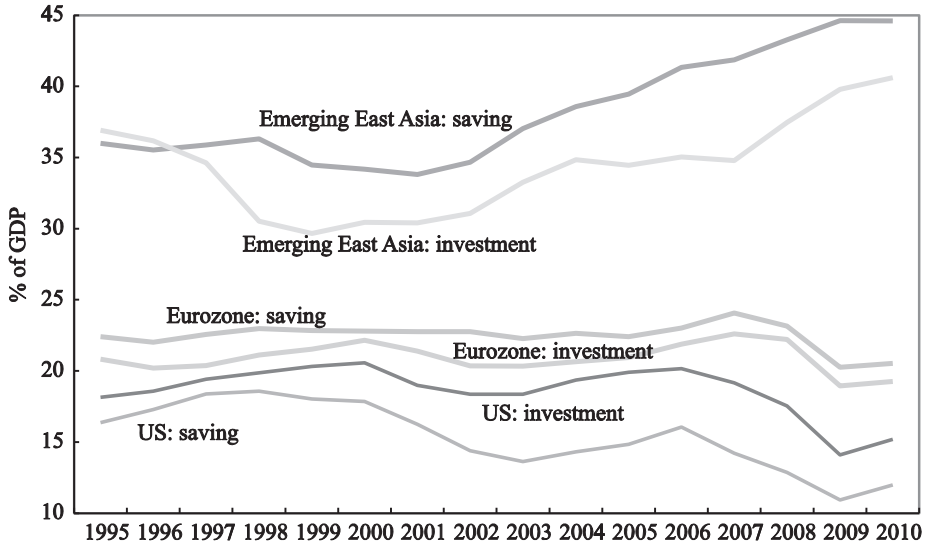
Figure 1. **Savings and Investment**



GDP = gross domestic product, US = United States.

Notes: Gross domestic savings refer to GDP less final consumption expenditure (total consumption). Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. The eurozone comprises Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. Emerging East Asia comprises the People's Republic of China; Hong Kong, China; Indonesia; the Republic of Korea; Malaysia; the Philippines; Taipei,China; Thailand; and Viet Nam.

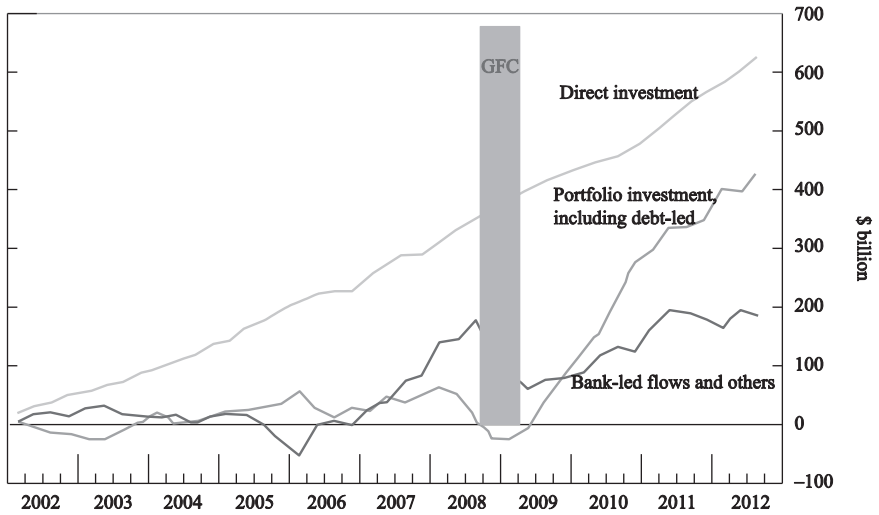
Sources: World Bank. World Development Indicators. http://data.worldbank.org/data-catalog/world-development-indicators (accessed 21 August 2012); For Taipei,China, Asian Development Bank. Statistical Database System. https://sdbs.adb.org/ (accessed 21 August 2012).

easing in the United States (US). As a result, capital flows into emerging markets surged (Figure 2). Excluding foreign direct investment (FDI), the surge of inflows intermediated by banks (bank-led flows) began in the mid-2000s. After a brief dip during the global financial crisis (GFC) and after the implementation of quantitative easing in 2009, portfolio flows, including those entering debt markets (debt-led flows), began to dominate (Azis and Shin 2015).

Both changes altered the global liquidity and capital flow environment, affecting not only the size and variety of available sources of funds, but also the use of these funds in the recipient economies. Easy money that reflects externalities caused by unilateral policies ("financial nationalism"[1]) in advanced economies emboldened investors as evidenced by the preference toward risky investments and financial assets—behavior similar to what was observed in Asia during the years leading up to the AFC (Azis 2005) and in Europe prior to the ongoing crisis in the

[1]The term "financial nationalism" refers to a country's unilateral act to deal exclusively with national financial matters without considering its possible externality and repercussions to other countries. See also Claessens (2009).

Figure 2. **Gross Capital Inflows to Emerging Markets**



GFC = global financial crisis.
Source: Azis and Shin 2015.

eurozone (Hale and Obstfeld 2014).[2] This trend was further reinforced by asymmetry in the incentive system and the growing opportunities for financial investment resulting from financial liberalization and innovation. While those changes helped boost the region's finance sector and economic growth, they also elevated the risks of volatility and financial instability.

In this paper, we argue that the surge of capital inflows in emerging East Asia in the midst of excess savings pose serious challenges to the region's financial stability. Inflows intermediated through banks could elevate the risk of procyclicality and undermine credit markets, and foreign capital flocking to capital markets could raise the finance sector's vulnerability to capital flow reversals and undermine long-term financing in capital markets. This is on top of the risks associated with growing pressures on exchange rates and the limited effectiveness of standard monetary policy.

The volatility of capital flows in emerging East Asia is analyzed by looking at how frequent the growth of each type of flow exceeded its standard deviation. Bank-led flows and debt-led flows have been found to be the most volatile.

The region's excess savings trend is traced by using flow-of-funds (FOF) data. Why FOF data? A standard approach using aggregate macroeconomic indicators, such as current account balance and net capital flows, does not allow us to delineate

[2] In their analysis, Hale and Obstfeld (2014) also argued that greater financial integration in Europe led to core European Monetary Union banks borrowing from outside the eurozone for significant lending to periphery borrowers. This has not only played a major role in the ongoing European crisis, but the impacts have also spilled over beyond the eurozone. Similarly, Azis, Mitra, and Baluga (2013) showed that the impacts of crises in the US and Europe—and the unilateral policy responses—have spilled over into Asia.

any change in the trends of how economic agents source and use their funds. It also diverts attention away from the global financing patterns that are at the core of financial fragility (Borio and Disyatat 2011). While the derived flows from current account data capture changes in net claims on an economy arising from trade in real goods and services, they exclude the underlying changes in gross flows and their contributions to existing stocks, including all transactions that involve only trade in financial assets. Yet, such transactions make up the bulk of today's cross-border financial activity.

The use of FOF data also enables us to analyze sector financing and financial market operations. In particular, the intersectoral impact of borrowing and lending flows can be traced. The case of the AFC is a notable example. One fundamental source of weakness in the affected economies during the years leading up to the AFC was the nature of capital inflows and the quality of investments. Huge influxes of short-term bank borrowing led to domestic credit booms that largely financed highly speculative investments. Even bank lending was used for stock purchases. Using the FOF data, one can trace the path of capital flows from the private sector to the banking sector and analyze how financial instability could emerge. By re-evaluating the case of Thailand during the AFC, Dawson (2004) showed how FOF analysis could capture the real vulnerabilities where macroeconomic indicators alone failed. These vulnerabilities could have been foreseen had FOF accounts been available and in use at the time.[3]

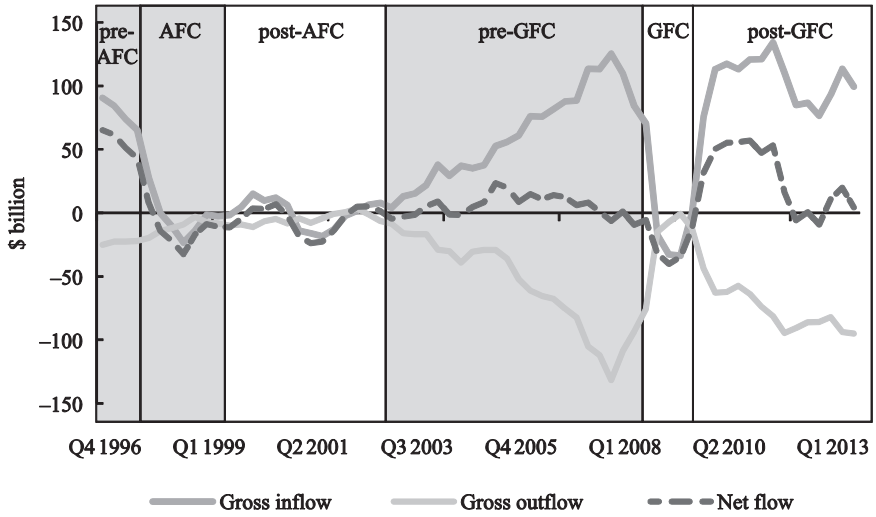
The paper is organized as follows. Section II discusses capital flow trends by focusing on the size and volatility of different types of flows. Section III looks at how excess savings evolved by evaluating the changes in the sources and uses of funds of different agents during the pre-GFC and GFC periods. These changes and the surge of liquidity provide the basis for subsequent analysis of agent preferences and risk-taking behavior in section IV. The analysis in section V focuses on the risks of procyclicality, vulnerability to capital flow reversals, and the ineffectiveness of standard policies. The paper concludes with a summary of the key findings.

II. Capital Flows

Of the roughly $1 trillion in net private capital flows to emerging market economies each year, about half goes to Asia (IIF 2015). The combination of low interest rates in advanced economies since the mid-2000s and a quantitative easing policy in the US in response to the GFC has sparked capital flows to emerging East Asia. The region has also exhibited strong pull factors due to its steady growth, stable economy, and higher returns.

[3]Dawson (2004) used the International Monetary Fund's financial accounts data to generate an FOF matrix for Thailand. Because the AFC underscored the importance of monitoring financial flows, improvements have since been made on the collection, standardization, and maintenance of data on FOF accounts in emerging East Asia, especially for those economies shaken by the crisis. An FOF matrix can now be directly sourced from official statistics in some Asian economies.

Figure 3. **Gross and Net Capital Flows in Select Emerging Asian Economies**



AFC = Asian financial crisis, GFC = global financial crisis.
Notes: Based on 4-quarter moving sums for Indonesia, the Republic of Korea, the Philippines, and Thailand. Inflows refer to bank flows from other investments on the liabilities side (assigned a positive value); outflows refer to the asset side (assigned a negative value).
Source: ADB calculations based on International Monetary Fund. Balance of Payments Statistics (BPM5 and BPM6). http://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52 (accessed 22 July 2013).

Since the AFC, capital flows other than short-term foreign debt have been dominant. Gross inflows increased significantly, but outflows have also been on the rise. Outward FDI and equity investment also increased, providing foreign asset buffers whenever markets became volatile. After recovering from a sharp fall during the AFC, gross inflows fluctuated before growing steadily again after 2002, intermediated predominantly by banks. The flows peaked in mid-2007 and fell again as the recession in the US began.[4] A sharp drop during the GFC led gross inflows to hit a bottom, falling even lower than the troughs reached during the AFC. Meanwhile, almost symmetrically, gross outflows began to rise in 2002 and peaked in mid-2007. Ultra-easy monetary policies and quantitative easing elevated risks in advanced economies, creating a strong push factor for further capital flows. As a result, gross inflows in emerging East Asia—most of which went through capital markets, driven largely by the search for yield—exceeded gross outflows during the post-GFC period (Figure 3).

[4]The decision of BNP Paribas to terminate withdrawals from three hedge funds and the bursting of the US housing bubble, which saw the values of securities tied to US real estate plummet, damaged global financial institutions. In August 2007, a number of central banks in advanced economies were actively pumping liquidity into the financial system to calm nerves amid fears of a credit crunch. The trigger for the panic was the decision by BNP Paribas to block withdrawals from three hedge funds due to what BNP Paribas (Boyd 2007) referred to as "complete evaporation of liquidity." The subsequent bank run included the first run on a leading bank in the United Kingdom since the mid-19th century.

Growing production networks in line with a supply-chain model were among the most important pull factors for FDI in the region, with East and Southeast Asia alone accounting for more than one-fifth of all global FDI flows in 2012 to 2014 (UNCTAD 2015). A large portion of this was absorbed by the People's Republic of China (PRC). The region's rebalancing process in moving toward domestic demand-led growth also offered opportunities for investors. Flows through equity markets were strong, as were inflows to bond markets, amid low returns and slow-growth environment in industrial economies. Bank deposits from nonresidents also surged as interest rate differentials persisted.

But volatility also returned. Using the International Monetary Fund's Balance of Payments Statistics, we distinguish capital inflows as follows: (i) FDI consisting of direct investment, (ii) debt flows comprising debt securities and others including derivatives, (iii) bank flows, and (iv) equity flows for equity portfolio. We also distinguish periods with unusual volatility. "Surges" are characterized by a sharp increase in inflows and "stops" occur when there is a sharp decrease in inflows. For gross outflows, the corresponding terms are "flight" (sharp increase) and "retrenchment" (sharp decrease).[5] Using one standard deviation of the change in the mean of capital flows as thresholds, which are depicted as dashed lines in Figure 4, the following episodes were identified:[6]

Surge Episodes
Equity-led: Q4 2009–Q1 2010
Debt-led (excluding banking flows): Q1 2002–Q3 2002, Q2 2007, and Q4 2007
Bank-led: Q1 1999–Q3 1999, Q1 2004, Q3 2009, Q2 2010, and Q4 2012

Stop Episodes
Equity-led: Q4 2000, Q4 2004, Q4 2006–Q1 2007, and Q1 2008–Q3 2008
Debt-led (excluding banking flows): Q1 1997–Q3 1997, and Q1 2001–Q3 2001
Bank-led: Q4 1996, Q4 1997–Q2 1998, Q4 2008–Q1 2009, and Q3 2011–Q1 2012

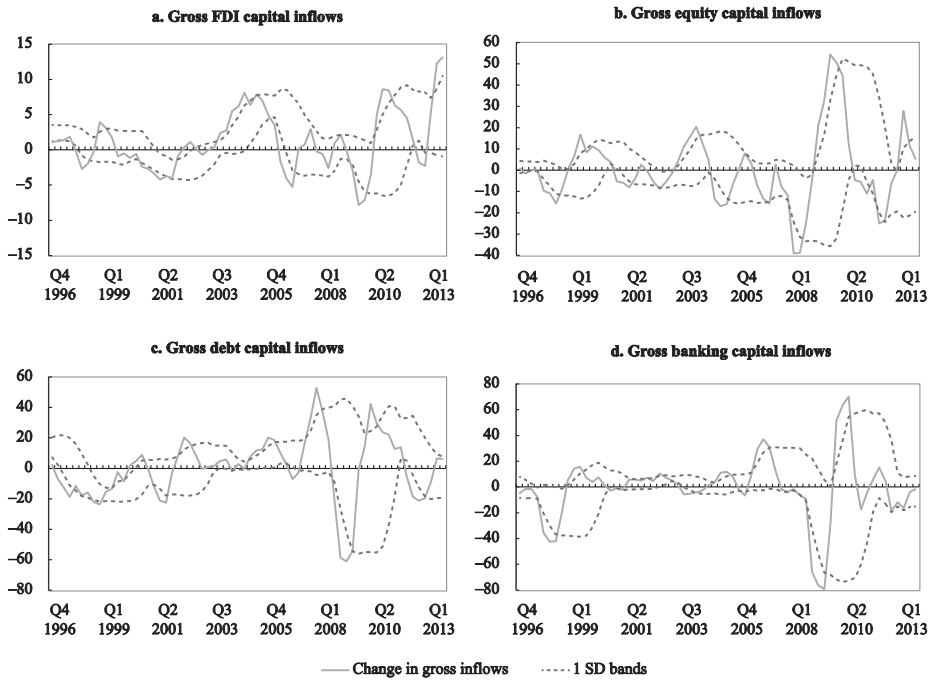
Flight Episodes
Equity-led: Q2 2007–Q4 2007
Debt-led (excluding banking flows): Q2 1999, Q4 2005, and Q4 2009–Q2 2010
Bank-led: Q2 1999–Q3 1999, Q4 2002–Q2 2003, Q3 2004, and Q1 2006–Q2 2006

Retrenchment Episodes
Debt-led (excluding banking flows): Q1 1998–Q2 1998, Q1 2008–Q2 2008, and Q2 2012
Bank-led: Q4 1996–Q1 1997, Q3 1998–Q4 1998, Q1 2002–Q2 2002, Q4 2004–Q2 2005, Q3 2008–Q1 2009, and Q3 2012

[5]Forbes, K. J. and F. Warnock. 2012. Capital Flow Waves: Surges, Stops, Flight, and Retrenchment. *Journal of International Economics.* 88 (2). pp. 235–51. However, unlike their analysis, we distinguish "debt" from "bank" because the latter is more prone to deleveraging and procyclicality, and therefore it has a more direct impact on the real sector.

[6]We conducted similar analysis for capital outflows, which is not shown here.

Figure 4. **Gross Capital Inflows in Select Emerging Asian Economies**



FDI = foreign direct investment, SD = standard deviation

Notes: Computed as year-on-year change based on 4-quarter moving sum. Inflows refer to bank flows from other investments on the liabilities side (assigned a positive value); outflows refer to the asset side (assigned a negative value). Episodes are based on one SD band. Emerging Asia comprises Indonesia, the Republic of Korea, the Philippines, and Thailand.

Source: ADB calculations based on International Monetary Fund. Balance of Payments Statistics (BPM5 and BPM6). http://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52 (accessed 22 July 2013).

Clearly, the volatility of capital flows has not been uniform across Asia. It is also equally clear that debt-led and bank-led flows have been the most volatile types of capital flows.[7] The growing debt-led flows were boosted by the region's safe-haven status when investors shunned risky holdings like equities but at the same time sought high-risk returns (Azis and Shin 2015). The yields on traditionally safer US Treasuries and on emerging market debt moved in the same direction during the period under review. The downgrade in global growth expectations pushed local currency (LCY) bond yields lower in tandem with those in advanced economies, implying that credit risks associated with LCY emerging market bonds were significantly lower than in the past.

[7] Debt-led flows are facilitated by asset managers, acting presumably on behalf of investors such as pension funds and insurance companies. Their investment behavior is guided largely by risk returns and market conditions, and less by standard macro policies.

In some economies, the size and liquidity of the bond market remained relatively small, and hence prone to perturbations. This is particularly the case where limited size and liquidity is combined with a high share of foreign ownership. For example, foreign ownership of LCY bonds exceeds one-third in Indonesia and Malaysia, compared with only around 10% in the Republic of Korea and Singapore. (*Asia Bond Monitor*, various issues) Sporadic and sudden outflows, as happened in June 2013 during the so-called "taper tantrum," can easily rattle the market and cause exchange rates to fluctuate.

In the case of bank-led flows, deleveraging by European banks contributed to volatility. As the funding conditions in Europe deteriorated toward the end of 2011, bleak economic prospects and doubts over fiscal sustainability undermined the value of sovereign and other assets. Bond issuance from banks fell, especially uncollateralized issuance in fiscally challenged economies. Outflows due to fund withdrawals surged, particularly in Italy and Spain, and exposures to a number of European Union institutions dropped sharply. At the same time, claims by US money market funds on European banks, especially French banks, fell significantly. The impact on emerging East Asia was felt in terms of a shrinking number of consolidated loans, new syndicated loans, and large bilateral loans from European Union banking groups during the third quarter of 2011.[8] The terms on new loans to corporations and households were also tightened. As a result, gross outflows from emerging East Asia rose toward the end of 2011 and gross inflows declined.

Beginning in 2012, signs emerged that non-European banks and bond market investors were compensating for the pullback from European banks, albeit not entirely, especially in trade finance. Japanese banks filled part of the gap, with their share of foreign claims remaining stable after the GFC (Figure 5). Cross-border lending to Asia from banks based in Australia; the Republic of Korea; and Taipei,China also increased; as did lending from banks in the United Kingdom and the US (Table 1).[9] Combined with the decelerated speed of European deleveraging, this led to a reversal in net flows by the end of 2012. Nonetheless, the volatility of bank-led flows increased during the period under review.

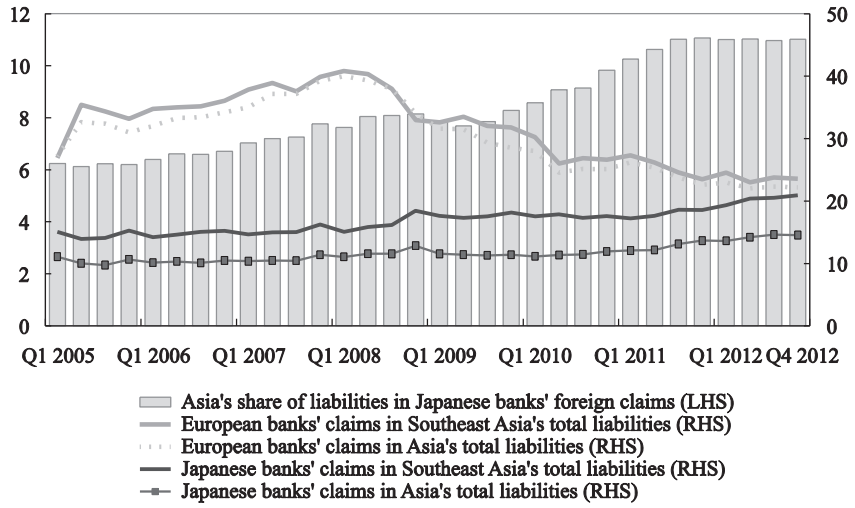
III. Excess Savings

Excess saving, as defined in this study, represents the difference between saving and investment viewed from the financial perspective; that is, financial assets less

[8] In contrast, lending by European banks to western Europe and other developed economies remained unchanged. In 2013, the amount of European bank lending to Asia was estimated at $280 billion, compared with $374 billion before the GFC.

[9] An increasingly important part of bank financing, however, remains unidentified. This is likely due to the absence of data from key economies, especially the PRC; Hong Kong, China; and Singapore.

Figure 5. **Japanese and European Banks' Foreign Claims in Asia**
(% of total claims)



LHS = left-hand side, RHS = right-hand side.
Notes:
1. European banks (excluding banks in the United Kingdom) based on Bank for International Settlements (BIS) definition.
2. Asia excludes Australia, Japan, and New Zealand due to differences in the structure of their economies with the rest of Asia.
3. Total foreign claims of banks from 22 BIS reporting economies.
Source: ADB calculations based on Bank for International Settlements. Table 9D: Consolidated Foreign Claims of Reporting Banks—Total Risk Basis. http://www.bis.org/statistics/consstats.htm (accessed on 11 July 2013).

financial liabilities. Excess saving refers to net lending (borrowing) from the capital accounts perspective and net financing from the financial accounts perspective.

A typical FOF summary matrix presents two accounts: the capital account and the financial account. The capital account comprises (i) gross saving and capital transfers, and (ii) capital accumulation. Taking the difference between the two yields net lending if saving is in excess of investment, or net borrowing if investment overshoots saving. In financial terms, this figure is referred to as net financing. Under the financial account, net financing is shown as the difference between the net acquisition of financial assets (uses of funds) and net incurrence of liabilities (sources of funds) and is broken down into key instruments. The first level of disaggregation includes between eight and 10 instruments, with the core instruments comprising currency and deposits, securities other than shares, loans, shares and other securities, and accounts receivable and payable. This breakdown is presented for each economic agent in the domestic sector—nonfinancial corporations, financial corporations, the general government, and households—and the rest of the world. See Appendix 1 for a sample FOF matrix.

