ASIA-PACIFIC DEVELOPMENT JOURNAL

Vol. 17, No. 2, December 2010

IN THIS ISSUE:

UNITED NATIONS
ESCAP
Economic and Social Commission for Asia and the Pacific

The secretariat of the Economic and Social Commission for Asia and the Pacific (ESCAP) is the regional development arm of the United Nations and serves as the main economic and social development centre for the United Nations in Asia and the Pacific. Its mandate is to foster cooperation between its 53 members and 9 associate members. It provides the strategic link between global and country-level programmes and issues. It supports Governments of countries in the region in consolidating regional positions and advocates regional approaches to meeting the region's unique socio-economic challenges in a globalizing world. The ESCAP secretariat is located in Bangkok, Thailand. Please visit the ESCAP website at <www.unescap.org> for further information.

The shaded areas of the map indicate ESCAP members and associate members.

Cover design by Bryan Joseph Granados Sabroso

ASIA-PACIFIC DEVELOPMENT JOURNAL

Vol. 17, No. 2, December 2010

United Nations
New York, 2011

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

ASIA-PACIFIC DEVELOPMENT JOURNAL

Vol. 17, No. 2, December 2010

United Nations publication
Sales No. E.10.II.F.21

Manufactured in Thailand
ISBN: 978-92-1-120619-7
ISSN: 1020-1246
ST/ESCAP/2592

Editorial statement

The *Asia-Pacific Development Journal* is published twice a year by the Economic and Social Commission for Asia and the Pacific.

Its primary objective is to provide a medium for the exchange of knowledge, experience, ideas, information and data on all aspects of economic and social development in the Asian and Pacific region. The emphasis of the *Journal* is on the publication of empirically based, policy-oriented articles in the areas of poverty alleviation, emerging social issues and managing globalization.

The *Journal* welcomes original articles analysing issues and problems relevant to the region from the above perspective. The articles should have a strong emphasis on the policy implications flowing from the analysis. Analytical book reviews will also be considered for publication.

Manuscripts should be sent to:

Chief Editor
Asia-Pacific Development Journal
Macroeconomic Policy and Development Division
ESCAP, United Nations Building
Rajadamnern Nok Avenue
Bangkok 10200
Thailand
Fax: (662) 288-3007 or (662) 288-1000
E-mail: escap-mpdd@un.org

ASIA-PACIFIC DEVELOPMENT JOURNAL
Vol. 17, No. 2, December 2010

CONTENTS

Explanatory notes

References to dollars ($) are to United States dollars, unless otherwise stated.

References to “tons” are to metric tons, unless otherwise specified.

A solidus (/) between dates (e.g. 1980/81) indicates a financial year, a crop year or an academic year.

Use of a hyphen between dates (e.g. 1980-1985) indicates the full period involved, including the beginning and end years.

The following symbols have been used in the tables throughout the journal:

Two dots (..) indicate that data are not available or are not separately reported.

An em-dash (—) indicates that the amount is nil or negligible.

A hyphen (-) indicates that the item is not applicable.

A point (.) is used to indicate decimals.

A space is used to distinguish thousands and millions.

Totals may not add precisely because of rounding.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Where the designation “country or area” appears, it covers countries, territories, cities or areas.

Bibliographical and other references have, wherever possible, been verified. The United Nations bears no responsibility for the availability or functioning of URLs.

The opinions, figures and estimates set forth in this publication are the responsibility of the authors, and should not necessarily be considered as reflecting the views or carrying the endorsement of the United Nations. Mention of firm names and commercial products does not imply the endorsement of the United Nations.

INFLATIONARY PRESSURES IN SOUTH ASIA

*Ashima Goyal**

The similarities yet differences across South Asian countries, and their differential response to recent food and oil price shocks, provides a useful opportunity to better understand the structure of inflation in these economies. Analysis of the internal goods market and external balance of payments equilibrium and evidence on demand and supply shocks suggests that output is largely demand determined but inefficiencies on the supply side perpetuate inflation. Pro-cyclical policy amplifies the negative impact of supply shocks on output. Inflation surges are reduced at high output cost while propagation mechanisms and well-intentioned administrative interventions turn relative price shocks into chronic cost-push inflation. The analysis brings out the importance of food prices for the inflationary process. It is necessary to protect the poor from inflation and especially food inflation. But this must be done effectively. The paper concludes with an analysis of effective short- and long-run policy options.