Table 1. **Exposure to European, Japanese, and US Banks in Asia**
(as of December 2012, % of borrower's domestic credit)

	Lender							
			European Banks					
Borrower	**US Banks**	**Japanese Banks**	**Total**	**France**	**Germany**	**UK**	**GIIPS**	**Rest of Europe**
Asia	2.2	2.7	4.4	0.5	0.4	2.6	0.1	0.7
Japan	1.8	na	1.8	0.4	0.2	0.6	0.0	0.2
Developing Asia	2.5	2.7	7.4	0.7	0.6	4.9	0.1	1.2
ASEAN-4 + Viet Nam	3.6	4.8	9.2	. . .	0.9	6.1	0.1	2.2
Indonesia	4.3	5.3	11.5	. . .	1.6	6.2	0.1	3.6
Malaysia	5.1	3.8	15.5	. . .	1.1	12.4	0.1	2.0
Philippines	7.1	3.8	13.0	. . .	1.1	7.9	0.2	3.8
Thailand	2.1	6.0	3.6	. . .	0.4	2.2	0.0	0.9
Viet Nam	1.1	2.4	7.1	. . .	1.0	3.1	0.1	3.0
NIEs	8.9	11.7	28.8	2.4	1.6	20.0	0.3	4.4
Hong Kong, China	10.0	31.6	71.4	3.9	2.3	57.4	1.0	6.8
Republic of Korea	7.9	4.4	12.4	1.6	1.1	7.6	0.1	1.9
Singapore	19.9	18.6	65.9	6.9	5.4	34.8	0.5	18.3
Taipei,China	5.5	6.5	9.8	0.8	0.5	7.1	0.0	1.4
People's Republic of China	0.6	0.5	1.9	0.2	0.2	1.1	0.1	0.3
India	10.5	7.7	20.0	2.0	3.1	11.1	0.3	3.5
United States	na	3.6	9.8	0.3	1.5	3.0	0.7	3.2
Eurozone	3.6	2.5	26.4	5.6	4.8	4.8	4.0	7.1

. . . = data not available; ASEAN = Association of Southeast Asian Nations; GIIPS = Greece, Ireland, Italy, Portugal, Spain; na = not applicable; NIEs = newly industrialized economies; UK = United Kingdom; US = United States.

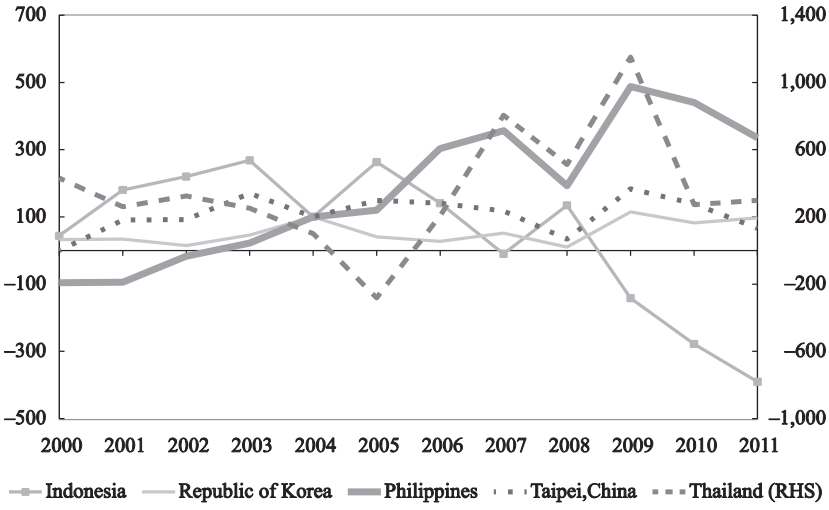
Notes: Eurozone comprises Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. Highlighted cells imply an increase in exposure compared with September 2008 in terms of domestic credit percentage value greater than $100 million. Domestic credit or domestic claims based on IMF definition of international financial statistics.

Source: ADB calculations based on Bank for International Settlements. Table 9D: Consolidated Foreign Claims of Reporting Banks—Total Risk Basis. http://www.bis.org/statistics/consstats.htm and CEIC (accessed on 15 July 2013).

In this section, we assess the changing trends and characteristics of excess savings in the pre-GFC (2000–2007) and GFC (2008–2011) periods in Indonesia; the Republic of Korea; the Philippines; Taipei,China; and Thailand.[10] A graphical presentation is used to match assets and liabilities by instrument for each of the three

[10] A survey of official websites for each economy was made to determine the availability of data that conform to the standard format of the FOF matrix. To enable a cross-economy comparison, the availability of annual data from 2000 to 2011 as well as a cross-section of financial instruments by sector was factored into the selection of economies.

Figure 6. **Excess Saving Index**
(2004 = 100)



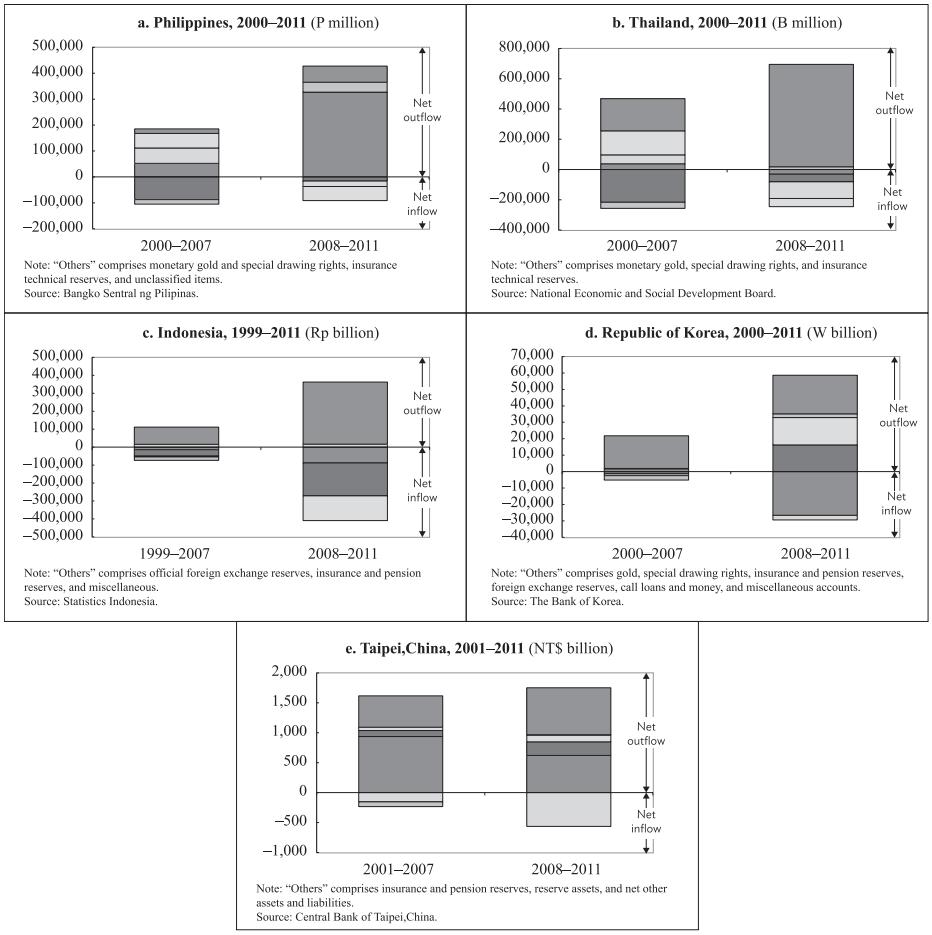
RHS = right-hand side.
Sources: Bangko Sentral ng Pilipinas; The Bank of Korea; Central Bank of Taipei,China; National Economic and Social Development Board; and Statistics Indonesia.

economic agents: financial institutions, households, and nonfinancial corporations. For clarity, only five core instruments—currency and deposits, securities other than shares, loans, shares and other securities, and accounts receivable and payable—are shown. The rest are lumped under the grouping "others."

Some Asian economies experienced a sharp increase in excess savings during the second half of the 2000s (Figure 6). This was most evident in the case of the Philippines and Thailand. An exception to this trend was Indonesia, which had a deficit during this period.

Even at the aggregate level, a change in the composition of excess saving is evident. Figure 7 presents the decomposition of excess saving by instrument (e.g., accounts receivable less accounts payable) for the same five economies during the pre-GFC and GFC periods. As negative excess saving corresponds to a net inflow from the rest of the world, the bars below the x-axis represent a net inflow of the instrument and those above the x-axis represent a net outflow. It is clear from the comparison of the bars that the composition of excess savings changed between the two periods in all five economies. For example, prior to the GFC, currency and deposits, loans, and securities equally contributed to the Philippines' outflows. During the GFC, outflows from the Philippines were largely in the form of securities. In terms of net inflows, loans increased for Indonesia, the Philippines, and Thailand during the GFC, while the net outflow of loans and equities increased for the Republic

Figure 7. **Excess Saving by Instrument**



of Korea and Taipei,China. In short, there was a significant change in the level and the composition of excess savings between the pre-GFC and GFC periods.

One of the interesting phenomena in Asia in the aftermath of the AFC was the surge in corporate savings.[11] Asia's corporate excess saving, while now declining, was higher than in any other region following the AFC. This has attracted the attention of analysts because they see it as having contributed to excess saving. Some even used the term "saving glut" and argued that this has been the reason behind global imbalances (see, for example, Bernanke 2005). Looking at the examples

[11] Cardarelli and Ueda (2006) provide insights on the phenomenon of rising corporate savings, defined as the difference between undistributed profits (gross saving) and capital spending, in the context of developed economies.

of Indonesia, the Republic of Korea, and the Philippines, corporate saving surged after the AFC, and did so rather dramatically in Indonesia. (The saving trend of different agents in each economy is displayed in Appendix 2.) An International Monetary Fund report raised this issue to argue that at the same time Asia's corporate investment stagnated, household saving did not provide enough of an offsetting trend to lead to an increase in national saving (Jain-Chandra, Nabar, and Porter 2009).[12]

A careful look at more recent FOF data, however, gives a rather different picture. It is true that corporate saving rose, but corporate investment has also increased since the mid-2000s. Even during the GFC, corporate investment in Indonesia continued to rise. It fell in 2009 in the Republic of Korea and the Philippines, before rising again. As a result, the excess saving (or net saving) of the corporate sector actually went down. Furthermore, the fall in corporate excess saving in Asia has been compensated by relatively high—and increasing in some economies—household excess saving, especially after the GFC.

Numerous studies have sought to identify the determinants of corporate excess saving. Factors specific to firms and economies seem to matter the most, ranging from high profitability and relatively low capital spending and dividends, to an underfunded corporate pension fund. But some macro indicators also continue to play a role such as output growth, interest rates, taxes and subsidies, and current account balance. To the extent the act of saving generally reflects anticipated risks, any conditions considered as reducing risk will lower the need for the corporate sector to save. This explains why higher levels of government saving, perceived as lowering risk to the economy, can be associated with lower levels of corporate saving as government saving crowds out private saving (Ricardian Equivalence). The extent of the relation, however, depends on the fiscal policies taken (see, for example, Corbo and Schmidt-Hebbel 1991).[13]

Another determining factor important to our study relates to the changed behavior of the corporate sector. For example, Cardarelli and Ueda (2006) found that one of the main drivers of the corporate sector's excess saving is the preference for investment in equities and cash rather than capital goods. This suggests the importance of an incentive system to invest in the real sector rather than in financial assets. To what extent was such a change in preferences present among economic agents after the GFC?

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[12] Jain-Chandra, S., M. Nabar, and N. Porter. 2009. Corporate Savings and Rebalancing in Asia. In S. Culhane and M. Bonilla, eds. *Regional Economic Outlook: Asia and the Pacific October 2009*. Washington: International Monetary Fund.

[13] In the PRC, rising corporate saving resulted from low interest rates, falling labor costs, and growing output prices that significantly increased the profitability of state-owned and private enterprises. Higher firm-level uncertainty and the underfunding of company pensions also encouraged larger cash holdings and debt repayment. State subsidies and low dividend payout ratios further increased corporate saving in the PRC. In the case of India, GDP growth was found to be a strong determinant of corporate saving. Additional factors that drive up corporate savings are preferential tax treatment, subsidies, and access to capital (Asian Development Bank 2009).

IV. Agent Preferences

The analysis of excess saving in the preceding section conceals the differences among economic agents. In particular, it did not reveal the change in agent preferences toward sources of fund (liabilities side) and uses of fund (assets side). This is what we intend to focus on in this section.

We begin with the household sector. On the liability side, except for Taipei,China, household loans rose significantly during the GFC in all five economies under review. In the case of Indonesia, the Philippines, and Thailand, household loans more than doubled relative to their amount in the pre-GFC period. On the asset side, household preferences toward currency and deposits (except in Taipei,China) and equity increased. The rise of household investment in equity markets was particularly high in Thailand and the Philippines; it was far higher than investment in less-risky securities such as the bond market. It is also notable that in all cases the increase of total listed items in household assets after the GFC was far greater than the increase of those in household liabilities. (See Appendix 3 for a graphical representation.)

Due to the rising household preference for liquidity, banks generally benefited through expanding deposit bases as reflected in the rise of liabilities in currency and deposits. Aside from the increase in cash and deposits, there were also increases in noncore sources of funds in the finance sector. These particular components capture capital flows intermediated by financial institutions as evidenced by the increasing share of noncore liabilities. They also reflect changes in the wholesale funding market. In the Philippines and Thailand, the contribution of other accounts payable and securities increased after the GFC. The Republic of Korea experienced an increase in the share of equities, while Indonesia saw a rise in the share of loans and equities. Taipei,China's noncore liabilities remained fixed and its core sources of funds rose.

Easy money inevitably also affects how assets are held. Apart from ensuring greater liquidity, as indicated by rising currency and deposits, massive inflows also entered the region's capital markets, including bond markets. With improved liquidity, the holding of securities by financial institutions in the Republic of Korea, the Philippines, and Taipei,China increased. In Indonesia and Thailand, financial institutions increased their issuance of loans and accounts receivable. Trends in the composition of assets and liabilities of financial institutions in each of the five economies under review are shown in Appendix 4.

The impact also extended to the corporate sector, where increased pension reserves were detected. The trends in and composition of financial assets and liabilities of the corporate sector are displayed in Appendix 5. Securities markets served as the main conduit in the Republic of Korea as the value of securities rose significantly between the pre-GFC and GFC periods. The value of securities also increased in the other economies, although the increase was far less than the rise in equity issuance

for Thailand; Indonesia; and Taipei,China. Bank loans in these three economies and the Philippines rose by an even larger proportion.

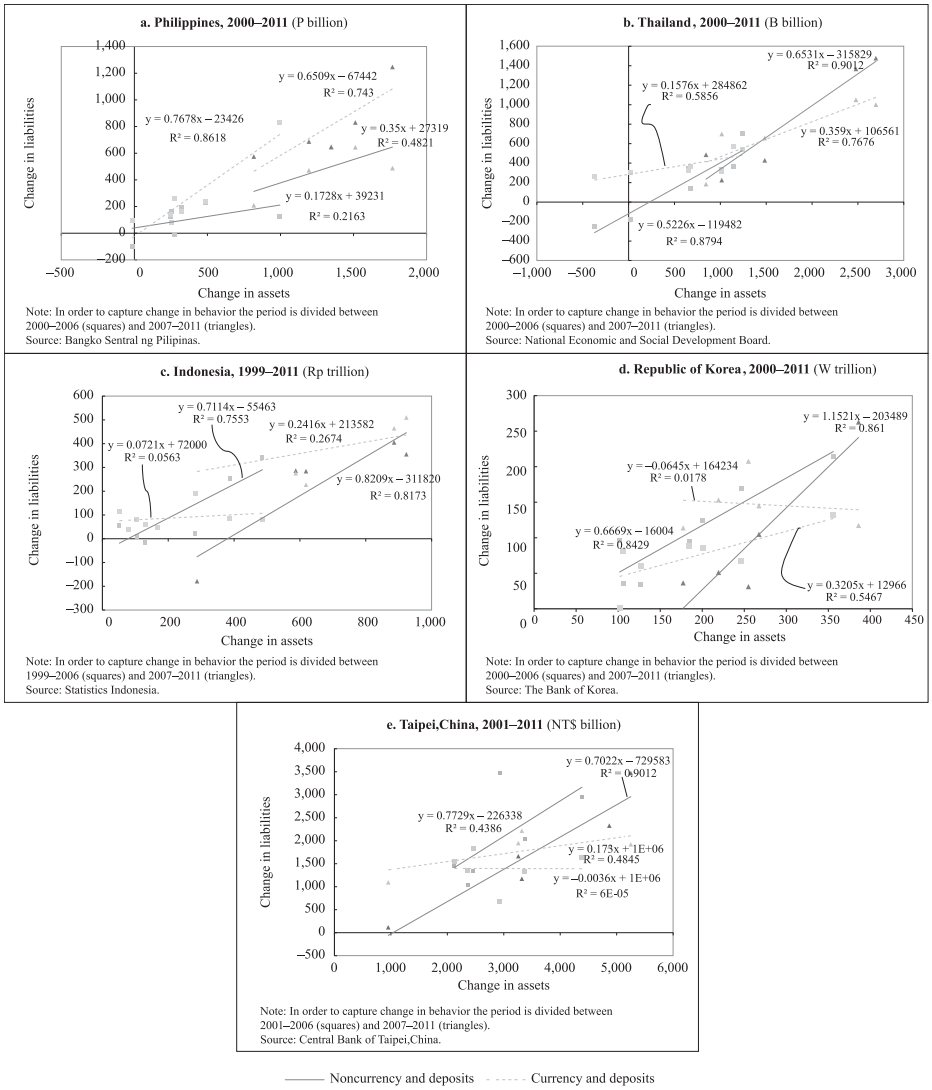
On the asset side, apart from the higher allotment for liquidity, which is a common stance among economic agents during a crisis, corporate portfolios shifted toward equities in all five economies. In addition, accounts receivable and loans rose (quite dramatically) in the Philippines. Other items constituted the largest increase in Indonesia's corporate sector, including foreign exchange reserves, insurance and pension reserves, and miscellaneous accounts.

Given the above trends, to what extent did the behavior of households, financial institutions, and the nonfinancial corporate sector reflect their perceptions of risk? In order to determine shifts in investment behavior, we plot each agent's assets and liabilities in a scatter graph with changes in assets in one axis and changes in liabilities in the other. We compare 2000–2006 to reflect the pre-GFC (depicted by squares) and 2007–2011 for the GFC period (depicted by triangles) and fitted the trendline with the corresponding regression equation for core and noncore instruments.[14] The scatterplot includes four trendlines: core instrument pre-GFC, core instrument GFC, noncore instrument pre-GFC, and noncore instrument GFC. The trends for noncore instruments are traced in solid lines and those for core instruments are traced in broken lines. By comparing these trendlines, we aim to capture the nature and extent of the changing response of liabilities and assets with respect to one another. For example, if the line for noncore financial instruments becomes steeper or has a bigger slope, it reflects a shift in preferences toward noncore financial instruments relative to traditional (core) financial instruments. This can be interpreted as a preference toward greater risk-taking behavior. Conversely, more conservative behavior is reflected when the line is flatter or has a smaller slope.

We present two sets of graphs for each economic agent. The first set is for liabilities as shown in Figures 8 and 9. The change in liabilities is shown on the y-axis and the change in assets on the x-axis (the correlation of liabilities with total assets across the two types of instruments). These figures have been constructed to capture movements in the source of funds, with the following question in mind: which type of liabilities moved in sync with changes in assets? The second set is for assets as shown in Figures 10 and 11. The change in assets is shown on the y-axis and change in noncore liabilities on the x-axis (correlation of assets with noncore liabilities across different asset instruments). These figures are aimed at capturing changes in the use of funds for every change in noncore liabilities. Take for example the case of the household sector. As discussed earlier and depicted in Appendix 3, loans were the dominant source of funds for households during both periods. As depicted by the dotted lines in the figures in Appendix 6, in the Republic of

[14] As we need to capture changes in agent behavior (slope changes) between the pre-GFC and GFC periods, we include a normal year from both periods. The first year of the pre-GFC period for Indonesia is 1999 and for Taipei,China it is 2001.

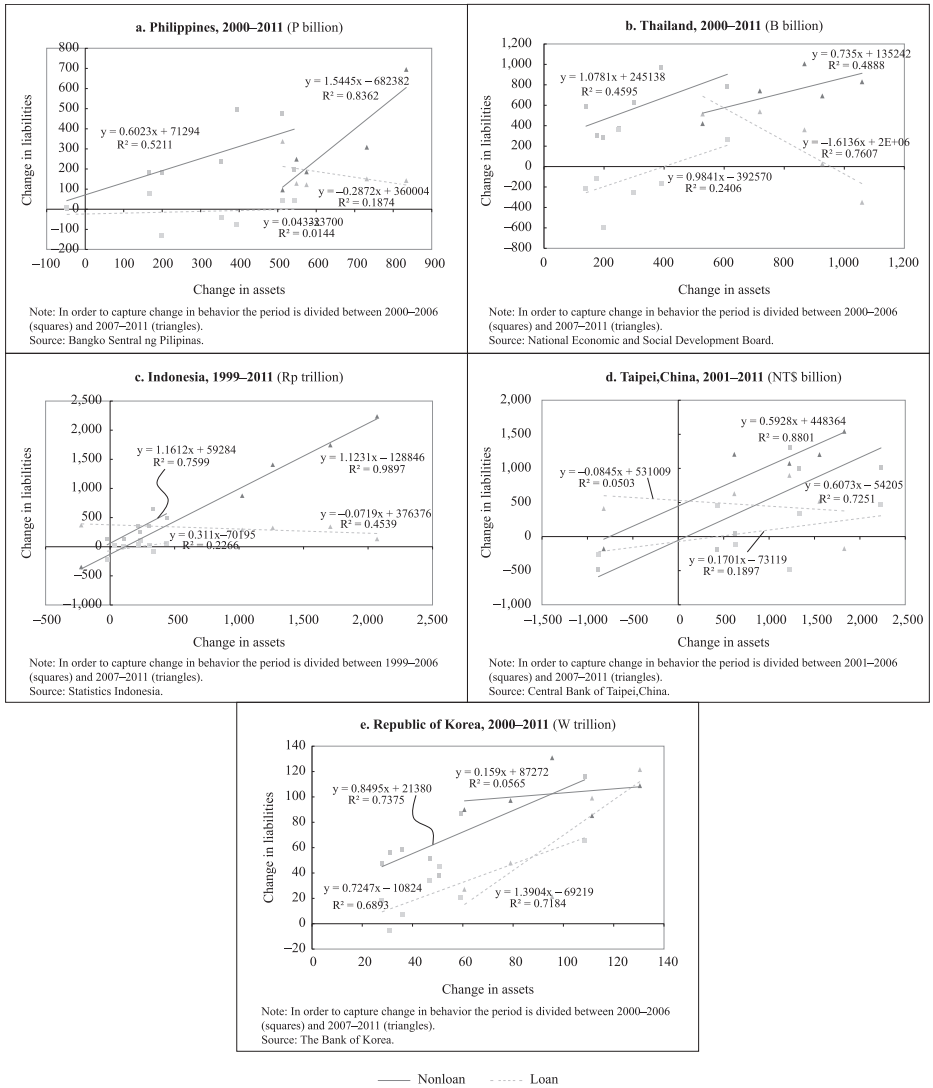
Figure 8. **Financial Institutions' Liabilities**



Korea, the slope for both loan and nonloan liabilities clearly shrunk between the two periods.[15] This was not the case in other economies, where the slope for nonloan

[15]Household debt is a particularly important issue for the Republic of Korea since the global financial crisis. Debt reached 146% of household disposable income at the end of 2007. Following the crisis, the household debt ratio increased further to 164% at the end of 2012, well above the OECD average of 133% (OECD 2014). Prior to the GFC, household debt rose nearly in sync with every change in total assets as household assets were almost completely financed through loans.