JEL Classification: E31, E52, O11.

Key words: Inflation, South Asia, food price policy, demand and supply shocks.

I. INTRODUCTION

Countries in South Asia have common features that affect macroeconomic policy choices, outcomes and stability. These include high population density, low per capita incomes, a large share of population in agriculture and relatively high

* Professor, Indira Gandhi Institute of Development Research, Gen. Vaidya Marg, Santosh Nagar, Goregaon (E), Mumbai-400 065 ashima@igidr.ac.in, http://www.igidr.ac.in/~ashima. The author is grateful to Nagesh Kumar and Aynul Hasan for the invitation to write on this topic, to Ashfaque Khan and other participants of the ESCAP expert group meetings for comments, Mahendra Dev for discussions on food price policy, Sanchit Arora for research assistance and Reshma Aguiar for secretarial assistance.

saving ratios.[1] Also, food comprises a large part of the average consumption basket and the economies depend on oil imports, making these countries vulnerable to terms of trade and other supply shocks.

The region initiated liberalizing reforms in the 1990s. The reforms brought on shocks to the economies but, over time, they created greater diversity and deeper markets that paved the way for reduced volatility. Controls may repress volatility, but they create a fragile situation. Effective liberalization, however, is gradual. The smaller South Asian countries, Bhutan, Nepal and Maldives, are more strongly affected by external shocks as they tend to be more open with less market development and capital account controls, and more burdened with government and international debt.

Similar features should lead to convergence in macroeconomic policies, but differing political systems are a potential factor causing divergence. Low per capita income democracies have a tendency to set short-term populist policies and face persistent and chronic inflation, while governments not so dependent on popular vote can allow higher inflation and volatility. These differential responses, under similar basic conditions and shocks, are used in this paper to understand causes of inflation and suggest better policy design.

Spikes in food and fuel prices prior to the global financial and economic crisis resulted in high inflation rates in most countries in Asia and the Pacific. With the onset of the crisis itself, inflationary pressure subsided sharply in all subregions of Asia and the Pacific except South Asia. Major economies of South Asia, such as India and Pakistan, experienced double-digit inflation rates. Food prices grew at even higher rates. Given the high incidence of poverty in the region, high food and overall inflation rates disproportionately impact the poor. Moreover, a sustained rise in food prices tends to raise wages and ultimately boost inflation.

To identify the underlying causes of high inflation, both food and overall, in countries of South Asia, mainly India, Pakistan, Bangladesh, Sri Lanka, Nepal and Maldives, and possible policy responses, potential causative factors are classified into the generic categories of demand and supply. The former includes domestic and external demand, monetary and fiscal policies. The latter includes sectoral price shocks and capacity constraints. Government interventions, which may moderate a price spike but raise costs over time, aggravate supply shocks so that a relative price change turns into inflation. Government policies for agriculture and speculative behaviour affect food inflation, and are also examined. The policies

[1] There are, of course, variations across countries. In Pakistan and Nepal the savings to GDP ratio struggles to reach 20 per cent while in India it has crossed 30 per cent.

include minimum price support, buffer stock, trade and public distribution schemes. More openness changes the inflationary dynamics.

Does high economic growth in some countries imply that infrastructural and other capacity constraints are contributing to inflationary pressures? Data and analysis suggest the macroeconomic dynamics is such that output is largely demand determined but inefficiencies on the supply side cause inflation. For example, the power shortages that most South Asian countries suffer from are a failure in the provision of public goods. These power shortages lead to higher costs since expensive substitutes have to be used.

The structural features outlined above help explain the patterns identified in the response of select South Asian countries to the severe food and oil price shocks of this decade. The analysis is used to assess the effectiveness of policy responses and interventions, and to suggest alternatives, including some arising from more openness.