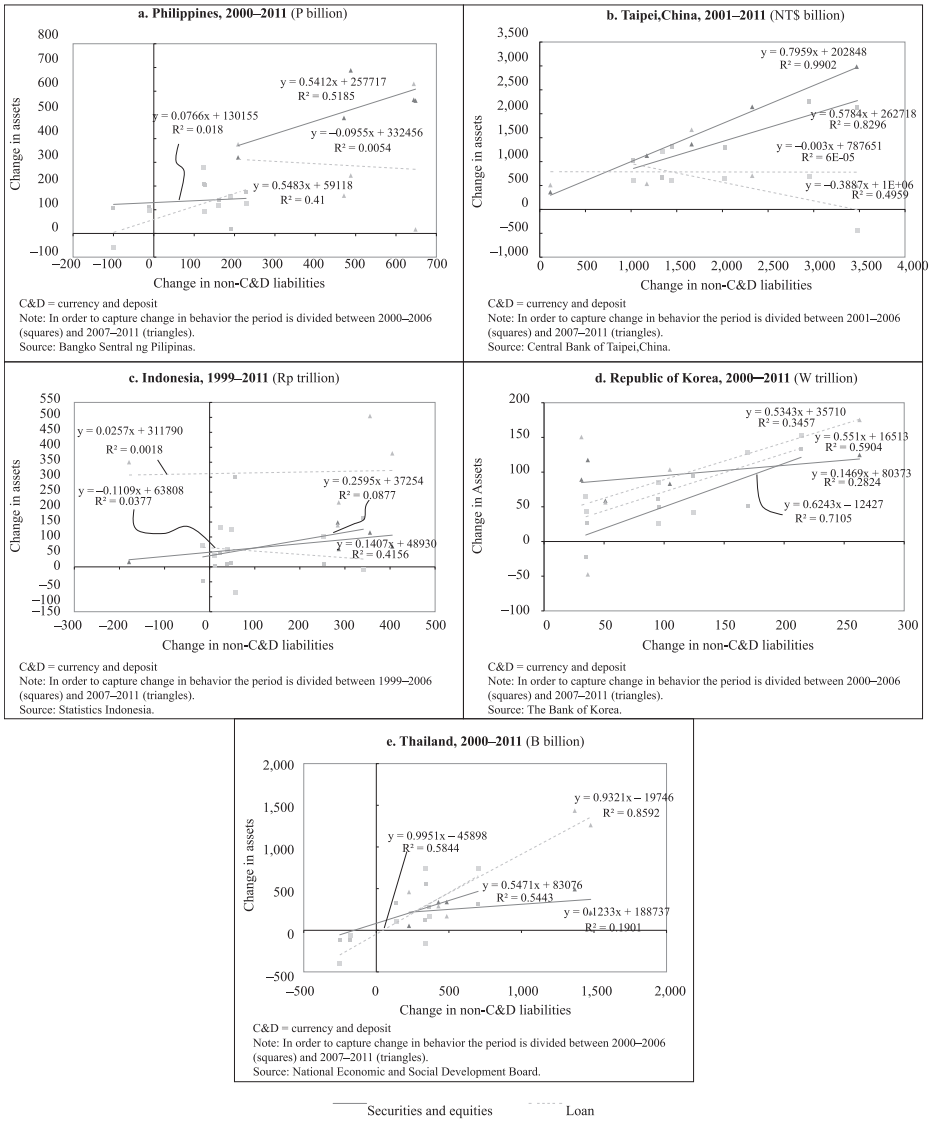
Figure 9. **Nonfinancial Corporate Liabilities**



(noncore) liabilities increased; that is, the comovement of noncore liabilities with assets strengthened in 2007–2011.

A clearer sign of behavior changes occurred in financial institutions and the nonfinancial corporate sector. The marginal response of noncore liabilities to changes in total assets was even more pronounced than in the case of households. Except for the Philippines, financial institutions' noncore liabilities generally moved more in sync with changes in total assets than did their core liabilities (currency and deposits). This is evidenced by the steeper slopes for noncurrency and deposit

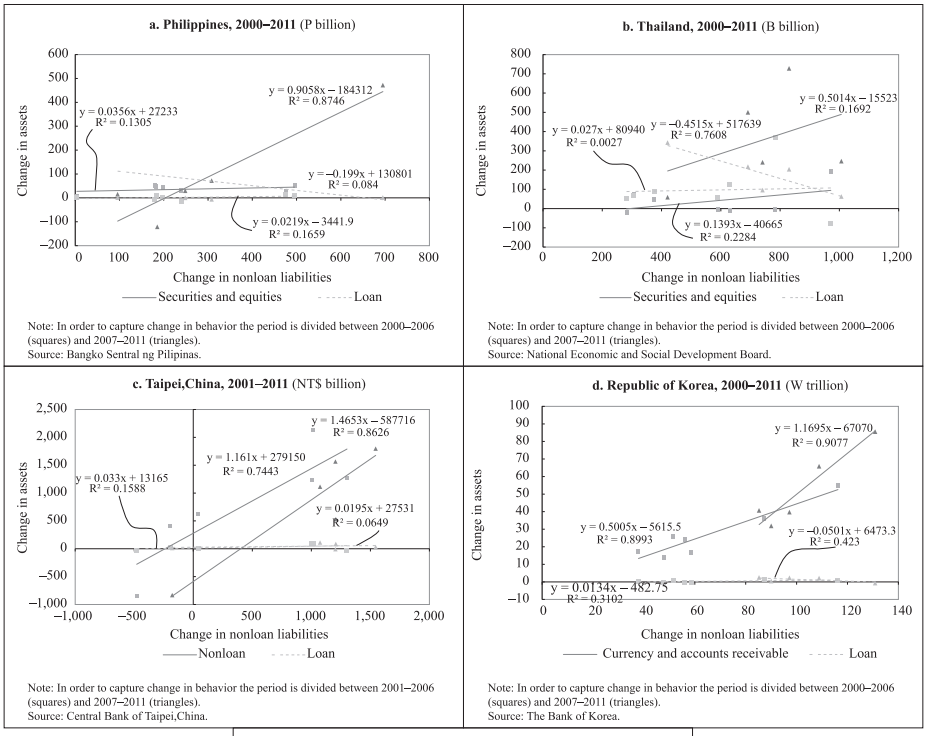
Figure 10. **Financial Institutions Assets**



liabilities compared with currency and deposit liabilities. Meanwhile, the marginal response of noncurrency and deposit liabilities to total assets increased during the GFC in Indonesia, the Republic of Korea, the Philippines, and Thailand (Figure 8).

In the corporate sector, the slope of loan liabilities turned negative during the GFC in Indonesia; the Philippines; Taipei,China; and Thailand. On the other hand, the marginal response of nonloan liabilities continued to be higher than that of loans in all of the economies under review except the Republic of Korea (Figure 9).

Figure 11. **Nonfinancial Corporate Assets**



It is clear from Appendix 6 and Figures 8 and 9 that, in general, the expanding assets of financial institutions and the corporate sector during the periods of observation were spurred by a surge in noncore liabilities. The subsequent question is as follows: how much did those noncore liabilities drive noncore assets? The answer is that different patterns emerge across different agents.

Households tend to hold traditional and liquid assets like currency and deposits. This was indeed the case in the Republic of Korea and Thailand during

the periods under review. Households in these economies reduced investments in securities and equities as loan liabilities rose, and instead increased their liquidity multifold. The elasticity of securities and equities, on the other hand, increased for households in Indonesia; the Philippines; and Taipei,China (Appendix 7).

Two opposite patterns emerged among financial institutions in terms of their response to increasing funds from nontraditional sources: (i) increased lending and (ii) increased investment in securities and equities. Rising noncurrency and deposit liabilities of financial institutions were associated more with higher levels of investments in securities and equities in the Philippines and Taipei,China. This trend intensified during the GFC. Bank loans were unresponsive to increases in noncore liabilities in these economies. In the case of Indonesia, the finance sector continued to prefer investing in securities rather than loans for every increase in liabilities, although the degree of preference declined after the GFC. In contrast, higher bank lending accompanied increases in noncore liabilities in the Republic of Korea and Thailand, with slopes of 0.5 and 0.9 for the pre-GFC and GFC periods, respectively (Figure 10). In these economies, the marginal response of noncore assets, particularly securities and equities, fell in 2007–2011.

Faced with the same increase in funds from nontraditional sources, firms in the Philippines and Thailand invested more in securities and equities, significantly raising the marginal response to changes in noncore liabilities. Korean firms increased their issuance of accounts receivable and held more currency (Figure 11). While no particular instrument drove changes in the asset holdings of firms in Indonesia or Taipei,China, the marginal response of total nonloan assets to noncore corporate liabilities increased in both economies. (Nonloan assets include currency and deposits, securities, equities, accounts receivable, and other miscellaneous instruments.)

Table 2 presents an overall summary of the results. It is clear that the region's abundant liquidity associated with excess saving and capital inflows have had an impact on agents' risk-taking behavior. As agents expanded their balance sheets, enabled by funds raised at relatively low costs, they tended to diversify their asset holdings toward risky investments.

V. Macrofinancial Risks

It is well-known that capital flows can be beneficial to recipient economies. But their volatile pattern and procyclicality can also act as a channel for the build-up of financial risks and imbalances. A large increase in highly volatile debt-led flows and bank-led flows, as described in the preceding sections, poses a difficult challenge for policy makers seeking to maintain macrofinancial stability.

Bank-led flows alter the size and composition of banks' balance sheets such that the risks of a banking crisis increase. On the asset side, loan-to-value ratios grow quickly amid excessive credit expansion and other forms of risky investment,

Table 2. **Behavior of Economic Agents in Response to Changes in Financial Flows**

	Preferences Toward Different Sources of Liabilities			Response of Assets to Increases in Noncore Liabilities		
Households	Pre-GFC Loan	Post-GFC Loan	= ↓	Pre-GFC C&D	Post-GFC C&D	↑ except for Indonesia and Taipei,China
	>	≤		>	≥	
	Pre-GFC Nonloan[a]	Post-GFC Nonloan	= ↑ except for the Republic of Korea	Pre-GFC Securities and SOE	Post-GFC Securities and SOE	
		except for the Republic of Korea and Taipei,China		except for the Republic of Korea and the Philippines	except for Taipei,China	↑ except for the Republic of Korea and Thailand
	Loans still dominate but this preference is tapering across all economies, while the preference for nonloans is rising and in some cases surpassing loans.			C&D is still the preferred asset but a preference for securities and SOE is rising.		
Financial Institutions	Pre-GFC C&D	Post-GFC C&D	↑ except for the Republic of Korea, the Philippines	Pre-GFC Loan	Post-GFC Loan	= ↑ for Indonesia, Republic of Korea; Thailand
	<	<		≤	<	
	Pre-GFC Non-C&D	Post-GFC Non-C&D	= ↑	Pre-GFC Securities and SOE	Post-GFC Securities and SOE	
	except for the Philippines	except for the Philippines		except for the Philippines, Thailand	except for the Republic of Korea, Thailand	↑ for the Philippines; Taipei,China
	All economies showed an increase in the preference for nondeposit sources of funds.			Two patterns emerged in response to an increase in noncore liabilities: (i) increased preference for securities and SOEs, and a decline in loans in the Philippines and Taipei,China; and (ii) increased preference for bank lending and a decline in securities and SOEs in Indonesia, the Republic of Korea, and Thailand.		

Continued.

Table 2. *Continued.*

	Preferences Toward Different Sources of Liabilities			Response of Assets to Increases in Noncore Liabilities		
Corporations	Pre-GFC Loan	Post-GFC Loan	↓ except for the Republic of Korea	Pre-GFC Loan	Post-GFC Loan	= ↓
	≤	<		≤	<	
	Pre-GFC Nonloan	Post-GFC Nonloan except for the Republic of Korea	= ↑ except for the Republic of Korea and Thailand	Pre-GFC Nonloan[b]	Post-GFC Nonloan[b]	↑
	Preference for loans is on a decline while preference for nonloan liabilities is increasing although slightly tapering			Clear preference for nonloan assets and it is getting stronger (accelerating)		

C&D = currency and deposits, GFC = global financial crisis, SOE = shares and other equities.
[a]No pre-GFC data on nonloan liabilities for the Philippines.
[b]Securities and SOE for the Philippines and Thailand; currency and accounts receivable for the Republic of Korea.
Notes: In comparing elasticity of instruments, ≤ or ≥ is used if the difference is within ±10 percentage points. Wider gap in elasticities between type of instruments is signified by < or > (strict inequality). The same approach is used in comparing elasticities between periods, = is added if the change in elasticity is within ±10 percentage points. Therefore, ↓ or ↑ signify a stronger decrease or increase in elasticity between the pre-GFC and GFC periods.
Source: Authors.

while on the liability side an increase in noncore liabilities through bank-led flows heightens banks' risky behavior and increases leverage. In times of external shock, such as deleveraging by eurozone banks and the normalization of US monetary policy, flows of bank credit can also be disrupted. With a stronger currency as a result of capital inflows, banks are willing to take even greater risks by extending more credit as the balance sheet positions of its borrowers improve.[16] These risks are very relevant for emerging East Asia because the region is bank-dependent with a relatively open capital account and the banks' leverage tends to exceed cyclical norms. Indeed, data show that the growth of bank credit in emerging East Asia since the GFC has exceeded the long-term trend. A significant portion of this rapid growth of credit went to the property and housing sector. The resulting increase in prices in this sector exposed the region to the risk of a bubble forming and subsequently bursting.

Using quarterly data from banks' balance sheets in 10 emerging East Asian economies, we test the role of rising noncore liabilities in spurring credit growth by using a credit channel model that incorporates the financial structure of lenders and borrowers to account for asymmetric information and the microbehavior of agents.[17] Given the phenomenon of financialization during a period of massive capital inflows, in which firms also act as lenders to other firms, friction in the credit market is likely to amplify, propagating real and nominal shocks to the economy (Stiglitz and Greenwald 2003).[18] The sensitivity of credit to the net worth of lenders is higher if agency costs associated with asymmetric information are present, in which case the effectiveness of monetary policy tends to be more limited. Has this been the case in emerging East Asia?

Table 3 shows that the growth of credit is influenced by changes in the net worth of lenders (Model 1) and lenders and borrowers (Model 2). The notion that earnings from higher bond yields may crowd out credit is tested in Model 3, where the sign of the coefficient is as expected but not significant. Only after controlling for these variables are the noncore liabilities included to see their contribution to credit growth. The results clearly point to the significant role of noncore liabilities in spurring credit growth.

In Model 2, we include the net worth of corporate borrowers and changes in the share of bond holdings among total bank assets.[19] The two variables have

[16]The amplified effect of cross-border flows on the supply of credit due to the changing risk behavior of banks is shown in Bruno and Shin (2012), and Azis and Shin (2015).

[17]The economies included are the PRC; Hong Kong, China; Indonesia; Japan; the Republic of Korea; Malaysia; the Philippines; Singapore; Taipei,China; and Thailand. The credit channel hypothesis was discussed in detail in Bernanke, Gertler, and Gilchrist (1996, 1999); Adrian and Shin (2009); Stiglitz and Greenwald (2003); and Stiglitz (2001).

[18]A firm's depressed collateral value due to falling asset prices, or the worsening of a firm's balance sheet caused by a double mismatch in the firm's leverage, can raise the agency costs imposed by asymmetric information between borrowers and lenders.

[19]Banks tend to accumulate government bonds to comply with capital adequacy ratio requirements, which are designed to reduce risk, even though it may limit their capacity to lend.

Table 3. **Determinants of Credit Growth: Role of Noncore Liabilities**

Independent Variables	**Model 1**	**Model 2**	**Model 3**
GDP growth	0.065**	0.0826**	0.026
	(1.97)	(2.26)	(0.84)
Change in banks' net worth$_{t-1}$	0.042**	0.049**	0.054***
	(2.15)	(2.24)	(2.95)
Change in nominal interest rates$_{t-1}$	–0.728***	–0.976***	–1.348***
	(–2.62)	(–3.12)	(–4.10)
Change in noncore liabilities$_{t-1}$	0.536***	0.625***	0.384***
	(18.74)	(20.65)	(11.30)
Change in corporate net worth$_{t-1}$	na	0.018	na
	na	(0.72)	na
Change in share of government bond holdings$_{t-1}$	na	–0.008	na
	na	(–0.48)	na
Change in government bond yields	na	na	–0.002
	na	na	(–0.39)
Constant	0.042***	0.029***	0.062***
	(5.42)	(7.32)	(9.09)
R-squared			
within	0.484	0.484	0.294
between	0.897	0.901	0.920
overall	0.613	0.613	0.551

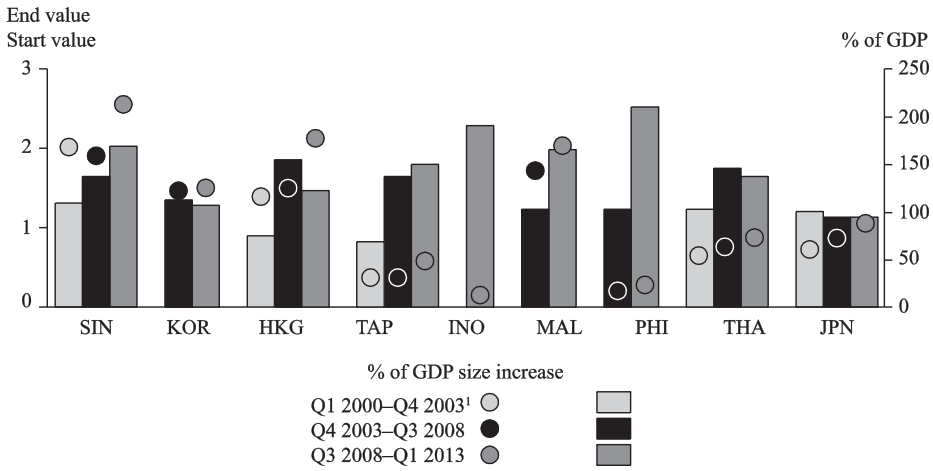
GDP = gross domestic product, na = not applicable.
Notes: z-values in parentheses. *** = significant at 1%, ** = significant at 5%, * = significant at 10% level.
Source: Authors' calculations.

the expected signs, although neither is significant. But the coefficient of noncore liabilities is higher than in Model 1 or Model 3, and at a higher level of significance as well. Noncore liabilities clearly contribute significantly to bank credit growth.

However, credit growth may not be the best indicator of vulnerability. How credit is allocated and how it influences the effectiveness of monetary policy matters more. In particular, the growth of monetary aggregates will likely not be in sync with real sector growth if most credit is allocated to a riskier and lower-productivity sector such as real estate. Such growth can spur inflation and create asset bubbles that can propagate financial instability. Looking at the data since 2000, housing and real estate loans in some emerging East Asian economies increased during the period of rising capital inflows. The largest increases as a percentage of GDP since the onset of the GFC were in Singapore and Hong Kong, China (Figure 12).

The limited capacity of monetary policy to prevent an economy from overheating under such circumstances is well-known. But controlling credit growth through monetary policy should be more straightforward if the financing source for credit is largely bank deposits. It is when the financing sources are nondeposit and other noncore liabilities that standard policies become ineffective as financial cycles fall out of sync with domestic business cycles. A better policy should instead entail supervising and managing noncore liabilities.

Figure 12. **Housing and Real Estate Loan Increases**
(Absolute size and % of GDP)



GDP = gross domestic product; HKG = Hong Kong, China; INO = Indonesia; JPN = Japan; KOR = Republic of Korea; PHI = Philippines; MAL = Malaysia; SIN = Singapore; TAP = Taipei,China; THA = Thailand.
Notes: Based on quarterly data. Data unavailable for the People's Republic of China. The review period begins in Q1 2000, except for Indonesia (Q3 2010), Japan (Q4 2000), the Republic of Korea (Q4 2005), Malaysia (Q1 2006), and the Philippines (Q2 2008).
Source: Azis and Shin (2015) based on CEIC data.

To evaluate the effect of monetary policy on noncore liabilities, we run a model that directly relates interest rates with noncore liabilities. Our intention is not to capture the causal relationship of the two variables. Instead, we want to determine how bank liabilities respond to interest rates. To the extent foreign banks have a wider global network and, therefore, greater access to external financing compared with domestic banks, the following regression equation is applied separately for the 1998–2012 period:

Ln(noncore liabilities) = Ln(GDP) + policy rate, where the policy rate variables include the current and the lag

After controlling for GDP growth, none of the policy rate coefficients are found to be significant (Table 4). While the GDP coefficients in all cases are significant and have the correct sign, the policy rates with and without lag are not significant despite their negative signs. Additionally, the policy rate coefficients for foreign banks' noncore liabilities are almost zero. To the extent the effect of monetary policy is instantaneous, the case without a lag is more appropriate. Under this specification, the only policy rate coefficient that is significant and with a correct sign is for domestic banks' core liabilities (at the 5% level), thereby confirming

Table 4. **Regression Results on Policy Rates and Bank Liabilities**

	Dependent Variable			
	Noncore Liabilities	**Core Liabilities**	**Noncore Liabilities**	**Core Liabilities**
Independent Variables	**Domestic Banks**		**Foreign Banks**	
Ln (GDP growth)	0.736***	0.944**	0.446*	0.347**
	(3.05)	(3.77)	(2.14)	(1.87)
Policy rate$_{t-1}$	–0.050	–0.068	–0.058	–0.068
	(–0.64)	(–0.98)	(–0.83)	(–1.12)
Policy rate$_t$	–0.185	–0.268**	–0.085	–0.077
	(–1.40)	(–2.24)	(–0.66)	(–0.69)
Constant	10.289***	10.502***	11.177***	14.087***
	(4.23)	(4.14)	(5.38)	–7.620

GDP = gross domestic product.
Notes: z-values are in parentheses. *** = significant at the 1% level, ** = significant at the 5% level, * = significant at the 10% level.
Source: Authors' calculations based on Azis and Shin (2015).

the limited effectiveness of standard monetary policy in containing the growth of noncore liabilities.[20]

These findings suggest that standard policies alone will not work. They need to be complemented by macroprudential measures to reduce the risk of financial vulnerability.

Another type of vulnerability relates to long-term financing through bond markets. To avoid a repeat of the double mismatch that led to the disastrous AFC, long-term LCY financing has been sought by policy makers in the region. In addition to reducing an overreliance on banking sources, the development of LCY bond markets can also help emerging East Asian economies establish benchmark pricing for other financial assets. More importantly for emerging East Asia, the long-term nature of bond markets is important in the context of the region's need to convert excess savings and capital inflows into productive activities such as infrastructure development. Yet, as cited earlier, in some economies with a relatively small LCY bond market the share of foreign ownership is large, leaving the market susceptible to withdrawals.

The volatility that may result from withdrawals could adversely impact market liquidity and reduce the attractiveness of the bond market, as it directly impacts investor perceptions of the collateral value of LCY bonds. Higher yields as a result of foreign withdrawals also imply higher borrowing costs, which may cause the private sector to postpone using local markets to fund new investment.

Capital inflows through bond markets may also tamper with the effectiveness of standard monetary policy. At the very least, they complicate the policy challenge.

[20] If interest rates are raised further, Azis and Shin (2015) show that not only will the goal remain unmet, but the risk that the financial health of banks will deteriorate due to tightened conditions will become elevated.

As the preference of agents toward securities and other risky assets tends to rise in the midst of increasing market liquidity driven by capital inflows, agents take advantage by holding more financial assets to safeguard returns. Corporate firms needing to secure long-term financing without risking a currency mismatch can raise funds. At the same time, low costs of borrowing could prompt the government to use LCY bonds for budgetary purposes.[21] In many emerging East Asian economies these bonds are largely held by banks, implying that the quality of a bank's balance sheet is also influenced by mark-to-market prices. In such circumstances, a tightening policy of raising interest rates could lower the price of bonds. On one hand, this could help issuing banks to raise funds inexpensively, on the other, this could lower the value of bond holdings and hurt those banks holding the securities. The net effect obviously depends on the size of bond issuance relative to bond holdings.

Figure 13 captures the trend of bond issuance and holdings in the corporate sector, including banks and nonbank financial institutions, in five emerging East Asian economies. In all cases, holdings clearly exceed issuance and the gap is fairly sizable in some economies. (For example, bond holdings in Indonesia were almost eight times bond issuance during the period under review.) Therefore, if bond prices were to fall due to higher interest rates, the asset values on corporate balance sheets could likewise deteriorate.

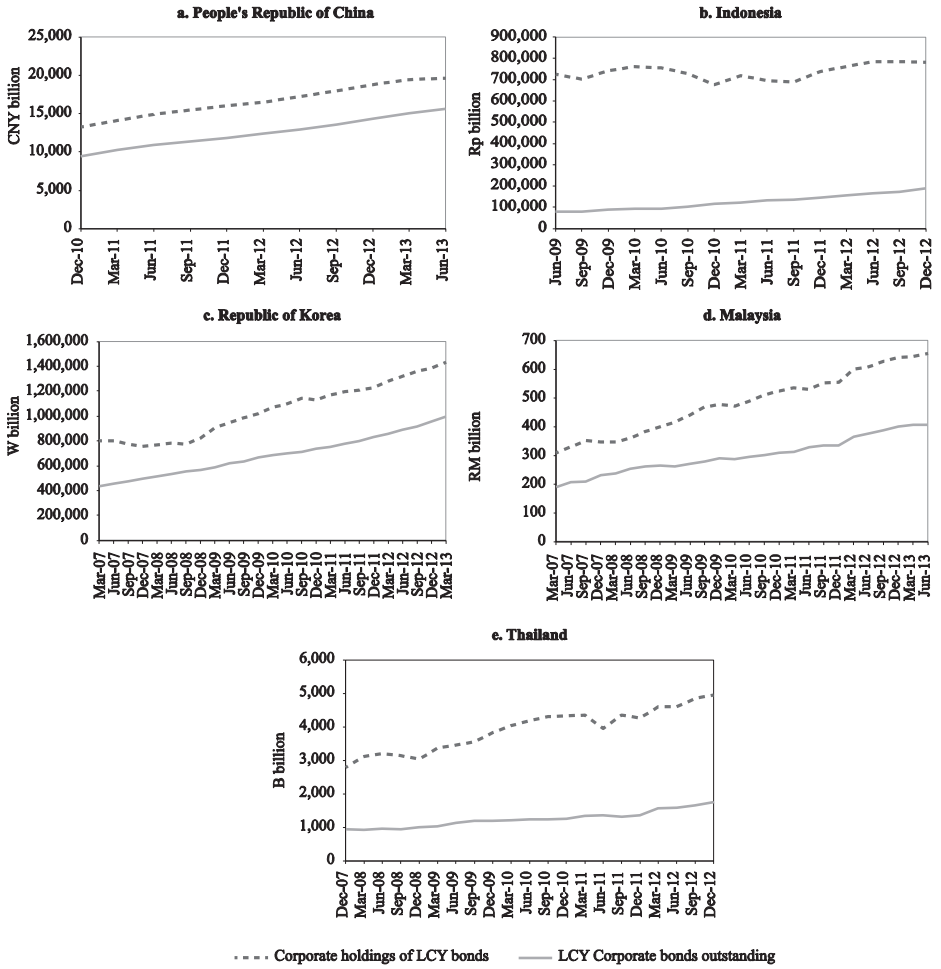
VI. Conclusion

A surge of capital flows has its eternal verities. One is that it helps augment liquidity and strengthen growth. Another is that boom and bust, together with severe financial crises, are permanent features. In this paper, we study the trend and characteristics of capital inflows in the midst of excess savings as one of the important sources of growing liquidity in emerging East Asia over the last decade. The inflows were first dominated by bank-led flows that caused a surge in banks' noncore liabilities and risk-taking behavior, and in the risk of procyclicality. In the subsequent phase that followed the unprecedented quantitative easing policy in the US, global investors' search for yield brought large (debt-led) inflows into emerging East Asian capital markets, including the LCY debt market. As markets in some emerging East Asian economies were small and lacked liquidity, the funds injected by foreign capital left these markets vulnerable to flow reversals.

Bank-led flows have a substantial impact on bank-dependent Asian economies, and debt-led flows could have significant repercussions on the long-term financing for infrastructure that the region greatly needs. Yet, these two types of flows were found to be the most volatile among all capital flows, thereby undermining the region's financial stability. The difference between the recent episode of

[21] As part of financial safety nets, LCY bonds were used by many emerging East Asian governments to help finance the fiscal stimulus during the GFC (see, for example, Azis 2014a).

Figure 13. **LCY Corporate Bonds Outstanding and Corporate Holdings of LCY Bonds**



LCY = local currency.
Notes:
1. Corporates include banks, nonbank financial institutions, and other corporate entities; and exclude government institutions, foreigners, and individuals.
2. Corporate bond holdings include holdings of both government and corporate bonds.
Source: Authors' calculations based on Azis and Shin (2015).

capital flows and the pre-1997 period before the AFC is that the more recent flows were larger in size and volatility, and occurred in the midst of excess savings.

Central to the elevated risks driven by the surge of liquidity was the change in the behavior of agents. Their preferences shifted toward riskier financial instruments. The corporate sector's preference toward securities and equities rose significantly, and amid growing noncore liquidity the finance sector tends to allocate funds to real estate loans and other risky financial assets. The search-for-yield inflows have

pushed a surge of funds into the commercial property market, sparking fears of a separate bubble. This can have economy-wide repercussions and undermine the region's financial stability.

The most recent episode of capital flows has also reduced the effectiveness of monetary policy as financial cycles fell out of sync with domestic business cycles. Simply tightening monetary policy not only failed to arrest the growth of noncore liabilities, but also risked lowering the value of securities held by banks, the largest holder of government bonds, and raising the probability of bankruptcy. This is aside from the unfavorable impact of surging inflows on income inequality discussed in Azis (2014b). From the national policy perspective, standard measures will not work. They need to be complemented by effective macroprudential measures to reduce the risk of financial vulnerability. From the global perspective, the effectiveness of global institutions to prevent authorities from taking unilateral policy actions (financial nationalism) that create negative externalities through capital flows to the rest of the world is called into question.

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Appendixes

Appendix 1. **Sample Flow of Funds Matrix**

Transaction Categories	Nonfinancial Corporation	Financial Corporation	General Government	Households[a]	Domestic Sectors[b]	Rest of the World	Total Volume
			Capital Account				
Gross saving and capital transfers	672,488	78,419	193,626	909,814	1,854,346	–309,334	1,545,012
Saving	672,488	78,419	186,911	909,300	1,847,117	–302,105	1,545,012
Net capital transfers	0	0	6,715	514	7,229	–7,229	0
Capital accumulation	592,820	40,348	250,271	661,408	1,544,847	165	1,545,012
Gross capital formation	592,820	40,348	249,529	662,315	1,545,012	0	1,545,012
Other capital accumulation	0	0	742	–907	–165	165	0
Net lending (+) / Net borrowing (–)	79,667	38,071	–56,645	248,406	309,499	–309,499	0
			Financial Account				
Net financing[c]	79,667	38,071	–56,645	248,406	309,499	–309,499	0
Net acquisition of financial assets	512,648	1,512,563	273,407	642,962	2,941,579	313,399	3,254,979
Monetary gold and SDRs		–19,617			–19,617	19,617	0
Currency and deposits	28,647	238,903	–43,237	482,660	706,973	52,775	759,748
Securities, other than shares	–611	498,131	264,222	9,741	771,483	177,508	948,991
Derivatives	–517	22,301			21,784	–23,291	–1,506
Loans	764	630,874	–32,453		599,185	–27,356	571,829
Shares and other equity	16,275	43,309	806	37,626	98,016	83,230	181,246
Insurance technical reserves		–3	8	23,880	23,886	0	23,886
Other accounts receivable[d]	468,089	98,665	84,061		650,815	30,915	681,731
Unclassified items[e]				89,054	89,054		89,054
Net incurrence of liabilities	432,980	1,474,492	330,052	394,555	2,632,080	622,899	3,254,979
Monetary gold and SDRs							
Currency and deposits		830,388			830,388	–70,640	759,748
Securities, other than shares	52,416	105,789	171,089		329,294	619,698	948,992
Derivatives	–989	66,711			65,722	–67,228	–1,506
Loans	337,058	60,986	42,183	213,635	653,862	–82,032	571,829
Shares and other equity	62,431	116,694			179,126	2,120	181,246
Insurance technical reserves		23,886			23,886	0	23,886
Other accounts payable[f]	–17,936	270,038	116,780	180,920	549,803	131,928	681,731
Unclassified items[e]						89,054	89,054

Continued.

Appendix 1. *Continued.*

Transaction Categories	Nonfinancial Corporation	Financial Corporation	General Government	Households[a]	Domestic Sectors[b]	Rest of the World	Total Volume
Net Lending / Net Financing by Financial Instrument							
Net financing[3]	79,667	38,070	–56,645	248,406	309,499	–309,499	0
Monetary gold and SDRs		*–19,617*			*–19,617*	*19,617*	*0*
Currency and deposits	28,647	–591,487	–43,237	482,660	–123,416	123,416	0
Securities, other than shares	–53,027	392,342	93,133	9,741	442,189	–442,189	0
Derivatives	472	–44,410	0	0	–43,938	43,938	0
Loans	–336,294	569,888	–74,636	–213,635	–54,676	54,676	0
Shares and other equity	–46,157	–73,385	806	37,626	–81,110	81,110	0
Insurance technical reserves	0	–23,888	8	23,880	0	0	0
Other accounts receivable (+) / payable (–)	486,025	–171,373	–32,719	–180,920	101,013	–101,013	0
Unclassified items[6]				89,054	89,054	–89,054	0

. . . = data not available, SDRs = special drawing rights.

Notes:

[a]Includes entrepreneurial activities of households as well as all other unaccounted transactions in the domestic economy; also covers nonprofit institutions serving households (NPISH).

[b]Refers to the sum of the domestic sectors' transactions among themselves and with the rest of the world (ROW).

[c]Net acquisition of financial assets less net incurrence of financial liabilities.

[d]For the household sector, presented as net of accounts payables.

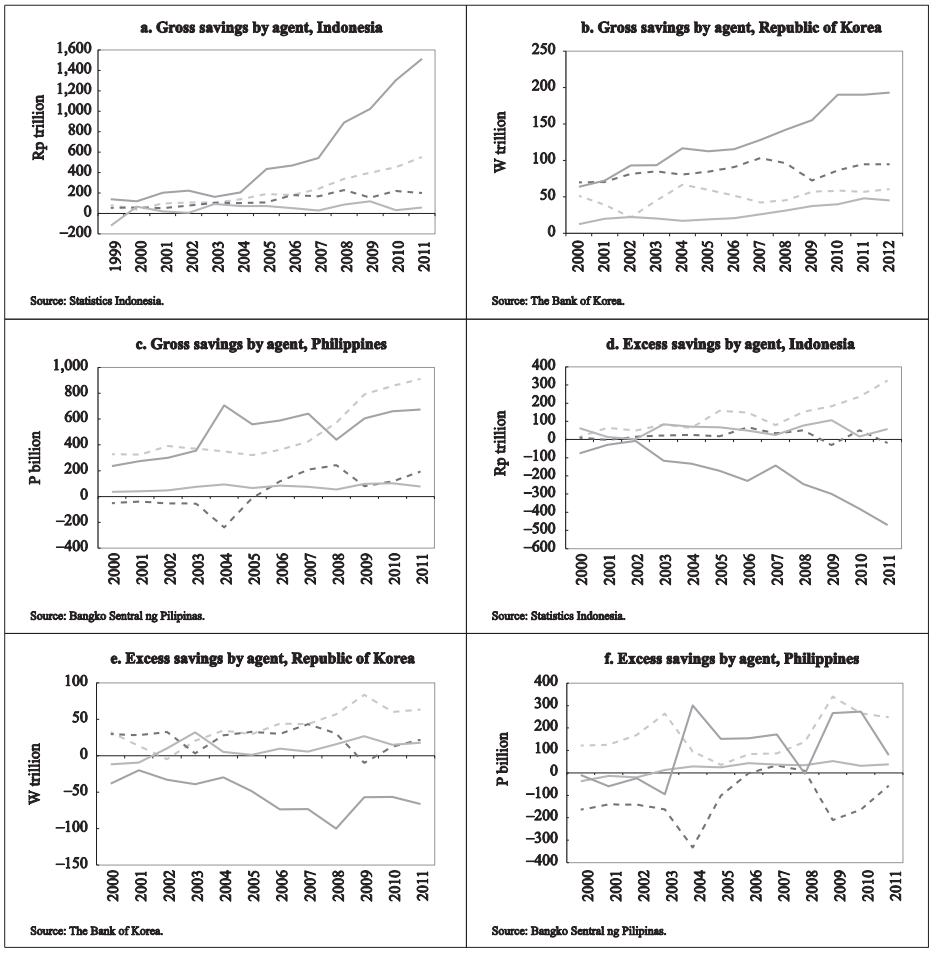
[e]Represents the unclassified financial assets/liabilities in the balance of payment, including derivatives.

[f]Households' other accounts payable includes errors and omissions.

Details may not add up due to rounding off.

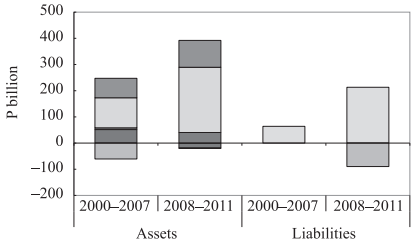
Source: Bangko Sentral ng Pilipinas.

Appendix 2. **Gross Savings and Excess Savings by Agent**



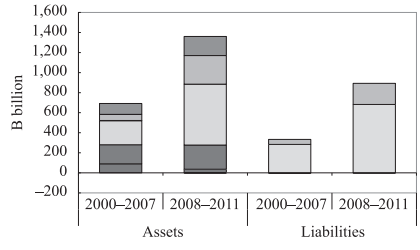
Appendix 3. **Household Financial Assets and Liabilities**

a. Philippines, 2000–2011



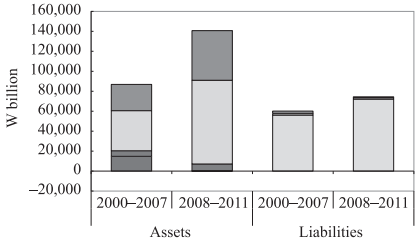
Note: "Others" comprises monetary gold and special drawing rights, insurance technical reserves, and unclassified items.
Source: Bangko Sentral ng Pilipinas.

b. Thailand, 2000–2011



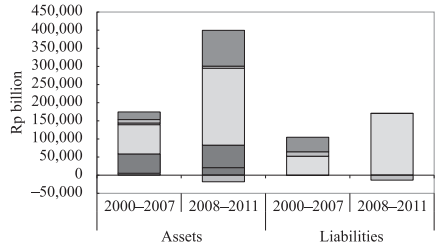
Note: "Others" comprises monetary gold, special drawing rights, and insurance technical reserves.
Source: National Economic and Social Development Board.

c. Republic of Korea, 2000–2011



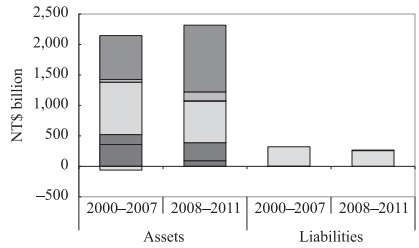
Note: "Others" comprises gold, special drawing rights, insurance and pension reserves, foreign exchange reserves, call loans and money, and miscellaneous accounts.
Source: The Bank of Korea.

d. Indonesia, 1999–2011



Note: "Others" comprises official foreign exchange reserves, insurance and pension reserves, and miscellaneous.
Source: Statistics Indonesia.

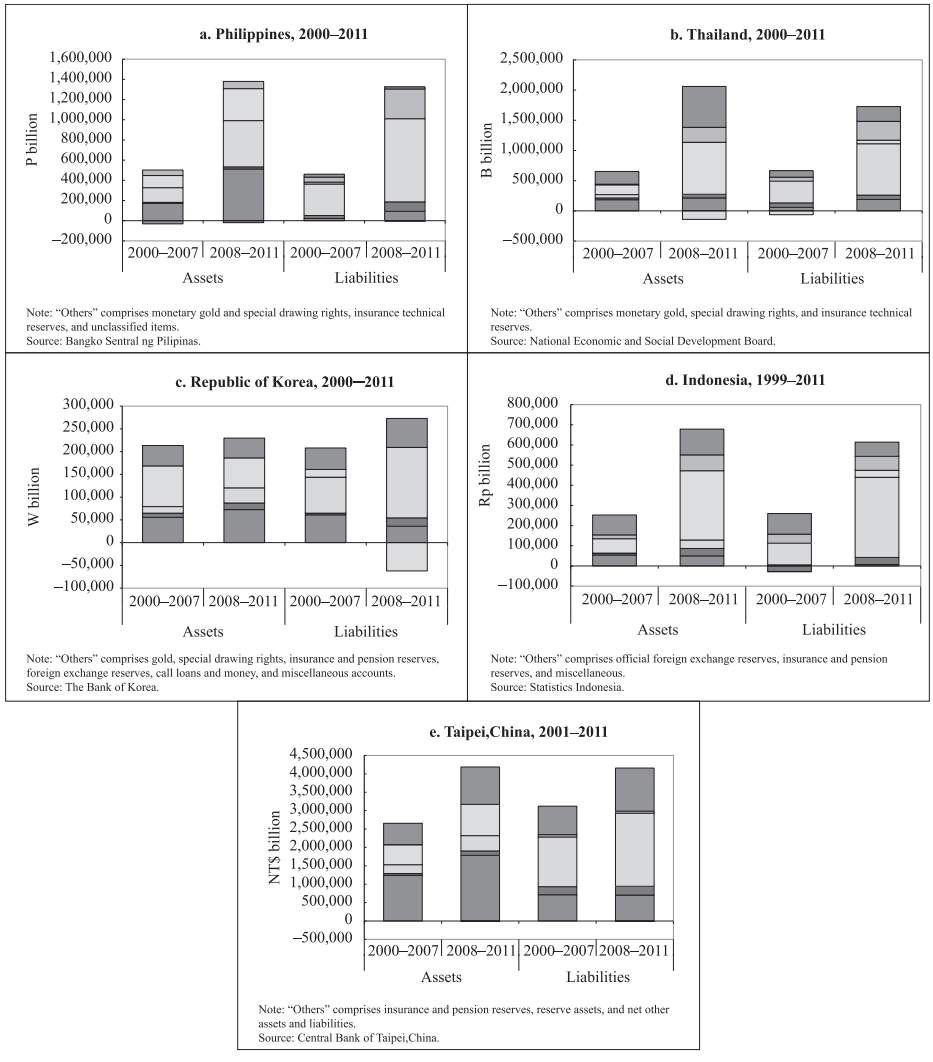
e. Taipei,China, 2001–2011



Note: "Others" comprises insurance and pension reserves, reserve assets, and net other assets and liabilities.
Source: Central Bank of Taipei,China.

■ Securities ■ Currency and deposits ■ Accounts payable and receivable ■ Shares and other equity ■ Loans ■ Others

Appendix 4. **Financial Assets and Liabilities of Financial Institutions**



Note: "Others" comprises monetary gold and special drawing rights, insurance technical reserves, and unclassified items.
Source: Bangko Sentral ng Pilipinas.

Note: "Others" comprises monetary gold, special drawing rights, and insurance technical reserves.
Source: National Economic and Social Development Board.

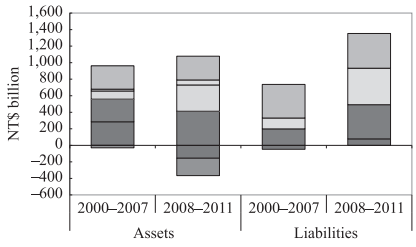
Note: "Others" comprises gold, special drawing rights, insurance and pension reserves, foreign exchange reserves, call loans and money, and miscellaneous accounts.
Source: The Bank of Korea.

Note: "Others" comprises official foreign exchange reserves, insurance and pension reserves, and miscellaneous.
Source: Statistics Indonesia.

Note: "Others" comprises insurance and pension reserves, reserve assets, and net other assets and liabilities.
Source: Central Bank of Taipei,China.

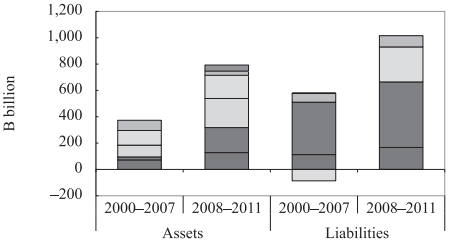
Appendix 5. **Financial Assets and Liabilities of Nonfinancial Corporations**

a. Taipei,China, 2001–2011



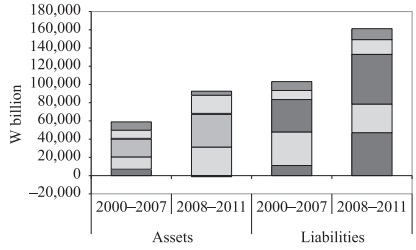
Note: "Others" comprises insurance and pension reserves, reserve assets, and net other assets and liabilities.
Source: Central Bank of Taipei,China.

b. Thailand, 2000–2011



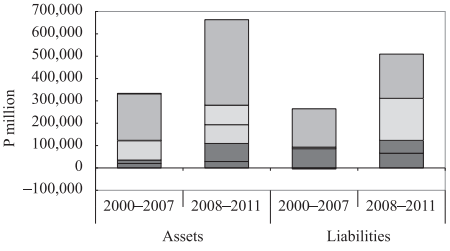
Note: "Others" comprises monetary gold, special drawing rights, and insurance technical reserves.
Source: National Economic and Social Development Board.

c. Republic of Korea, 2000─2011



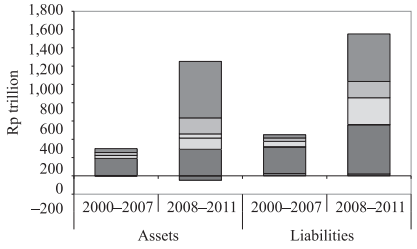
Note: "Others" comprises gold, special drawing rights, insurance and pension reserves, foreign exchange reserves, call loans and money, and miscellaneous accounts.
Source: The Bank of Korea.

d. Philippines, 2000–2011



Note: "Others" comprises monetary gold and special drawing rights, insurance technical reserves, and unclassified items.
Source: Bangko Sentral ng Pilipinas.

e. Indonesia, 2000–2011

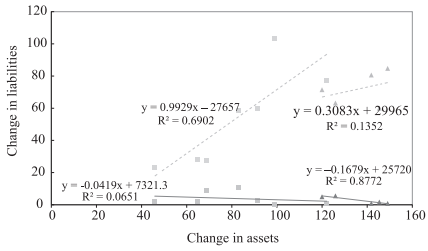


Note: "Others" comprises official foreign exchange reserves, insurance and pension reserves, and miscellaneous.
Source: Statistics Indonesia.

■ Securities ■ Currency and deposits ■ Accounts payable and receivable ■ Shares and other equity ■ Loans ■ Others

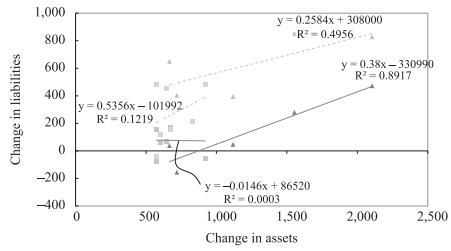
Appendix 6. **Household Liabilities**

a. Republic of Korea, 2000–2011 (W trillion)



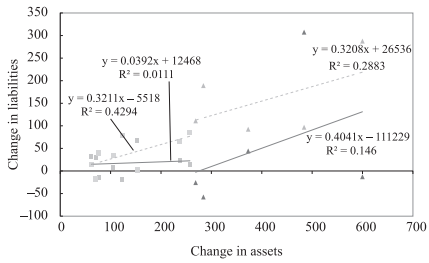
Note: In order to capture change in behavior the period is divided between 2000–2006 (squares) and 2007–2011 (triangles).
Source: The Bank of Korea.

b. Thailand, 2000–2011 (B billion)



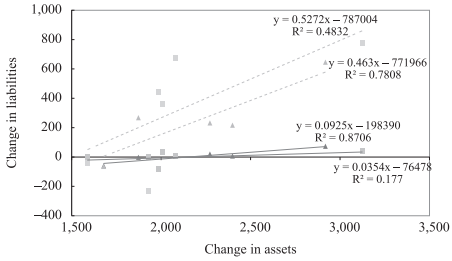
Note: In order to capture change in behavior the period is divided between 2000–2006 (squares) and 2007–2011 (triangles).
Source: National Economic and Social Development Board.

c. Indonesia, 1999–2011 (Rp trillion)



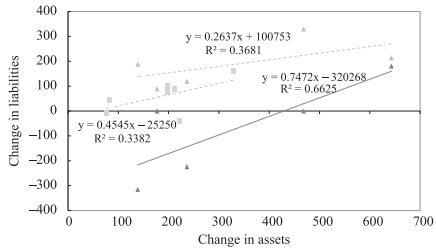
Note: In order to capture change in behavior the period is divided between 1999–2006 (squares) and 2007–2011 (triangles).
Source: Statistics Indonesia.

d. Taipei,China, 2001–2011 (NT$ billion)



Note: In order to capture change in behavior the period is divided between 2001–2006 (squares) and 2007–2011 (triangles).
Source: Central Bank of Taipei,China.

e. Philippines, 2000–2011 (P billion)

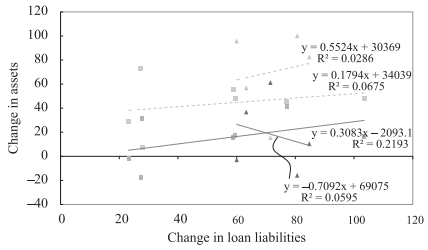


Note: In order to capture change in behavior the period is divided between 2000–2006 (squares) and 2007–2011 (triangles). Prior to 2009, all household liabilities are in the form of loans.
Source: Bangko Sentral ng Pilipinas.

——Nonloan - - - - - -Loan

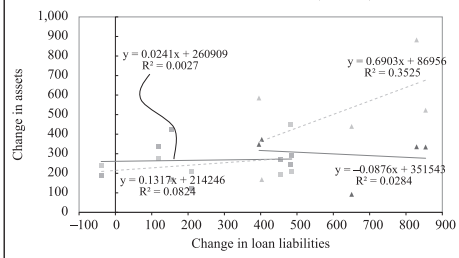
Appendix 7. **Household Assets**

a. Republic of Korea, 2000–2011 (W trillion)



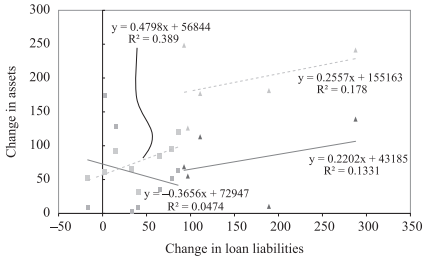
Note: In order to capture change in behavior the period is divided between 2000–2006 (squares) and 2007–2011 (triangles).
Source: The Bank of Korea.

b. Thailand, 2000–2011 (B billion)



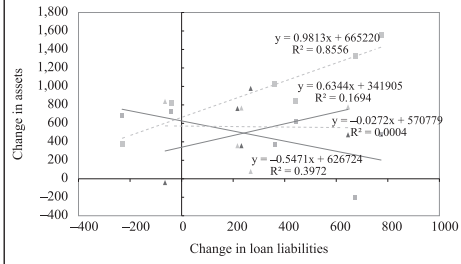
Note: In order to capture change in behavior the period is divided between 2000–2006 (squares) and 2007–2011 (triangles).
Source: National Economic and Social Development Board.

c. Indonesia, 1999–2011 (Rp trillion)



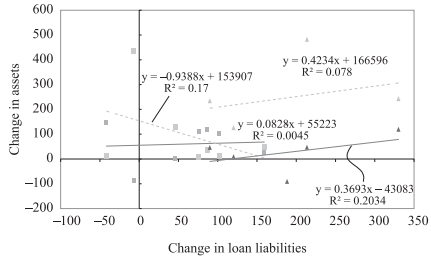
Note: In order to capture change in behavior the period is divided between 1999–2006 (squares) and 2007–2011 (triangles).
Source: Statistics Indonesia.

d. Taipei,China, 2001–2011 (NT$ billion)



Note: In order to capture change in behavior the period is divided between 2001–2006 (squares) and 2007–2011 (triangles).
Source: Central Bank of Taipei,China.

e. Philippines, 2000–2011 (P billion)



Note: In order to capture change in behavior the period is divided between 2000–2006 (squares) and 2007–2011 (triangles).
Source: Bangko Sentral ng Pilipinas.

——Securities and equities - - - - - - Currency and deposits

Democratic Government and Development: A Survey

PIERGIUSEPPE FORTUNATO*

Recent decades have witnessed an unprecedented expansion of democracy. During the third wave of democratization, as described by Samuel Huntington, democracy spread well beyond its historical boundaries and it is now adopted in all major regions of the world. Yet, not all democracies are equally effectual in delivering good governance and progrowth policies. Why do democratic institutions induce good governance and prosperity only in some economies? This paper presents an overview of the dimensions along which successful and unsuccessful democracies differ. It argues that four socioeconomic variables are of critical importance to create and maintain a well-functioning democracy: (i) social capital, (ii) information, (iii) education, and (iv) equality. History also plays an important role as do the contingencies characterizing the collapse of authoritarian regimes and the emergence of democratic institutions.

Keywords: democracy, East Asia, education, information, social capital
JEL codes: D72, H11, N10, O10

I. Introduction

Amartya Sen won the Nobel Prize in Economics, in part, for assessing the importance of democracy as a universal value in the sense that a vast majority of individuals, independent of their geographic location and specific characteristics, and at almost all times, may have reason to see democracy as valuable. Its value does not rest on just one particular merit, but rather on a plurality of virtues. Sen (1999) emphasizes the intrinsic importance of political participation and freedom in human life, and the constructive role of democracy in the formation of values and the understanding of needs, rights, and duties.

Beyond these widely accepted virtues of democratic institutions, Sen also considers a more disputed dimension of democracy: the instrumental importance of political incentives in keeping governments responsible and accountable. Periodic, free, fair, broadly participatory, and genuinely contested elections, together with a system of norms and institutions that support the right to vote and make it

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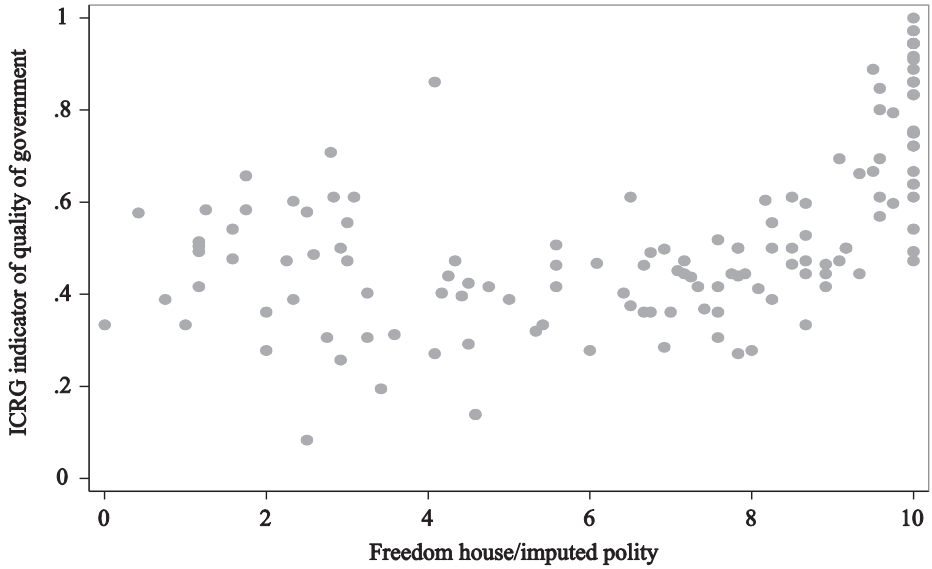
Figure 1. **Democracy and Quality of Government**



ICRG = International Country Risk Guide.
Source: The Quality of Government Institute at the University of Gothenburg. The Quality of Government Dataset. http://qog.pol.gu.se/ (accessed on 20 December 2013).

meaningful, give people the power to control and discipline the government. This ensures the implementation of policies favoring the population as a whole rather than specific (political or economic) segments of the population. In this sense, democratic institutions are both responsive to the demands of constituents and effective in using limited resources to address these demands.

The available empirical evidence, however, suggests only a weak correlation between the extension of democratic liberties and good policy making. Various societies that are considered democratic, according to standard measures, are seriously marred by institutional malpractices of different kinds (see, for example, Acemoglu, Robinson, and Santos–Villagran 2013).

Figure 1 plots the correlation between a commonly used index of democracy and a standard indicator of government quality.[1] It shows that while most

[1]As is standard in the literature, this paper measures the quality of government with an aggregate index that jointly considers corruption and competency indicators. The Quality of Government Index is the simple average of the following International Country Risk Guide variables: control of corruption, law and order, and bureaucratic quality. (Corruption and bureaucratic quality are highly correlated in the data.) The Quality of Government Index ranges between 0 and 1, with higher values associated with a higher quality of government. Democracy is measured using an average of the Polity IV Project and Freedom House indexes of democracy. The Polity IV Project classifies different political regimes on the basis of the formal rules and institutions in place; it looks at the formal inclusiveness and contestability of the political system—the quality of political representation—and at the constraints on executive power. Freedom House takes the view of "democracy as freedom" and classifies political regimes on the basis of

well-governed states also have well-established democratic institutions, many equally democratic states perform poorly on governance.[2]

This paper examines some of the reasons behind the variation in performances of modern democracies and presents recent developments in research on the functioning of democratic institutions. This paper will also probably open more questions than it will offer answers, which is partly its intention. Despite the growing interdisciplinary work on democratic governance, we still have a limited understanding of the subject.

This paper is organized as follows. Section II presents the debate on the relative merits of democratic institutions and discusses the critical socioeconomic dimensions along which modern democracies differ. Section III looks at one additional dimension: the role of history and of different paths to democracy to understand current and observable differences in governance. Section IV examines in some detail the case of East Asian economies and how democracy evolved in the region. Section V concludes by advancing policy suggestions to foster the functioning of democratic institutions in developing economies.

II. Democracy and Good Government

In the last 40 years, democracy has spread well beyond its historical boundaries in the Western hemisphere. Between 1973 and 2003, more than 60 economies all over the world adopted democratic institutions either after the collapse of larger states (e.g., the Soviet Union) or the end of dictatorships and authoritarian dominant-party systems (e.g., the Republic of Korea). By the beginning of the 21st century, the only major region of the world lacking democratic economies was North Africa and the Middle East, but recent events in this region are apparently putting an end to this Arab anomaly. This visible globalization of democracy has fomented a revival of the old debate on the relative merits of democratic and autocratic regimes dating back to Plato and Aristotle.

Acemoglu, Johnson, and Robinson (2001); Acemoglu et al. (2008); and Acemoglu and Robinson (2012) emphasize the importance of inclusive political institutions as a fundamental factor in explaining cross-economy differences in income per capita.

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observable outcomes in terms of political and civil rights. The combined measure employed in this paper takes into account both conceptions and ranges between 0 and 10, with higher values associated with greater levels of democracy.

[2]Interestingly, the correlation is overall positive for consolidated democracies (+6 to +10) confirming the instrumental importance of democratic institutions for governance, but it turns out to be negative for autocratic regimes (–10 to –6). The quality of government is, in fact, relatively high in fully institutionalized autocracies and tends to decrease as we move toward relatively more democratic regimes. This U-shape suggests that economies ruled under a consolidated regime (either democratic or autocratic) tend to be better governed than economies in transition.

In line with this optimistic view on the interactions between democratic institutions and economic dynamics, North (1990) argues that modern democratic societies with universal suffrage offer the most favorable institutional structure for the functioning of the market. Other authors focus on the benefits of democracy for the functioning of the sociopolitical system. Olson (1993) suggested that the democratic electoral process is essential to solving commitment issues, while according to Wittman (1989), democratic institutions minimize the transaction costs of sociopolitical organizations.[3]

More skeptical theories of democracy emphasize instead the inefficiencies of representative government. In his foundational study on political development, Huntington (1968) argued that populist demands for consumption and taxation might be channeled easily through democratic institutions with negative consequences on economic performance.[4] Becker (1983) models how a democratic polity can yield inefficient outcomes by enabling various interest groups to compete for political influence, while Besley and Coate (1998) synthesize a vast literature that models the distortions caused by incumbent politicians running excessive deficits to guarantee re-election.

These different views on the complex linkages between democracy and the economy triggered a lively debate in the empirical literature as well. Rodrik and Wacziarg (2005), and Papaioannou and Siourounis (2008a) find democracy (or democratization) has a positive effect on growth rates, and Persson and Tabellini (2008) find, on average, a negative effect on growth of leaving democracy.[5] On the contrary, Barro (1996 and 2000) and Glaeser et al. (2004) find no evidence for a direct causal effect of democracy on economic growth and, consistent with public choice theories, Tavares and Wacziarg (2001) show that democracies are associated with low levels of private investment and high government spending.

The debate in the literature shows no sign of an emerging consensus on the merits of democracy and its effects on economic growth. Rather than studying the average effect of democracy, this paper looks more carefully to its variation: when are democratic institutions more likely to breed success and when are they associated with economic failure?

So far, a number of different dimensions have been identified by economists, political scientists, and sociologists to distinguish democratic winners and losers.

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[3]It has also been argued that taxation revenues, which are usually higher in democratic settings, can be used to mitigate capital market imperfections and resolve market failures (Galor and Zeira 1993).

[4]Also, the public choice tradition is deeply concerned with the possibility of a big state satisfying the demands of the masses (Buchanan and Tullock 1962).

[5]With regard to the specific channels of interaction, democracies have been associated with lower political instability and smoother government changes (Alesina and Perotti 1996), faster human capital accumulation (Tavares and Wacziarg 2001), and better capacity to cope with adverse economic shocks (Rodrik 1999).

A. Social Capital

The literature in political science and sociology has long argued that social capital is of critical importance to create and maintain a democracy.[6] When citizens interact often, join groups, and trust each other, their relationships aid democratization by crystallizing and organizing opposition to a nondemocratic regime.[7] Once a democracy is established, these relationships help consolidate democratic institutions by affecting both the quantity and quality of citizens' political participation (Paxton 2002).

The historical tradition of civil society and democracy holds that an individual's participation in civil associations creates feelings of duty, increases a sense of interdependence with others, and produces a habit of participation. Membership in voluntary associations therefore increases the amount (or quantity) of political participation. This view is supported by vast empirical evidence that documents the linkages between membership in voluntary associations and political participation (see, for example, Verba, Schlozman, and Brady 1995).

The bonds of social capital also affect the nature (or quality) of participation. Because relationships increase communication and the flow of information, they increase the exposure of individuals to political ideas and foster the creation of an informed and reasoned public opinion. New ideas and opinions are therefore more quickly disseminated throughout the population, while extremist ideas are more easily challenged, as they have less chance of remaining isolated (Habermas 1989).

Another strand of literature focuses on the role of social capital in the formation of common expectations. According to Fukuyama (1995), a community that regularly expresses collaborative behavior based on a set of common norms develops mutual expectations. In turn, these expectations, or social trust, facilitate profitable exchanges by reducing risks and making behavior more predictable.

Along the same lines, Putnam (1993) argues that generalized social trust is based on norms developed within networks in which members of the community are engaged, and that democracy requires generalized social trust to operate fruitfully. He shows that the newly empowered regional governments introduced in Italy in the early 1970s with fairly similar organizational structures succeeded only in those regions blessed with vibrant networks and norms of civic engagement. Where social life was fragmented and a culture of distrust diffuse, the performance of the

[6] More recently, the economic literature has recognized the importance of social norms and civic culture, and their effects on economic performance (see, for example, Tabellini 2010).

[7] Fortunato and Fugazza (2014) show that certain forms of social capital may instead contribute to the stabilization of nondemocratic regimes. Their results emphasize the need to distinguish carefully between the mechanics of trust (the existence of mutually accepted norms) and the political content embodied in such norms.

new executive bodies was less responsive to public demands as politics took on patron–client characteristics.

Blending together empirical and anecdotal data, Putnam (1993) describes two radically different Italian political traditions. While the Normans laid the foundations for patron–client politics in the South, the cities and towns of the North governed themselves as communal republics with an emphasis on community trust and mutual security. Putnam (1993) argues that these different civic traditions have radically affected Italians' relations with modern democratic institutions and, in turn, the functioning of these institutions. In the North, residents have inherited what he calls horizontal traditions, emphasizing civic associations and egalitarian political participation. In contrast, Southern Italians have received only vertical traditions, characterized by a distrust of institutions and engagement in patron–client relationships.[8] This scenario resembles Banfield's idea of amoral familyism, defined as a social equilibrium in which people care exclusively about their nuclear family (and expect everybody else to behave likewise) and disregard common goods, thereby preventing the development of well-functioning institutions (Banfield 1958).

More recent contributions confirm the existence of a positive association between the quality of democratic institutions and social capital by replicating Putnam's results with up-to-date and more disaggregated data (Rice and Sumberg 1997).

B. Information

While the political science literature emphasizes the interaction between democracy and social capital, the literature in economics has traditionally examined democratic governance focusing on the distortions brought about by the presence of informational asymmetries between citizens and politicians. These asymmetries reflect the nonperfect observability of the actions undertaken by politicians in office and the characteristics of the candidates running in an electoral competition (e.g., ability and honesty).

The first class of informational problems gives rise to moral hazard and rent-seeking, and is the object of the classic political economy models of democracy. Barro (1973) and Ferejohn (1986) consider principal–agent settings where voters are the principals who seek to control the actions of the agents they elect (policy makers). In a world of scarce information in which the actions of policy makers are only partly observable by citizens, elected officials face strong incentives to appropriate rents. As information dissemination increases, however, voters are better able to use elections to screen and discipline politicians. Hence, political accountability rises and the space left for rent-seeking declines.

[8]These different cultures and traditions are reflected in Putnam's Civic Community Index, which attempts to quantify the "civicness" of a community.

A vast series of papers has offered empirical support to these predictions by showing the positive effects of information diffusion on democratic governance. The literature on the role of mass-media invariably finds that an increased media presence is associated with the dissemination of information and improvement of electoral accountability (Besley and Burgess 2002, Djankov et al. 2003). Alternative sources of information have been shown to be important for democracy; Djankov et al. (2010), for example, focus on the disclosure of politicians' finances and business activities. They examine the relationship between disclosure rules and several measures of the quality of government using a database of the financial and business disclosures of members of the lower house of parliament in 175 economies. They find that high- and upper-middle-income economies require disclosure and make the information publicly available more often than the rest of the world. They also find that public disclosure is associated with better government. According to their estimates, the introduction of public disclosure norms increases an economy's government effectiveness score in the World Bank's Worldwide Governance Indicators by 0.242 points.

The idea that a lack of information constrains electoral accountability is also consistent with the higher incidence of clientelism in low-income settings. Using evidence from the introduction of conditional cash transfers for the poor in Mexico, De La O (2013) argues that voters use the incidence of clientelistic policies to learn about politicians' behavior. Villages that were randomly chosen for the program 21 months before the 2000 presidential election saw an increase in turnout of 7% and an increase in the incumbents' vote share of 16% as compared to villages that entered the program only 6 months prior to the election. She interprets these findings as evidence that the amount of time since program entry predicts the extent of preferences for incumbents, suggesting that citizens who learned the most about the program changed their voting behavior the most.

The second class of informational asymmetries—related to politicians' characteristics in terms of talent, virtue or preferences, generates problems of adverse selection. The literature in this area concentrates on the way public officials are recruited rather than on the decisions they take once in office. It suggests that bad politicians are relatively more likely to enter when formal returns to politics are low and more likely to be selected if information about candidates quality is limited (Caselli and Morelli 2004; and Besley, Pande, and Rao 2005).

When information about politicians' quality is limited, ethnic politics tend to prevail. Ethnic networks provide informal insurance and enable information flows (Miguel and Gugerty 2005). Furthermore, a politician's ethnic identity is often a good predictor of redistributive preferences (Besley, Pande, and Rao 2007). All else being equal, both reasons will cause voters to favor politicians belonging to their own ethnicity when the information about the candidates' quality is limited. This will provide the party that represents the majority ethnic group with an electoral

advantage and can reduce elections to a mere head-counting exercise, lessening their role as a source of accountability.

Consistent with this hypothesis, Banerjee and Pande (2009) demonstrate the existence of a positive correlation between ethnic politics and economy-level measures of political corruption. They argue that the forces that make a politician's ethnic identity more salient reduce voter emphasis on honesty, and provide empirical support for this thesis using panel data from a North Indian state.

C. Education

One of the classical theories of political sociology, formulated by Martin Lipset and often referred to as the modernization hypothesis, maintains that as all societies grow they are headed toward more modern and democratic ways of cohabitation. Higher levels of education, in particular, naturally lead to a better-functioning democracy and stronger institutions (Lipset 1960).

Throughout history, educated people have shown a remarkable willingness and ability to fight for (and protect) democracy because of their interest in ideas and their ability to organize. Nowhere is this clearer than in the remarkable propensity of students to battle for political and civil rights, as recently shown by the nature of the protest movements that paved the way for the Arab Spring.[9]

Democracies in the Netherlands, the United Kingdom, and the United States (US) have also regularly been defended by people steeped in legal and political learning. It is not surprising then that recent empirical research identifies a positive correlation between levels of education and the extent of democratization (Glaeser et al. 2004, Papaioannou and Siourounis 2008b). Inspired by this evidence, Glaeser, Ponzetto, and Shleifer (2007) developed a model in which democracies have more, albeit less-motivated, supporters than dictatorships, since under a dictatorial regime insiders earn large political rents while in democracy the political rents are shared among many people. They show that relatively more people fight for a more inclusive regime as human capital increases.

The positive interaction between democracy and education can also be explained by looking at the impact of education on political engagement and participation (social capital), and on citizens' ability to make good ex ante electoral choices and to evaluate ex post the actions of elected officials (informational asymmetries).[10]

The idea that education might positively affect social capital dates back to the socialization hypothesis first raised by Samuel Bowles and Herbert Gintis. Bowles and Gintis (1976) suggested that education is primarily about teaching people how to interact successfully with others (see also Knack and Keefer 1997). Successful

[9] Students also played a key role in liberal movements and revolutions in Europe in the middle of the 19th century. Rander–Pehrson (1999, 145) stated that "[if] the revolution had a core, it was the young educated elite."

[10] Alesina and Giulinao (2011, 8) describe education as "the best proxy for both information and civic virtues."

interaction includes understanding and appreciating others' point of view, as well as being able to effectively communicate one's own. When people communicate successfully, they may control any innate antisocial tendencies and become more productive participants in social and political activities.[11] In fact, in most empirical studies, education emerges as the strongest predictor of political participation.

Using data on 324 national lower house elections between 1972 and 1995, Blais and Dobrynska (1998) find that turnout increased by 16 percentage points when illiteracy declined from 85% to 12%. The cross-country correlation between education and turnout is paralleled by a positive correlation between years of schooling and propensity to vote in the microdata for rich economies. For the US, the classic survey data study by Wolfinger and Rosenstone (1980) shows that citizens with a college degree are significantly more likely to vote than people with fewer than 5 years of schooling. (They estimate a difference of around 38 percentage points.)

Education can also attenuate the informational problems that threaten the quality of governance by equipping citizens with the cognitive skills they need to be effective participants in a representative democracy. Education is indeed likely to increase citizens' ability to select able leaders, understand the issues upon which they vote, and recognize corrupt public officials (Milligan, Moretti, and Oreopoulos 2004; Ostrom 2006). In short, the severity of both adverse selection and moral hazard problems seem to be linked, at least in part, to the level of education of the citizenry.

Fortunato and Panizza (2015) empirically examine the role of education in explaining the success or failure of democratic governance without looking at the specific channel of interaction; that is, without decomposing the impact of education into problems of civic culture, selection, or incentives. Using cross-country and panel data regressions they show that the correlation between democracy and the quality of government is not statistically significant in countries with low levels of education and is positive and statistically significant in countries with high levels of education. In particular, they find a negative but not statistically significant relationship for countries with low levels of education that becomes positive and statistically significant when average education reaches 8 years. They conclude that the success of democratic institutions is closely related to the educational attainment of the population.[12]

In discussing their findings, Fortunato and Panizza (2015) acknowledge that causality is hard to establish because their key explanatory variables are likely

[11] Almond and Verba ([1963] 1989, 315) famously wrote that "the uneducated man or the man with limited education is a different political actor from the man who has achieved a higher level of education."

[12] Fortunato and Panizza (2015) also find a positive and statistically significant marginal effect of education on the quality of government in democratic countries, and no significant effect of education in nondemocratic countries. This ancillary result suggests that democracy is of critical importance to channel the political benefits of education into government performance.

to be endogenous and there are not good external instruments for education and democracy.[13] They deal with this issue by running a set of Monte Carlo simulations aimed at testing the robustness of the estimates and show that even the presence of extreme endogeneity does not reverse the findings; in the worst case scenario, severe endogeneity leads to statistically insignificant estimates of the parameters of interest.

The problem of endogeneity is, of course, more general than that. It goes beyond the relationship between education and quality of government in democratic settings and equally affects the other factors discussed in this survey. At the end of the day, the argument of this paper is that democratic institutions are endogenous; their form and their functioning depend on the conditions under which they emerge and endure. Conditions shape institutions and institutions partly transmit the causal effects of these conditions. The question, thus, is how to distinguish the effects of institutions from those of the conditions that give rise to them.

In econometrics jargon, this represents an identification problem; solving it ultimately relies on finding a credible and transparent exogenous source of variation in the data. This is what most of the empirical papers reviewed here have done. Given the aim of this survey, however, the focus is on the economics behind the results, rather than on the specific empirical tests employed. Interested readers are requested to seek out the original sources for the econometric details.

D. Inequality

In his seminal investigation on the virtues of democratic institutions, Alexis de Tocqueville ([1835] 1998) warned of the possible dangers associated with democracy in societies characterized by large economic disparities. He described an ideal state with democratic institutions in place coupled with perfect economic equality, but also suggested that equality of political rights might lead to a "tyranny of the majority" in which the distribution of resources is uneven. In unequal societies, so the argument goes, democracies granting more equal political influence may experience excessive redistributive pressure, and therefore curtail property rights protection and distort the incentives for individual entrepreneurship. Low inequality and correspondingly low redistributive pressure, on the contrary, would facilitate the implementation of good economic institutions and policies under a democracy.

Along the same lines, the modern endogenous fiscal policy literature models the interaction between polity type, income inequality, and economic performance. The models proposed by Alesina and Rodrik (1994) and Persson and Tabellini (1994) show that high levels of income inequality raise the demand for redistribution. If under democracy fiscal policy and taxation are selected endogenously by majority

[13]Well-functioning democracies, for example, are likely to grant universal access to quality education. As a matter of fact, access to quality education is one of the dimensions according to which we judge good governance.

voting, then high inequality will lead to lofty taxation, lower investment, and (consequently) slower growth. Autocratic regimes would be more insulated from such a mechanism since citizens in the lower tail of the income distribution are denied a political voice.

Cervellati, Fortunato, and Sunde (2008) expand this reasoning and, in line with de Tocqueville's view, explicitly model the impact of inequality on the quality of institutions, in particular on property rights protection, under different political regimes. They show that efficient democracies, which are able to enforce property rights, cannot emerge and consolidate if economic inequality is sufficiently large. Under these conditions, and in line with Hobbes' Leviathan metaphor, all social groups prefer to leave control over policies in the hands of a rich and powerful elite. Conversely, a social contract emerges only under democracy if inequality is sufficiently small. Sunde, Cervellati, and Fortunato (2008) bring these predictions to the data. In their cross-sectional analysis, they find evidence for a significant interaction effect between democracy and inequality in determining the quality of growth-promoting institutions like the rule of law. They find that democracy is associated with better rule of law only when inequality is low.

In an influential contribution, Piketty (2014) highlights an additional channel through which inequality may dampen the functioning of democratic institutions. Extremely high levels of inequality raise the risks of institutional capture by part of those (few) in the upper tail of the income distribution, thereby seriously threatening one of the pillars of modern liberal democracies: the principle of representation.

III. Democratization and Good Government

The previous section examined four critical elements that partly explain the huge variation in the performances of democratic regimes across space and time. A fifth element, however, has been so far left aside: history.

Historically, authoritarian regimes have collapsed and new democracies emerged under very different scenarios involving varying levels of conflict. While in some economies democratization has been essentially peaceful and well accepted (or even actively promoted) by the elite, in others the establishment of democracy was the result of violent social conflicts triggered by an uprising of the politically and economically deprived classes and fueled by failed attempts at repression. The threat of revolution and social unrest, for example, played an essential role in the establishment of voting rights for the disenfranchised people in many Latin American economies (e.g., Uruguay in 1919, Colombia in 1936, Venezuela in 1945, and Nicaragua in 1979), while historical examples of consensual regime transitions include the Nordic economies. Different transition scenarios, in turn, may affect the functioning of the new democratic institutions. Transitions, defined as periods of regime change, are formative and founding moments. As such, they set a society

on a path that shapes its subsequent political (and economic) development. After discussing at length the occurrences of violence during the democratic transitions of the third wave of democratization, Huntington (1993) concludes that violent uprisings are less likely to lead to a regime change and such uprisings when successful may lead to worse democracies.[14]

A. Type of Democratization

Cervellati, Fortunato, and Sunde (2012) propose a model of endogenous democratization that analyzes the determinants of different transition scenarios and their consequences for the features of emerging democracies. The model predicts that democratic transitions taking place amid broad consensus in the population foster the establishment of democracies with good institutional quality, since individual behavior can be coordinated during the transition process. A transition initiated by part of the ruling elite, in fact, can function as a signal and facilitate the settlement of a social contract.

Cervellati, Fortunato, and Sunde (2014) broaden this view by investigating the incentives of different social groups to engage in violence, and by studying the role of openly violent conflict during the democratization process in shaping the features of emerging democracies. The theory predicts that violent transitions are less likely to lead to well-functioning democracies with high levels of protection of civil and economic liberties. The results also suggest that a minimum consensus among the population is required for the emergence of sound democratic institutions, and that consensual and peaceful transitions are more likely if economic interests are fairly aligned in the population. This is the case if, for example, economic power is not concentrated among a very small group of elites.

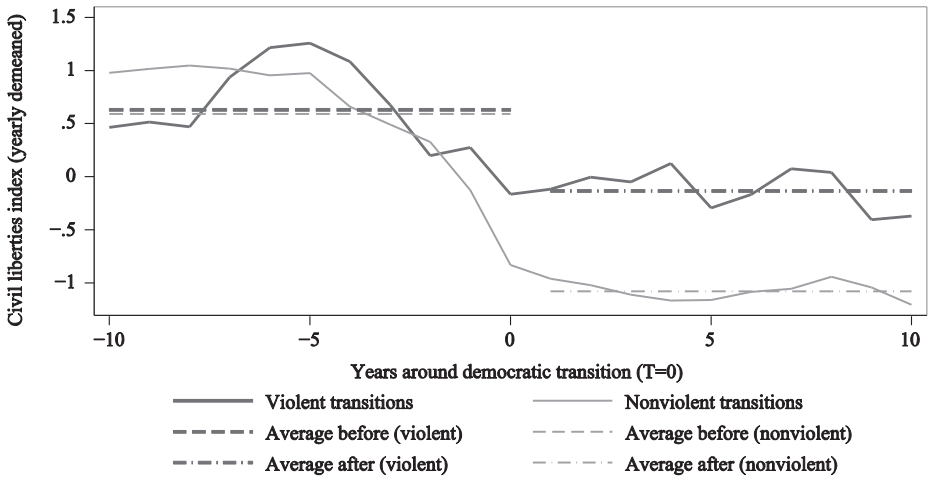
The prediction that the level of violence characterizing the regime transition may persistently affect the future prospects of democracy is consistent with the empirical evidence from the third wave of democratization over the period 1970–2003. The comparison of civil liberties between economies that experience either a peaceful democratization or a violent transition to democracy reveals that the peaceful route leads to a substantially, and persistently, larger improvement in civil liberties.

Figure 2 illustrates this finding by plotting the evolution of average civil liberties before and after a permanent democratization. Lower index scores depicted in the graph imply more civil liberties. The plot distinguishes between economies with a violent transition to democracy and economies in which the transition to democracy was peaceful.[15] While the overall pattern in both groups is similar, there

[14] As Huntington (1993, 207) stated: "Governments created by moderation and compromise are ruled by moderation and compromise. Governments created by violence are ruled by violence."

[15] Civil liberties are represented by an aggregate index provided by Freedom House. It includes the following categories: freedom of assembly, demonstration, and public discussion; the possibility to form political parties and organizations; religious institutions; and the existence of an independent media. The aggregate index takes a value

Figure 2. **Civil Liberties and Democratization**



Source: Cervellati, M., P. Fortunato, and U. Sunde. 2014. Democratization and Civil Liberties: The Role of Violence During the Transition. *European Economic Review.* 66 (2). pp. 226–47.

is a clear difference in the level of civil liberties after the transition. After a nonviolent democratization, civil liberties are about one index point higher than the world average, corresponding to an improvement of about 1.5 index points. Economies with a violent transition experience a much less pronounced improvement.

The political science literature also recognizes the importance of the contingencies characterizing the transition to democracy. Remmer (1990), among others, suggests that the opportunities and possibilities that follow a change of regime will make a real difference only when the great majority of the population participates actively in the process of democratization. This analysis is corroborated by a study by Freedom House (2005) examining the political dynamics of 67 economies that had experienced transitions from authoritarian rule over the last 3 decades. The report studies the relationships between the mode of civic involvement in democratic regime change and the post-transition state of freedom; that is, the degrees of political rights and civil liberties that the citizens of these economies were experiencing in 2005. It revealed the likelihood that a transition from authoritarian rule would lead to liberal democracy was over four times higher for transitions supported by strong and nonviolent civic coalitions.

from 1 to 7, with 1 representing the most free and 7 representing the least free. Data on the extent of violence during democratic transitions are provided by the Uppsala Conflict Data Program at the Peace Research Institute Oslo (Armed Conflict Dataset 9), as researched and reported on by Harbom and Wallensteen (2010). Using this data, violence is coded as a binary variable if an economy experiences any incidence of civil conflict with more than 25 battle-related deaths in a given year.

B. Natural Resources

Many factors can affect the contingencies of democratic transitions, but one is particularly important: natural resources. When natural resources are abundant and their distribution is highly concentrated, the opportunity cost is often too high to induce a small group of elites to willingly give up power. Under this scenario, elites prefer an authoritarian regime, which allows them to keep full control of the resources, and firmly oppose any kind of democratic reform.

This is especially the case for economies richly endowed with easy-to-grasp natural resources—such as alluvial diamonds and drugs like coca and opium poppy—or with resources requiring high operational costs—such as oil, bauxite, and mineral gas—that are subject to public expropriation. In these economies, democratization is likely to be enforced by the disenfranchised population under (the shadow of) conflict and against the will of the ruling elite.

Cross-sectional regression analysis confirms that the propensity for observing violence during democratization is significantly higher in economies with abundant natural resources and high levels of inequality.[16] In turn, relative to nonviolent transitions, significant or high levels of violence during a regime change reduce institutional quality in the long run (Cervellati, Fortunato, and Sunde 2015). The empirical results also show that natural resource abundance has a long-lasting negative effect on institutional quality even after controlling for the type of transition. There also appears to be a direct effect of natural resources on institutions beyond the one mediated through the transition scenario. These findings are fully consistent with the recent literature on the political economy of the "natural resource curse" that has extensively documented the linkages between resource abundance and institutional quality (Torvik 2009).

C. Democratizing for Development, or the Other Way Around?

The discussion so far has focused exclusively on the conditions that can favor the emergence and success of democratic institutions. However, growth in less-than-democratic economies, such as the People's Republic of China (PRC), has surged in recent years. This brings us to whether authoritarian or democratic states are more conducive to economic development. It also brings us to whether it is the introduction of democratic institutions that breeds economic success or, on the contrary, it is an economy's brightening economic picture that boosts the chances of democratization.

[16] In particular, it is the dependence on natural resources (as measured, for example, by the share of natural resources in total exports) that is positively associated with violence. In general, recent empirical evidence suggests that it is not an abundance of natural resources, but rather an excessive dependence on natural capital, including oil and other mineral resources, that blunt incentives to build up other types of capital that are essential to sustain development over long periods (Gylfason 2008).

There is a lively debate on this topic. An important strand of literature asserts that modern capitalist growth requires not only secure property rights, but also creative destruction; that is, the entry of new firms with new ideas and technologies that replace the successful firms of the past (see, for example, Acemoglu and Robinson 2012). While autocratic regimes can effectively secure the first, and therefore generate growth for certain periods of time, democracies are inherently better at favoring the latter; creative destruction requires a level playing field, which democracies are better at providing because they have more equal distribution of political power than autocracies or monarchies. According to this view, democratic institutions in the US were essential to create the environment for new businesses to enter and flourish in the marketplace, spurring the industrial growth of the 19th century, while rich autocracies—such as Cuba, Haiti, and Jamaica—stagnated because they were unable or unwilling to change collective decision-making processes and democratize.[17]

In line with the Lipset's seminal hypothesis, other scholars emphasize the primacy of economic development, particularly human capital accumulation, over institutions (see, for example, Dahl 1971; Glaeser et al. 2004; Glaeser, Ponzetto, and Shleifer 2007). Human capital boosts labor productivity and, by providing skills to the population at large, favors wage increases and a reduction of economic inequality. Human capital development, therefore, affects both national income level and income distribution. But education, as discussed in detail in the previous section, also facilitates the diffusion of interpersonal trust, empowers the disadvantaged, and promotes prodemocratic attitudes. As a matter of fact, many of the recent development success stories have been driven by less-than-democratic regimes, such as Lee Kwan Yew's Singapore and Park Chung Hee's the Republic of Korea, which invested heavily in human capital and then commenced their first steps toward democracy only after an economic takeoff. These successes underscore the capacity of human capital (education) to affect both economic and institutional development. Glaeser at al. (2004) find that autocratic regimes with a more highly educated populace are more likely to shift toward democracy over time. Education also makes existing democracies more resilient: 95% of the democracies ranked as "well-educated" in 1960 stayed democratic for the next 40 years; by contrast, 50% of those ranked as "less well-educated" became dictatorships within a decade (Glaeser et al. 2004).

IV. Democratization in East Asia

The experience of East Asian economies in recent decades can be used to illustrate the pattern of human-capital-driven economic and institutional

[17]The importance of the institutional setting for economic performance is at the heart of the new institutional economic literature (see, among others, North 1990, and Engerman and Sokoloff 2001).

development discussed in the previous section. Some of the most successful economies in the region, like the Republic of Korea and Taipei,China, experienced fast growth and industrialization under authoritarian regimes and later transited smoothly to democracy; others, like Malaysia, Singapore, and the PRC, are currently experiencing controlled and progressive political and institutional changes after impressive growth over the last couple of decades. In a sense, while fast economic growth provided legitimacy to many nondemocratic regimes in East Asia, it also undermined the very foundation of such regimes by educating the population, pluralizing society, and broadening and politically empowering the urban middle class.

The Republic of Korea represents probably the most notable example of this pattern of transition. It was exceptionally poor at the end of the civil war in 1953 and was subsequently ruled by an authoritarian regime for over 30 years. Over the period 1954–1980, the average value of its Polity IV democracy index, which is distributed over a range between perfect autocracies (–10) and perfect democracies (+10), was –3, only marginally higher than the Democratic People's Republic of Korea (Marshall, Gurr, and Jaggers 2014). Yet, the autocratic regime of the Republic of Korea implemented an effective set of economic measures that led to modernization of the economy and fast economic growth accompanied by sustained wage increases. In 1961, 80% of the population of the Republic of Korea comprised poor farmers. By 1980, when the economy reached a per capita level of income of $1,589, industrial workers (over 50%) and the middle class (about 40%) dominated the social structure (Ohno 2013).

The regime also heavily invested in education; from 1945 to 1960, enrollment in primary schools tripled, secondary school enrollment increased more than eightfold, and enrollment in higher education increased 10 times. In 1945, only 40% of school-aged students were enrolled in grades 1–6, while 15 years later, 96% were. Enrollment continued to grow steadily so that almost all school-aged students were attending middle school in the 1970s and the high school graduation rate reached 90% by the end of the 1980s (Kim and Lee 2002). This massive expansion of education, along with the expansion of the middle class, laid the basis for the emergence of a new and vibrant civil society that constituted the bulk of the emerging democratization movement (Gwon 2006). In the 1980s, the Republic of Korea began transforming itself into a full-fledged democracy and the progressive process of democratization proceeded hand-in-hand with sustained economic development.[18] On the contrary, and despite a relatively more developed industrial base at the end of the civil war, the Democratic People's Republic of Korea stagnated.[19] In 2000,

[18]The formal transition to democracy dates to 1987 when Roh Tae Woo became president through a popular election.

[19]There was significant industrialization in the Republic of Korea and the Democratic People's Republic of Korea during the colonial period with the expansion of both Japanese and indigenous firms. Yet, this development was concentrated more in the north than the south. For instance, the large Japanese *zaibatsu* (industrial or financial

it remained an autocratic state with a level of income equal to only around one-sixteenth of the Republic of Korea's. While it is obvious that since the end of the civil war the Republic of Korea has had the better political institutions of the two, these institutions seem to be the outcome of effective economic policy making and growth after 1953 rather than the cause.

The other poster child for successful democratization in the region, Taipei,China, followed a similar pattern. The authoritarian regime of Taipei,China obtained domestic legitimacy from sustained economic growth and prodevelopment policies over many decades.

Rising real wages, land reform, and educational progress eventually produced a broad middle class that grew increasingly uncomfortable with the autocratic institutional setup in Taipei,China. In the 1980s, when this emerging middle class joined a coalition with other regime opponents, the ruling party, the Kuomintang, gradually loosened its grip on power and initiated democratic reforms (Freedom House 2005).[20]

While the Republic of Korea and Taipei,China successfully completed their transitions and developed democratic institutions, the PRC, the largest and most successful Asian economy in the recent decades, remains under the rule of a less-than-democratic regime.[21] Yet, much like the Republic of Korea and Taipei,China, its growth was fostered by a major change in economic policy away from a rigid central planning and collective ownership structure to a system that allowed price incentives to encourage agricultural production for the market, at least at the margins. This pattern continued when economic reforms spread to the urban sector and industry.

Recognizing the absence of market-supporting institutions, Chinese policy makers, starting with the Deng Xiaoping administration, adopted a cautious and strategic approach to economic reforms (Vogel 2011).[22] They gradually established the necessary institutions for longer-term economic reform while experimenting with institutional arrangements to address constraints. Various dual-track industrialization strategies were adopted, such as a combination of support for import substitution in selected sectors with export-processing activities considered new

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combination) of *Noguchi*, which accounted for one-third of Japanese investment in the Republic of Korea and the Democratic People's Republic of Korea, was centered in the north (Acemoglu et al. 2008).

[20]The first step toward systematic liberalization came in 1986, when martial law was lifted and the people of Taipei,China gained freedom of assembly and association. After years of steady liberalization, popular elections were introduced: first for the national assembly in 1992, then for provincial governorships in 1994, and finally for president in 1996.

[21]The PRC has enjoyed a spectacular economic rise over the past quarter-century: its average annual per capita gross domestic product growth of 9.5% has resulted in an increase in per capita income by a factor of seven and raised the PRC's status from that of a low-income to an upper-middle-income economy (World Bank 2015).

[22]However, as pointed out by Nee and Opper (2012), some private sector-led experiments with market production and the ending of collective incentives had started before Deng Xiaoping's reforms. For example, in Anhui province, peasant households had dissolved communes and collectives and started a land-lease system before any nationwide reforms were introduced. Therefore, the Communist party was pushed to catch up with developments on the ground that had resulted from the earlier political vacuum.

to the domestic economy (McMillan and Rodrik 2011), thereby blending an East Asian model of national enterprise-led growth with a Southeast Asian model of global value chain-led growth primarily orchestrated by multinational corporations (UNCTAD 2014).

The overall package of economic reforms undertaken greatly facilitated the entry of new businesses and increased access to education and economic opportunities for a vast part of the populace. Using the language introduced by Acemoglu and Robinson (2012), the PRC's economic institutional setup became substantially more inclusive, thereby creating the basis for economic prosperity.

Whether this new institutional setup can survive and progress in the long run without the support of more inclusive and democratic political institutions remains an open question. According to Acemoglu and Robinson (2012), inclusive economic institutions can emerge and encourage growth in the short run but cannot survive in the long run in a nondemocratic regime; the future success of the PRC would therefore rely on its capacity to accelerate political reforms. In a Lipsetian perspective, however, these political reforms are likely to follow as a by-product of the economic and social progress that has taken place in recent decades. The impressive income growth and educational advancements achieved by the PRC, in fact, should naturally smooth the path toward democratization in the years to come.

The key to East Asian growth, which in many cases has preceded a political transition, is that it is broad-based and is shared with the populace. Economic institutions became progressively more inclusive in most economies in the region, thereby providing a more level playing field and more equal access to education and productive opportunities. The leaders of the region's "developmentalist" states provided education and social goods—such as housing, pensions, and health care—facilitating the achievement of an inclusive and inequality-reducing growth path that ultimately paved the way for successful transitions to democracy (Ginsburg 2008).[23]

Many East Asian economies, especially the Republic of Korea and Japan, were also "blessed" with few natural resources. Export orientation represented the only plausible route out of poverty for these economies and they were therefore insulated against the pathologies of the natural resource curse discussed in the previous section. Others—such as the PRC, Malaysia, and Thailand—achieved economic diversification despite being endowed with substantial mineral resources. One common theme among these (different) success stories is the need to reduce costs for the non-natural resource sectors, whether through macroeconomic management and exchange rate policy, trade policy, or well-focused public investments. Another is the importance of openness to foreign investors, skills, and new markets, and the efforts to supplement market incentives in various ways to encourage diversification (Gelb 2010).

[23]The notable exception not discussed here is Ferdinand Marcos in the Philippines.

It was the combination of the effective development of human capital and efficient deployment of physical capital for economic diversification that made the difference in East Asia. The lesson from this paper's perspective is that it is not growth alone, but the type of growth that matters for democracy to emerge and thrive. Only if growth is widely shared among a broad social base, and then only if it brings sustained educational improvements, are healthy democratic institutions likely to arise.

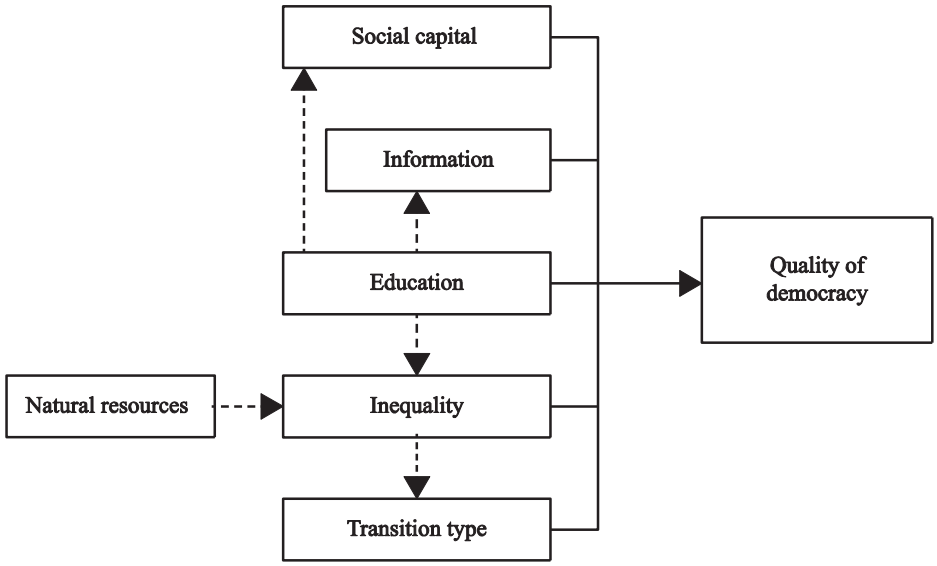
V. Concluding Remarks

The literature discussed in this paper suggests that democratic institutions do not always guarantee good governance. Democracy does indeed require important ancillary conditions to operate fruitfully and foster economic development. Where social life is fragmented and a culture of distrust diffuse, evidence shows that democratically elected bodies are less responsive to public demands and politics takes on patron–client characteristics. A well-functioning democracy also requires voters to be informed about the political process and politicians' actions. In places where the media does not facilitate access to unbiased information and where the rules and practices of information disclosure are not part of the political culture, elected officials are likely to be only partially accountable and serious moral hazard problems may arise. Education is likely to affect both the strength of social networks and access to information; it therefore represents a key pillar of democratic governance. Education may also have a direct effect on the functioning of democratic institutions, since it empowers citizens to engage with government institutions and facilitates the negotiated resolution of social and economic disputes. Finally, inclusive and efficient democratic institutions also require a certain commonality of (economic) interests across the population. Economies heavily relying on natural resources whose rents are unevenly distributed are more likely to experience violent conflicts and, in turn, to develop a dysfunctional institutional setting after the transition to democracy. Again, education may play an important role here; modern economies in which a significant share of value-added accrues to human capital development are less likely to be trapped in this institutional facet of the natural resource curse.

This complex network of direct and indirect effects is illustrated in Figure 3. The diagram exemplifies the interplay among the different factors analyzed in the paper and the functioning of democratic institutions. Solid lines represent direct channels of influence on the quality of democracy, while dotted lines symbolize the existence of linkages among our different explanatory variables (and thus of indirect effects on governance).[24]

[24]The quality of democratic institutions, in turn, is likely to affect education, social capital, and inequality. This endogeneity problem is discussed in Section II.C.

Figure 3. **The Determinants of Democratic Quality**



Source: Author's diagram.

Low-income economies score poorly on many of the dimensions that determine the quality of a democracy. Therefore, identifying the priorities on the policy agenda to create and/or consolidate democratic institutions represents a critical development challenge.

Policy makers should try to increase stock of social capital. Yet, social capital is frequently a by-product of religion, tradition, shared historical experience, and other factors that lie outside the control of any government. It is extremely difficult to identify effective levers for creating trust and other forms of social capital. The area where governments probably have the greatest direct ability to generate social capital is education. As discussed above, educational institutions do not simply transmit human capital, they also pass on social capital in the form of social rules and norms.

Governments can also foster the creation of social capital indirectly by efficiently providing necessary public goods, particularly property rights and public safety. There are important externalities associated with the enforcement of property rights; people cannot associate, volunteer, vote, or take care of one another if they fear for their lives when walking down the street. Given a stable and safe environment for public interaction and property rights, it is more likely that trust will arise spontaneously as a result of the iterated interactions of rational individuals.

Public policy should also seek to increase the information readily available to voters. Sustaining the diffusion of independent mass media and fostering political competition is of critical importance in this regard. However, in the short to medium

run, relying on the media may not suffice. Many low-income economies are far from having an independent media whose role is to provide citizens with up-to-date and objective information. Equally, increases in political competition may not suffice since information transmission by political parties may simply not be credible.

The potential inefficacy of "good" prodemocratic reforms, such as facilitating the diffusion of an independent media and increasing the contestability of the political arena, brings us to the final point of this paper: not only the choice of specific political and economic reforms matter for the functioning of democratic institutions, but also their sequencing. Discussing recent African economic and institutional advancements, Miguel (2011) asked why some African economies, such as Ghana, developed successful democracies in the 1990s, while others, such as Côte d'Ivoire, tried and failed. And why did democracy take root only recently, while earlier democratic experiments in the 1960s collapsed within an election cycle or two. The answer to that question may lie (once again) in education. In the 1990s, unlike in the 1960s, education was widespread on the continent, and it was this rapid expansion of schooling, which took place during the otherwise lost decades of the 1970s and 1980s, that paved the way for effective and sustainable political reform. As a matter of fact, the same sequencing characterized the successful democratic transitions in East Asia discussed in the previous section.

A complex combination of factors is needed to sustain the functioning of democratic institutions and guarantee their success. Despite the voluminous research to date, we are still far from a complete understanding of the interplay among these factors. Education seems to be at the core of this network and future advances in the field will inescapably rely on a deeper understanding of the channels through which it influences the mechanics of modern democracies.

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* ADB recognizes "China" as the People's Republic of China and "South Korea" as the Republic of Korea.

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An Empirical Estimation of Asia's Untapped Regional Integration Potential Using Data Envelopment Analysis

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This paper uses bilateral flow data on multiple dimensions of economic integration to construct a composite index of regional integration outcomes covering 19 regions in various parts of the world. As a first step, the multidimensional indicator is used to rank regions according to their current degree of regional integration, which allows for a direct comparison of Asia's regional integration performance with those of other regions of the world. As a second step, the constructed indicator of regional integration outcomes is used as the output variable in a data envelopment analysis to estimate Asia's untapped regional integration potential.

Keywords: Asia, composite index, data envelopment analysis, integration potential, regional integration
JEL codes: F02, F10, F13, F15

I. Introduction

Regional integration is at the center of the current debate on strategies for optimal growth and development policies. Many authors have stressed the role of regional integration in achieving economies of scale, improving market structures, and enhancing the forces of competition. These impacts drive technological change and foster higher productivity growth and investment activities, which are often viewed as eventually leading to higher benefits from trade and positive welfare gains (Krugman 1991a, Baldwin and Venables 1995, Fernandez and Portes 1998, Sapir 2011). Regional integration is also frequently seen as a possible building block for greater trade liberalization and multilateralism (Bhagwati 1993; Baldwin 2006; Calvo-Pardo, Freund, and Ornelas 2011). In addition, there may be important

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noneconomic benefits of regional integration that go beyond raising national income levels and reducing poverty (Bhattacharyay, Kawai, and Nag 2012).

While the academic debate on regionalism has also produced various studies arguing against regional integration efforts—when compared with multilateral trade liberalization within the World Trade Organization (see, for example, Krugman 1991b; Frankel, Stein, and Wei 1995)—the empirical evidence over the past 2 decades shows that the focus of trade policy has shifted toward regional approaches. The rising prominence and increasing number of preferential trade agreements and regional trade agreements are evidence of this (WTO 2011).

Compared to the sometimes euphoric perceptions of policy makers, the empirical evidence on regional integration outcomes is, however, rather limited. As De Lombaerde et al. (2008) argue, there is a need for quantitative measures and empirically verifiable analyses of regional integration outcomes, which this paper seeks to address. Most of the existing studies on regional integration can be classified into two groups. The first comprises papers that discuss regional integration at an institutional level, looking, for example, at subregional organizations or multilateral free trade agreements, and often referring to the stages of integration defined by Balassa 1961. Most of these studies focus on theoretical considerations and are based on qualitative arguments.

In the second group are studies that investigate effective degrees of economic integration using empirical data. Most of these papers investigate only a single dimension of integration, such as the large literature on trade, or studies on migration. This paper follows the empirical approach of the latter class of studies, but combines data on multiple areas of integration into a single indicator. This allows for an estimation of realized degrees of regional integration along various dimensions and enables the results for Asia's regions to be compared with those from other regions of the world. A constructed composite index of regional integration outcomes is then used as the output variable in a data envelopment analysis (DEA) to estimate Asia's untapped regional integration potential. The results suggest heterogeneous (but on average, large) possible increases in regional integration levels across Asia given the current status of institutional conditions and available resources.

The remainder of the paper is structured as follows. Section II introduces the data sources and explains the applied methods for the construction of a composite regional integration (CRI) index and the performance of DEA. The results are presented in Section III and tested for their robustness in Section IV. Section V concludes.

II. Data and Applied Methods

In order to estimate regional integration potential in Asia, as a first step a composite index of regional integration outcomes based on empirical data for

various areas of economic integration is constructed.[1] Any such composite index depends on the data used and the chosen aggregation methods. Although several authors have recently proposed procedures to construct such an index, no standard procedure has yet been established in the literature so far (De Lombaerde et al. 2008). The methods applied in this paper are specifically designed to capture integration outcomes along multiple distinct dimensions in a coherent and transparent way and to aggregate the data to ensure comparability of variables with different scales and units of measurement. Alternative measurement and weighting schemes are discussed as part of the robustness checks in Section IV.

A. Data Selection, Normalization, and Aggregation

Following Nardo et al. (2008), a first step in constructing composite indices is to select a set of empirically quantifiable subindicators that serve as proxies for the multiple dimensions of regional economic integration outcomes being considered. Different from composite indices in other contexts, the construction of a multidimensional index of regional integration outcomes requires data on bilateral cross-border flows, rather than on individual country-level stocks. Because of the limited availability of global bilateral datasets, the selection of variables to be included in the CRI index is restricted. However, for a number of relevant dimensions of economic integration such data do exist, including (i) cross-border mobility for migration and tourism, (ii) trade and investment, and (iii) monetary and financial integration.[2]

In order to keep the data comparable, intraregional shares of flow variables F_{ij} (for specific origin and destination) are used as a single measure for all considered dimensions of economic integration.[3] Based on a bilateral data matrix containing information about these flows between economies i and j, the intraregional share is defined as the fraction of flows between the economies in region R (denoted F_{RR}) and total flows between those economies in R and all economies in the world W (F_{RW}), which can be calculated as

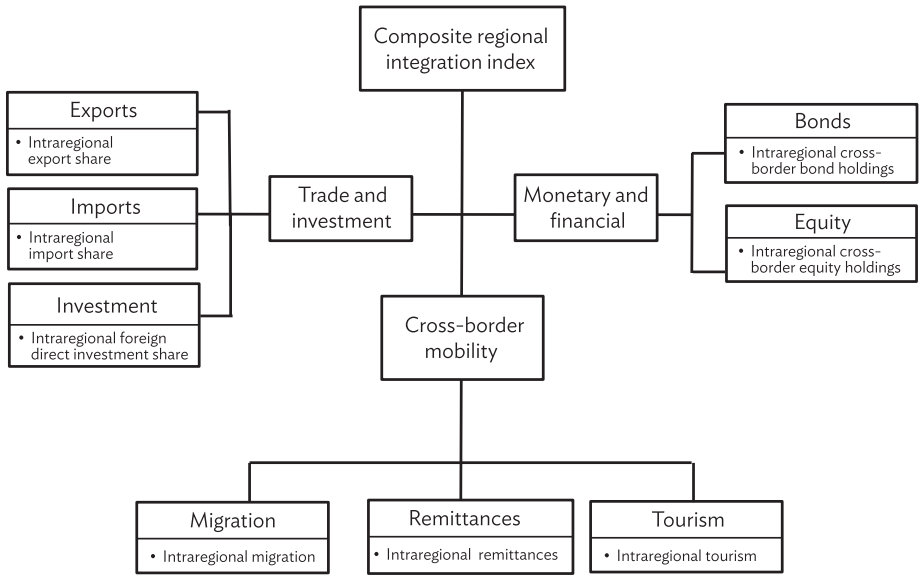
$$\frac{F_{RR}}{F_{RW}} = \frac{\sum_{i \in R} \sum_{j \in R, j \neq i} F_{ij}}{\sum_{i \in R} \sum_{j \in W, j \neq i} F_{ij}} \tag{1}$$

[1] The term "region" is used in this paper to refer to a set of (mostly bordering) economies located in the same geographical area.

[2] The conceptual framework for the choice of subindicators is based on ADB's regional cooperation and integration strategy framework (ADB 2006), particularly the four defined regional cooperation and integration pillars: (i) cross-border infrastructure, (ii) trade and investment, (iii) monetary and financial integration, and (iv) regional public goods. The selection of individual variables reflects important areas of integration within these dimensions for which data are globally available. For other areas than the ones considered, such as regional public goods, no adequate datasets could be identified.

[3] Other possible measures of regional integration outcomes include intraregional correlation coefficients and intensity indices.

Figure 1. **Composite Regional Integration Index**



Source: Author's illustration.

The CRI index is based on each region's performance along the considered variables and constructed as shown in Figure 1. At each aggregation level, equal weights are assigned to the respective subindicators. While this is in line with other studies that construct composite indices with the purpose of using them in data envelopment analysis (Afonso, Schuknecht, and Tanzi 2005; Herrera and Pang 2005), it introduces an additional assumption. The robustness of the results to different weighting schemes are discussed in Section IV.

All included variables are normalized such that higher values indicate a higher degree of regional integration and the range of possible values is between 0 and 1 for all variables. For indicator I, this is achieved by calculating the distance to the sample maximum, setting the normalized value for region i equal to

$$I_i^* = \frac{I_i}{\max_{i \in N}(I_i)} \tag{2}$$

For all variables that are measured according to a predefined scale (e.g., the Logistics Performance Index) the distance to the theoretically maximal attainable value is used, which is five in the case of the Logistics Performance Index.[4] Most of the variables used in the analysis come from International Monetary Fund (IMF)

[4]Other normalization methods, such as standardization (z-scores) or rescaling, would either allow for differing ex-post ranges across variables (setting instead the first two moments equal) or force the smallest value in the sample to equal 0, which may not sufficiently capture cases where all regions are performing relatively well.

and World Bank datasets, as well as from ADB's Integration Indicators database. Table 1 provides a complete list of data sources.

B. Economy Groupings and Missing Data

The sample consists of 19 regions, comprising a total of 186 economies. Table A.1 in the Appendix lists the corresponding groupings. For some of the variables used, data on additional economies not listed in the Appendix are available. These economies are included in the calculation of total flows between individual regions and the world (F_{RW}) as part of W.

For all variables, data on some economies are missing and hence the affected regions are only a subset of the corresponding economies. The numbers of available economies are shown in Table A.2 in the Appendix. The average coverage across all variables is about 80% of each region's economies and with the exception of the IMF's Coordinated Portfolio Investment Survey dataset, the coverage is never below 50% for any variable or region. For the two variables on monetary and financial integration (cross-border bond and equity holdings), data are available for only 40% of the economies (e.g., many of the island states in the Pacific and Caribbean are missing) and only two African economies are included (Egypt and South Africa).

In order to correct for the bias that would occur for the African regions if this subindicator were simply excluded from the computation of the respective CRI index for these regions, an attempt was made to impute the missing values. This was done by using the average of the two available economies for the three African regions that do not have any observations. Although this procedure represents only a very rough approximation, it is likely to significantly reduce the bias that would otherwise occur.[5] When the CRI index is computed without taking into account monetary and financial integration, the resulting ranking differs only slightly and none of the imputed regions are severely affected. This indicates that the imputed values are not driving the results for these regions.

C. Global Comparison of Composite Regional Integration Levels

The resulting values for the CRI index are shown in Table 2 (column 1), along with normalized intraregional shares for the three considered areas of economic integration (columns 2–4), and input-related variables (columns 5–7). The regions with the highest CRI levels are Western Europe, North America (Canada, Mexico, and the United States), and East Asia. The regions with the lowest CRI levels are Middle Africa and Northern Africa, and Central Asia and South Asia. Southeast Asia

[5] In the event that Egypt and South Africa are generally more financially integrated than the average African country, the imputed values would be too high. This, however, would not affect the overall resulting ranking according to the CRI index, given that the African regions are already at the lower end of the sample.

Table 1. **Data Descriptions and Sources**

Variable	Description	Data Source (institution, year)
Outputs:		
Intraregional export share	Intraregional exports (% of total exports)	Direction of Trade Statistics (IMF, 2014)
Intraregional import share	Intraregional imports (% of total imports)	Direction of Trade Statistics (IMF, 2014)
Intraregional FDI share	Intraregional FDI inflows, net (% of total FDI inflows, net)	Foreign Direct Investment (UNCTAD, 2012)
Intraregional bond holdings	Intraregional cross-border bond holdings (% of total cross-border bond holdings)	Coordinated Portfolio Investment Survey (IMF, 2013)
Intraregional equity holdings	Intraregional cross-border equity holdings (% of total cross-border equity holdings)	Coordinated Portfolio Investment Survey (IMF, 2013)
Intraregional migration	Intraregional outbound migration (% of total outbound migration)	Trends in International Migrant Stock (UN, 2013)
Intraregional remittances	Intraregional remittances inflows (% of total remittances inflows)	Bilateral Remittances Matrix (World Bank, 2012)
Intraregional tourism	Intraregional outbound tourists (% of total outbound tourists)	Outbound Tourism (World Tourism Organization, 2012)
Inputs:		
Cross-border infrastructure	Overall Logistics Performance Index score based on (i) efficiency of customs clearance process; (ii) quality of trade and transport infrastructure; (iii) ease of arranging shipments; (iv) quality of logistics services; (v) ability to track and trace consignments; (vi) timeliness of shipments (1 = low to 5 = high); and (vii) export and import conditions measured as the distance to the "frontier," representing the best performance observed for the following: documents (number), time (days), and cost ($ per container) associated with exporting and importing a standardized cargo by sea (0 = lowest to 100 = highest)	Logistics Performance Index (World Bank, 2014); Doing Business database (World Bank, 2015)
Business regulation environment	Overall distance to the "frontier," representing the best performance observed for the following: starting a business, dealing with construction permits, getting electricity, registering property, getting credit, protecting minority investors, paying taxes, enforcing contracts, and resolving insolvency (0 = lowest to 100 = highest)	Doing Business database (World Bank, 2015)

FDI = foreign direct investment, IMF = International Monetary Fund, UN = United Nations, UNCTAD = United Nations Conference on Trade and Development.
Note: For economies in which 2014 Logistics Performance Index data are missing, the next available year has been used.
Source: Author's compilation.

Table 2. **Global Comparison of Regional Integration Levels**

Region	CRI Index[a] (1)	Trade and Investment[b] (2)	Monetary and Financial[b] (3)	Cross-Border Mobility[b] (4)	Input Index[c] (5)	Doing Business[d] (6)	Logistics Perform.[d] (7)
Western Europe	**0.89**	1.00	1.00	0.68	0.76	0.75	0.76
Eastern Europe	0.33	0.33	0.18	0.47	0.61	0.63	0.60
Northern Europe	0.30	0.36	0.23	0.30	0.75	0.80	0.69
Southeastern Europe	0.13	0.13	0.00	0.25	0.58	0.62	0.55
North America	**0.62**	0.65	0.31	0.90	0.75	0.78	0.72
South America	0.27	0.28	0.06	0.46	0.57	0.58	0.56
Central America	0.23	0.22	0.08	0.40	0.57	0.61	0.54
Caribbean	0.12	0.15	0.06	0.14	0.55	0.61	0.48
East Asia	**0.50**	0.68	0.22	0.62	0.73	0.74	0.71
Southeast Asia	0.38	0.42	0.21	0.50	0.62	0.64	0.60
West Asia	0.34	0.20	0.33	0.48	0.62	0.64	0.59
Pacific and Oceania	0.23	0.12	0.09	0.47	0.60	0.63	0.57
South Asia	0.11	0.08	0.01	0.24	0.53	0.55	0.52
Central Asia	0.11	0.09	0.01	0.23	0.55	0.60	0.50
Western Africa	**0.25**	0.12	0.01	0.60	0.48	0.46	0.50
Eastern Africa	0.20	0.13	0.01	0.46	0.48	0.49	0.46
Southern Africa	0.18	0.00	0.01	0.53	0.60	0.62	0.57
Northern Africa	0.12	0.07	0.02	0.26	0.56	0.58	0.53
Middle Africa	0.09	0.01	0.01	0.25	0.43	0.41	0.46
Average:							
Europe	0.41	0.46	0.35	0.43	0.67	0.70	0.65
Americas	0.31	0.32	0.13	0.48	0.61	0.65	0.58
Asia	0.28	0.26	0.15	0.42	0.61	0.63	0.58
Africa	0.17	0.07	0.01	0.42	0.51	0.51	0.51

CRI = composite regional integration.
Note: Values in bold indicate regions with the highest CRI index for their respective continent.
[a] Average of aggregated indicator variables in columns 2–4 (see main text).
[b] Simple average of normalized intraregional shares along corresponding subindicators (see Figure 1).
[c] Average of columns 6–7 (see main text).
[d] Normalized economy averages based on corresponding variables described in Table 1.
Source: Author's calculations.

and West Asia achieve values that are higher than those obtained by Eastern Europe, South America, and all African regions. When looking at simple averages over continents, Europe has the highest result. Asia achieves a value only slightly below the average of the four American regions, while Africa lags behind. All continents are characterized by considerable heterogeneous regional integration levels.

In addition to the results based on the constructed CRI index, integration outcomes can also be compared separately for different areas of integration. The disaggregated results on individual dimensions of economic integration (columns 2–4) show that East Asia has the second highest value for trade and investment, ranking slightly above North America and below only Western Europe. While North America has the highest result for cross-border mobility, East Asia, Southeast Asia,

and West Asia all achieve values that place them within the range of values obtained by South America and Western Europe.

When comparing the Pacific and Oceania with the Caribbean, both regions obtain very similar results for trade and investment, and for monetary and financial integration, although the Pacific and Oceania have significantly higher values for cross-border mobility, which may be driven by Australia and New Zealand. The largest gap between Western Europe and all other regions appears to be in monetary and financial integration. As shown in Section IV, these results remain almost unchanged when different weighting schemes of subindicators are used, suggesting that the findings are relatively robust against moderate changes in the construction of the CRI index.

D. Data Envelopment Analysis

Data envelopment analysis (DEA) is a nonparametric approach for estimating production frontiers and can be used to measure relative efficiency rates across a set of comparable units of observation. The method has been applied to a wide range of fields, including an assessment of the efficiency of health and education expenditures in developing countries (Herrera and Pang 2005) and public sector efficiency in Europe (Afonso, Schuknecht, and Tanzi 2005). In estimating production inefficiencies, the DEA approach assumes the existence of a convex production frontier defined by the maximum attainable output for a given input level. Efficiency is measured as the distance from the observed input–output combination to the efficient frontier. In particular, a unit is considered to be relatively inefficient if another unit uses less or an equal amount of inputs to generate more or the same amount of output. The range of possible values is from 0 to 1, and all economies located on the frontier are assigned the maximum value of 1.

In the specific context of this study, the underlying intuition behind the applied DEA is that regions that feature the same enabling environment for economic integration—the quality of cross-border infrastructure and institutional arrangements that facilitate multinational private sector activities—should in general also be able to attain similar levels of regional integration outcomes. Any estimated inefficiencies are interpreted as untapped potential in regional integration. This highlights the empirical character of the analysis in which untapped regional integration potential is defined as the distance between the currently achieved level of regional integration (measured by the CRI index) and the theoretically possible level (corresponding to the estimated integration frontier).

It is important to note that the resulting values are based on currently available resources and conditions rather than on potential future developments. The study therefore does not seek to generate forecasts of further integration potential corresponding to possible scenarios of enhancements in economic conditions or political changes. Instead the analysis is designed to compare levels of integration outcomes

across different regions and to identify those regions that, relative to others, seem to achieve lower levels of regional integration than their potential suggests.

Since all resulting values are estimated relative to the performance of other regions, the corresponding estimates for a specific region are dependent on the set of other regions included in the analysis. This feature can be used to derive different results for the Asian regions corresponding to a lower and upper bound of regional integration potential. For the derivation of a lower bound, regional integration potential is estimated using only the Asian regions in the analysis. This approach compares input–output combinations across the considered Asian regions and estimates the frontier based on the most integrated regions in Asia only. Including additional regions in the analysis moves the frontier outwards (e.g., as highly integrated European regions become additional possible benchmarks), which increases the resulting estimates for Asia. The inclusion of all 19 regions leads to the estimation of a current upper bound.[6]

In order to apply this approach to estimate untapped regional integration potential, the CRI index constructed above is used as the output variable in the DEA. The considered input variables are chosen as proxies for two relevant dimensions of the enabling environment for regional integration: the quality of cross-border infrastructure, and institutional arrangements that facilitate private sector activities leading to increased economic integration.[7] The data come from the World Bank's Logistics Performance Index and the Doing Business database. A complete list of the considered variables and data sources is shown in Table 1.

While there are many other possible drivers of regional integration outcomes, ranging from geographical features (e.g., distance and natural characteristics) to cultural factors (e.g., common language), this study focuses on conditions that are substantially determinable by governments and policy makers. In addition, the included indicators of cross-border infrastructure (time and cost associated with exporting and importing) may also partially capture geographic conditions as they represent de facto distances between economies in terms of transportation time and cost.[8] The inclusion of variables from the Doing Business database is based on the view that private sector activities constitute an important driving force of regional integration outcomes (see, for example, Peng 2002, Yoshimatsu 2002). All input variables are normalized and aggregated to a single input index using the same methods as described above.

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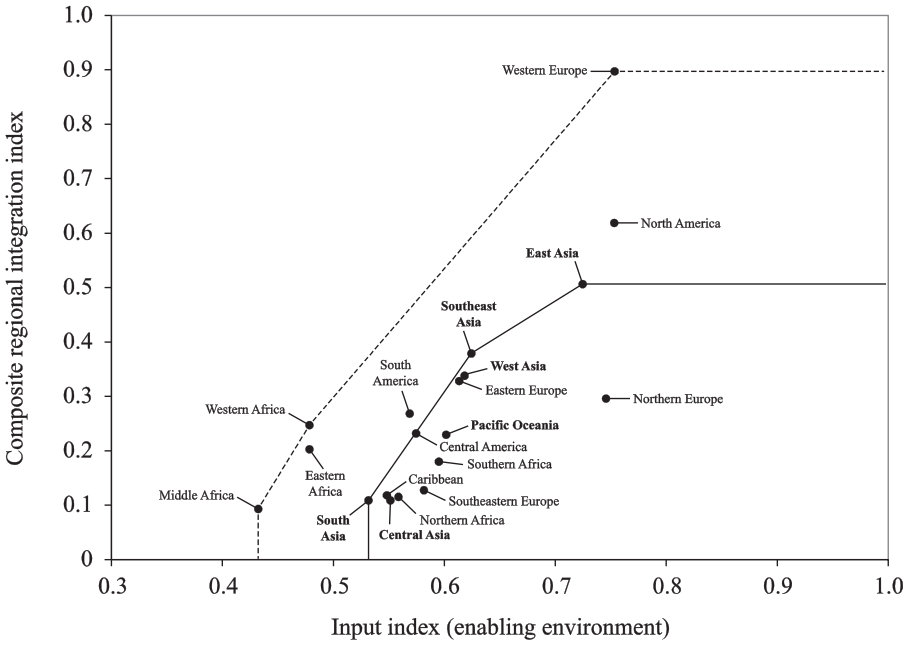
[6]Note that the upper bound is likely to be underestimated by the DEA approach, since regions located on the frontier have reached 100% of their potential by definition even though they may have scope for further enhancement.

[7]Both dimensions have been argued to be important drivers of the areas of integration considered in the CRI index (see, for example, Francois and Manchin 2013, Lewer and Van den Berg 2008, Khadaroo and Seetanah 2008).

[8]Following a similar line of reasoning, the measures of customs clearance efficiency, cost, and documents associated with cross-border transportation are likely to also represent the scope of institutional integration achieved in terms of trade agreements and other forms of regional cooperation. Since the outcomes for cross-border trade and mobility are more likely to depend on the actual conditions than those agreed upon in free trade and similar agreements, no additional measure of the institutional conditions is included.

Figure 2. **Regional Integration Frontier**



Notes: Plotted lines represent production possibility frontiers for the sample consisting of the six Asian regions (solid line) and the full sample of 19 regions (dashed line). See Table 2 and main text for details on the composite regional integration index and input index.
Source: Author's calculations.

III. Estimation Results

An output-oriented DEA is performed using the software tool DEAP 2.1 to estimate each region's untapped integration potential (Coelli 1996, Coelli et al. 2005). Figure 2 shows the resulting production possibility frontier for the six Asian regions (solid line) and for the full sample of 19 regions (dashed line), corresponding to the lower and upper bound, respectively. The resulting estimates for untapped integration potential are presented in Table 3, along with each region's rank. Larger ranks correspond to smaller estimated values and indicate higher potential for increased integration levels. An estimated value of 1 indicates the region is located on the corresponding frontier.

Based on the results for the global sample, South Asia and Central Asia have the largest unused integration potential among the six Asian regions. Their scores are both around 0.3, suggesting that the two regions are currently only achieving about 30% of their possible integration levels, based on the specification corresponding to an upper bound estimate. East Asia, Southeast Asia, and West Asia all achieve scores of around 0.6, indicating they are relatively nearer to the estimated frontier, but there is still considerable scope for increases in integration levels.

Table 3. **Data Envelopment Analysis Estimates of Untapped Integration Potential**

		Full Sample		Asia	
Region	**CRI Index**	**Score**	**Rank**	**Score**	**Rank**
Western Europe	0.893	1.00	1		
Eastern Europe	0.328	0.59	8		
Northern Europe	0.296	0.34	12		
Southeastern Europe	0.127	0.26	16		
North America	0.619	0.70	3		
South America	0.269	0.59	7		
Central America	0.231	0.49	9		
Caribbean	0.118	0.29	14		
East Asia	0.504	0.61	5	1.00	1
Southeast Asia	0.379	0.65	4	1.00	1
West Asia	0.338	0.59	6	0.93	4
Pacific and Oceania	0.229	0.43	10	0.73	5
South Asia	0.109	0.30	13	1.00	1
Central Asia	0.108	0.26	16	0.65	6
Western Africa	0.246	1.00	1		
Eastern Africa	0.202	0.83	2		
Southern Africa	0.180	0.35	11		
Northern Africa	0.115	0.27	15		
Middle Africa	0.093	1.00	1		
Average:					
Europe	0.411	0.55			
Americas	0.309	0.52			
Asia	0.278	0.47			
Africa	0.167	0.69			

CRI = composite regional integration.
Notes: Columns 3–6 report data envelopment analysis scores and corresponding ranks based on output-oriented analysis and variable returns to scale. The input variable is the index based on variables from the Doing Business and Logistics Performance Index databases (Table 2, column 5). The output variable is the composite regional integration index (Table 2, column 1).
Source: Author's calculations.

The estimation based solely on the Asian regions yields additional results. With the exception of South Asia, the order of obtained ranks is qualitatively the same. But as expected, the absolute estimated scores are much higher as very integrated regions such as Western Europe are no longer serving as benchmarks. Based on South Asia's input values and currently achieved integration level, the region is at the lower-end of the corresponding frontier (with an assigned score of 1). This result highlights that, according to the DEA approach, the regions located at the frontier are assumed to achieve their full potential by definition mainly because no other regions exist in the sample that can serve as a corresponding benchmark. In order to overcome this limitation, the results for the full sample and the Asian specification can be combined to derive a rough assessment of the magnitude of untapped integration potential corresponding to the range between the lower and upper bounds. For East and Southeast Asia, this yields values between 0 and around

40% of unused potential, while for South Asia, the upper bound of untapped potential is 70%.

Based on the results in Table 3, all continents feature regions with considerable untapped integration potential. On average, Europe and the Americas achieve scores slightly above 0.5, which indicates there is still considerable scope for increased integration, in particular in Southeastern Europe and the Caribbean. Asia's level of regional integration is found to be slightly below half of its estimated potential, representing the largest scope for a further increase in regional integration levels in the sample. The results for Africa suggest that the continent is achieving around 70% of its current integration potential.[9]

IV. Robustness Checks

As described in Section II, the construction of a CRI index involves decisions on a number of possible normalization and aggregation methods that may crucially affect the obtained results. In order to test the robustness of the CRI index to different specifications in aggregation, Table 4 shows the resulting CRI values and rankings for different weighting schemes, including principal component analysis. The reported Spearman correlation coefficients represent a measure of the similarity between rankings, where a value of 1 indicates that both rankings are identical, and smaller values imply less agreement. (A value of 0 indicates that the rankings are completely independent.)

For most regions, the respective rank changes only very slightly when different weighting schemes are used. Both the standard Pearson correlation coefficient and the Spearman correlation coefficient for rankings are always close to 1 and significant at the 1% level, suggesting that the results are relatively robust against moderate changes in the construction of the CRI index. Analogous results for the constructed input index are shown in Table 5. The resulting rankings are found to be a bit more sensitive to different aggregation methods, but correlation coefficients between the absolute values are always very close to 1. Based on these results, the presented findings in Section III are unlikely to be driven by the specific aggregation methods underlying the construction of the CRI and input indexes.

V. Conclusion

The empirical findings presented in this paper are able to provide answers to two important questions: How integrated are Asian regions compared with other

[9]Note that the presented estimates are based on currently available resources and institutional conditions, and thus do not allow for an interpretation of how close Africa is to its general integration potential, i.e., when economic or political conditions improve in the future. In addition, the analysis focuses exclusively on integration potential corresponding to effective levels of economic integration along the areas captured by the CRI index and does not provide any results on welfare or growth effects. Implications of economic integration in this direction are discussed in other studies (e.g., Baldwin and Venables 1995, Sapir 2011).

Table 4. **Composite Regional Integration Index—Different Weighting Schemes**

Region	Baseline[a]	Rank	Weighting of Subindicators with Emphasis on: Trade and Invest.[b]	Rank	Monetary and Financial[c]	Rank	Cross-Border Mobility[d]	Rank	Principal Component Analysis	Rank
Western Europe	0.89	1	0.92	1	0.92	1	0.84	1	4.56	1
Eastern Europe	0.33	6	0.33	5	0.29	6	0.36	6	0.34	6
Northern Europe	0.30	7	0.31	6	0.28	7	0.30	9	0.05	7
Southeastern Europe	0.13	14	0.13	14	0.10	15	0.16	14	−1.21	14
North America	0.62	2	0.63	2	0.54	2	0.69	2	2.59	2
South America	0.27	8	0.27	8	0.22	8	0.32	8	−0.11	8
Central America	0.23	10	0.23	9	0.19	10	0.27	11	−0.39	11
Caribbean	0.12	15	0.12	15	0.10	14	0.12	19	−1.30	16
East Asia	0.50	3	0.55	3	0.43	3	0.53	3	1.65	3
Southeast Asia	0.38	4	0.39	4	0.34	4	0.41	4	0.71	4
West Asia	0.34	5	0.3	7	0.34	5	0.37	5	0.43	5
Pacific and Oceania	0.23	11	0.20	11	0.19	9	0.29	10	−0.38	10
South Asia	0.11	17	0.10	18	0.08	17	0.14	16	−1.34	17
Central Asia	0.11	18	0.10	16	0.08	18	0.14	17	−1.34	18
Western Africa	0.25	9	0.22	10	0.19	11	0.33	7	−0.22	9
Eastern Africa	0.20	12	0.19	12	0.16	12	0.27	13	−0.59	12
Southern Africa	0.18	13	0.14	13	0.14	13	0.27	12	−0.72	13
Northern Africa	0.12	16	0.10	17	0.09	16	0.15	15	−1.28	15
Middle Africa	0.09	19	0.07	19	0.07	19	0.13	18	−1.45	19
Pearson correlation	1.000	-	0.997	-	0.993	-	0.989	-	0.999	
Spearman correlation[e]	-	1.000	-	0.988	-	0.991	-	0.972	-	0.997

Notes:
[a] Simple average; that is, equal weights assigned to each subindicator (one-third) as in Table 2, column 1.
[b] One-half is assigned to Trade and Investment and one-quarter to each of the two other subindicators.
[c] One-half is assigned to Monetary and Financial and one-quarter to each of the two other subindicators.
[d] One-half is assigned to Cross-Border Mobility and one-quarter to each of the two other subindicators.
[e] The Spearman correlation coefficient ranges inside the interval [−1,1] and takes the value 1 if the agreement between two rankings is perfect (the two rankings are identical), the value 0 if the rankings are completely independent, and the value −1 if one ranking is the reverse of the other.
Source: Author's calculations.

Table 5. **Input Index—Different Weighting Schemes**

Region	Baseline[a]	Rank	Weighting of Subindicators with Emphasis on: Doing Business Index[b]	Rank	Logistics Performance Index[c]	Rank	Principal Component Analysis	Rank
Western Europe	0.76	1	0.75	1	0.76	1	2.39	1
Eastern Europe	0.61	7	0.62	5	0.61	6	0.25	6
Northern Europe	0.75	3	0.76	6	0.73	7	2.18	7
Southeastern Europe	0.58	10	0.59	14	0.57	15	−0.24	14
North America	0.75	2	0.76	2	0.74	2	2.32	2
South America	0.57	12	0.57	8	0.57	8	−0.40	8
Central America	0.57	11	0.59	9	0.56	10	−0.34	11
Caribbean	0.55	15	0.57	15	0.53	14	−0.77	16
East Asia	0.73	4	0.73	3	0.72	3	1.92	3
Southeast Asia	0.62	5	0.63	4	0.62	4	0.41	4
West Asia	0.62	6	0.63	7	0.61	5	0.32	5
Pacific and Oceania	0.60	8	0.61	11	0.59	9	0.07	10
South Asia	0.53	16	0.54	18	0.53	17	−0.96	17
Central Asia	0.55	14	0.57	16	0.54	18	−0.71	18
Western Africa	0.48	17	0.47	10	0.49	11	−1.70	9
Eastern Africa	0.48	18	0.48	12	0.47	12	−1.75	12
Southern Africa	0.60	9	0.60	13	0.59	13	−0.03	13
Northern Africa	0.56	13	0.57	17	0.55	16	−0.58	15
Middle Africa	0.43	19	0.43	19	0.44	19	−2.38	19
Pearson correlation	1.000	-	0.997	-	0.997	-	0.999	
Spearman correlation[d]	-	1.000	-	0.837	-	0.844	-	0.830

Notes:
[a]Simple average; that is, equal weights assigned to each subindicator (one-half) as in Table 2, column 5.
[b]Two-thirds are assigned to Doing Business Index and one-third to Logistics Performance Index.
[c]Two-thirds are assigned to Logistics Performance Index and one-third to Doing Business Index.
[d]The Spearman correlation coefficient ranges inside the interval [–1,1] and takes the value 1 if the agreement between two rankings is perfect (the two rankings are identical), the value 0 if the rankings are completely independent, and the value –1 if one ranking is the reverse of the other.
Source: Author's calculations.

regions in the world when looking at multiple dimensions of economic integration? And, how large is the untapped potential of Asia's regions for further integration based on currently available resources and institutional conditions?

Although quantitative magnitudes should be interpreted with caution, as data quality and availability for the considered areas of integration are limited, the resulting relative levels of regional integration outcomes indicated by the constructed composite index seem to be both plausible in comparison to the findings of other studies and robust to moderate changes in the applied construction methods. The presented results provide empirical evidence for the view held by many authors that Europe, in particular the Western European countries belonging to the European Union, constitutes the highest level of integration worldwide (see, for example, Freund and Ornelas 2010, Baldwin and Wyplosz 2006). While currently prevailing

stages of institutional integration (Balassa 1961) may be considerably lower in Asia than in the European Union, the findings based on the CRI index indicate that East Asia and Southeast Asia are achieving effective levels of economic integration that are comparable to those achieved by European regions, and for most areas of integration are higher than any region in Africa or Latin America.

Including the constructed CRI index as an output variable in a DEA suggests that most parts of the world seem to have considerable scope for further integration that is not based on possible future changes in economic conditions or political reforms, but on the current status of available resources and institutions. On average, Asia is estimated to achieve around half of its current potential in regional integration outcomes and South Asia and Central Asia are found to have the largest untapped potential among the Asian regions.

In addition to the purely descriptive results based on the CRI index that allow for a global comparison of currently achieved levels of regional economic integration outcomes, several possible conclusions for Asia can be derived from the presented findings. First, East Asia and Southeast Asia are achieving considerably higher integration outcomes than other Asian regions and may be considered as Asian benchmarks for future policies directed at increasing regional integration levels. However, based on the current level of cross-border infrastructure, institutional environment, and observed integration outcomes, the regions that are facing more similar conditions with the other Asian regions seem to be Northern Africa and Southern Africa, and Central America and South America.

Asian regions are achieving comparable levels of integration for cross-border mobility, trade, and investment, but monetary and financial integration seems to be lower than for those regions that feature similar CRI levels overall. South Asia and Central Asia achieve particularly low levels, while the outcomes for East Asia and Southeast Asia appear to constitute the largest gap across areas of economic integration compared with Western Europe. This highlights the importance of financial and monetary integration in achieving similar composite integration levels as those obtained by the most integrated regions in the sample.

While the analysis has focused exclusively on effective levels of economic integration, the findings may also be used as a basis for discussions on further advances in integration at an institutional level, for example, by informing decision makers about currently achieved levels of economic integration and contributing to the design of policies addressing the identified magnitudes of currently untapped integration potential.

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APPENDIX: Data and Economy Groupings

Table A.1. **Regional Economy Groupings**

Europe (38)	**America (37)**
Western Europe (12): Austria, Belgium, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Switzerland, United Kingdom **Northern Europe (8):** Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, Sweden **Eastern Europe (12):** Belarus, Bulgaria, Croatia, Czech Republic, Hungary, Moldova, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Ukraine **Southeastern Europe (6):** Albania, Bosnia and Herzegovina, Greece, Macedonia, Montenegro, Serbia	**North America (3):** Canada, Mexico, United States **Central America (7):** Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama **Caribbean (15):** Antigua and Barbuda, Aruba, Bahamas, Barbados, Cuba, Curacao, Dominican Republic, Grenada, Haiti, Jamaica, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, United States Virgin Islands **South America (12):** Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
Asia (63)	**Africa (48)**
Central Asia (8): Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, Uzbekistan **East Asia (7):** People's Republic of China; Hong Kong, China; Japan; Republic of Korea; Macau, China; Mongolia; Taipei,China **South Asia (8):** Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka **Southeast Asia (10):** Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam **Pacific and Oceania (16):** Australia, Cook Islands, Fiji, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, New Zealand, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, Vanuatu **West Asia (14):** Bahrain, Cyprus, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, Yemen	**Western Africa (15):** Benin, Burkina Faso, Cote d'Ivoire, The Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo **Northern Africa (6):** Algeria, Egypt, Libya, Morocco, Sudan, Tunisia **Eastern Africa (14):** Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Somalia, Tanzania, Uganda, Zambia, Zimbabwe **Middle Africa (8):** Angola, Cameroon, Central African Republic, Chad, Democratic Republic of the Congo, Congo, Equatorial Guinea, Gabon **Southern Africa (5):** Botswana, Lesotho, Namibia, South Africa, Swaziland

Note: Number of economies in parentheses.
Source: Author's compilation.

Table A.2. **Variables and Data**

Region	Export (1)	Import (2)	FDI (3)	Debt (4)	Equity (5)	Migration (6)	Remittances (7)	Tourism (8)	Doing Business (9)	Logistics Performance (10)
Western Europe	0.560	0.540	0.503	0.635	0.557	0.470	0.584	0.644	75.0	3.81
Eastern Europe	0.231	0.269	0.042	0.146	0.076	0.355	0.325	0.487	63.1	2.98
Northern Europe	0.222	0.246	0.116	0.173	0.099	0.274	0.283	0.206	80.2	3.45
Southeastern Europe	0.097	0.053	0.060	0.001	0.000	0.188	0.095	0.327	61.7	2.73
North America	0.494	0.354	0.206	0.237	0.133	0.861	0.888	0.546	78.4	3.61
South America	0.189	0.196	0.076	0.051	0.028	0.313	0.217	0.589	57.8	2.80
Central America	0.144	0.137	0.072	0.057	0.036	0.120	0.072	0.754	60.5	2.72
Caribbean	0.145	0.096	0.000	0.004	0.067	0.071	0.051	0.226	61.3	2.42
East Asia	0.358	0.309	0.414	0.088	0.163	0.362	0.388	0.770	74.4	3.54
Southeast Asia	0.250	0.220	0.209	0.149	0.106	0.342	0.176	0.700	64.5	3.02
West Asia	0.106	0.148	0.065	0.230	0.169	0.374	0.274	0.541	64.3	2.97
Pacific and Oceania	0.069	0.068	0.064	0.037	0.067	0.562	0.444	0.206	63.0	2.87
South Asia	0.067	0.048	0.010	0.016	0.000	0.298	0.187	0.121	54.8	2.58
Central Asia	0.069	0.069	0.004	0.000	0.008	0.105	0.144	0.315	60.0	2.52
Western Africa	0.089	0.098	0.015	-	-	0.700	0.147	0.633	45.9	2.51
Eastern Africa	0.144	0.067	0.011	-	-	0.390	0.327	0.428	49.4	2.32
Southern Africa	0.002	0.001	0.000	0.006	0.001	0.457	0.370	0.501	62.0	2.85
Northern Africa	0.067	0.042	0.001	0.020	0.007	0.013	0.077	0.516	58.5	2.66
Middle Africa	0.007	0.016	0.000	-	-	0.351	0.252	0.045	40.9	2.29
Average	0.174	0.157	0.098	0.116	0.095	0.348	0.279	0.450	61.9	2.88
Maximum	0.560	0.540	0.503	0.635	0.557	0.861	0.888	0.770	80.2	3.81
Minimum	0.002	0.001	0.000	0.000	0.000	0.013	0.051	0.045	40.9	2.29
N (economies)	181	181	153	70	70	185	182	184	173	150

FDI = foreign direct investment.

Notes: Values in columns 1–8 are intraregional shares based on origin/destination bilateral flow data (author's computations).

Columns 9 and 10 represent index scores based on scales ranging from 1 = lowest to 100 = highest (Doing Business) and 1 = lowest to 5 = highest performance (Logistics Performance Index). Many datasets record values only if they exceed a certain threshold (e.g., for cross-border bond and equity holdings, 0 indicates a value of less than $500,000).

Source: Author's calculations.

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