Although the Reserve Bank of India has always emphasized the importance of money supply as the cause of inflation, the sustained food inflation has recently spurred some analysis of supply side factors (Gokarn, 2010; Mohanty, 2010). Joshi and Little (1994) have long argued that supply-side responses have been neglected in Indian macroeconomic policy.

The structure of the paper is as follows: Section II presents data on the causes of inflation and draws out some stylized facts from the data. Section III derives an analytical framework. Section IV explores the political economy of food prices. Section V presents evidence supporting the analysis. Section VI draws out policy implications. Section VII concludes the paper.

II. CAUSES OF INFLATION

Relevant macroeconomic data are displayed in tables and figures for 5 South Asian countries.[2] Table 1 gives a comparative macroeconomic picture of the countries and shows how this has changed at ten-year intervals from 1981 to 2009. Apart from nominal gross domestic product (GDP) and reserves, it provides critical balance of payment ratios, long- and short-term interest rates, inflation and changes in exchange rates.

[2] The data source is the IFS (IMF). The advantage of using this data set is that the definitions used are consistent for comparative purposes. But there are gaps in the data. The Maldives data are so patchy and erratic they cannot be graphed.

Table 1. Key macroeconomic variables for South Asian countries

	Bangladesh	India	Nepal	Maldives	Pakistan	Sri Lanka
1981						
Nominal GDP	17.9	173.0	2.2	0.05	28.1	4.4
FX reserves	118.8	3 233.8	167.8	0.5	571.3	260.8
Exports/GDP	4.4	5.0	5.9	17.4	10.3	24.6
Net exports/GDP	-10.7	3.6	-10.3	-44.2	-9.8	-17.2
CA/GDP	-5.7	-1.0	-0.9	-40.6	-3.3	-10.1
Inflation	..	13.1	11.1	..	11.9	18.0
Depreciation	16.4	10.1	2.8	0.0	0.0	16.4
Interest rates: Short term	12.0	8.6	12.0	..	9.3	19.0
Interest rates: Long term	12.0	16.5	5.0	6.0	9.4	15.6
1990						
Nominal GDP	29.0	324.9	3.5	0.2	39.3	8.0
FX reserves	423.8	847.0	201.7	17.1	207.4	296.9
Exports/GDP	5.8	5.5	5.0	24.8	14.2	23.8
Net Exports/GDP	-6.7	-1.7	-12.7	-39.1	-4.5	-9.6
CA/GDP	-1.4	-2.2	-8.2	4.6	-4.2	-3.7
Inflation	6.1	9.0	8.2	..	9.1	21.5
Depreciation	7.1	7.9	8.0	5.7	5.7	11.1
Interest rates: Short term	12.0	15.6	11.0	7.0	7.3	21.6
Interest rates: Long term	16.0	16.5	7.9	..	8.1	14.1
2000						
GDP	45.5	467.8	5.3	0.6	71.3	16.3
FX reserves	1 140.0	28 600.6	719.9	92.5	1 150.5	749.4
X/GDP	10.5	9.1	13.1	12.2	12.7	33.2
NX/GDP	-7.9	-2	-15.5	-50.1	-2.6	-5.2
CA/GDP	-0.7	-1	-5.6	-8.2	-0.1	-6.4
Inflation	2.2	4.0	2.5	..	4.4	6.2
Depreciation	6.2	4.4	4.2	0.0	8.4	9.0
Interest rates: Short term	8.6	9.3	7.5	6.8	8.6	17.3
Interest rates: Long term	15.5	12.3	5.3	6.9	4.2[a]	14.0

Table 1. ***(continued)***

	Bangladesh	India	Nepal	Maldives	Pakistan	Sri Lanka
2009						
Nominal GDP	89.1	62 311.7	7.9[b]	1.5	155.9	42.0
FX reserves	6 059.8	164 945.0	1 042.6[c]	157.2	6 339.0	2 883.8
Exports/GDP	14.0	12.7	11.4[b]	5.2	11.2	17.5
Net exports/GDP	-9.2	-6.9	-25.9[b]	-60.5	-9.1	-6.0
CA/GDP	3.8	-2.8	-1.7[b]	52.7[d]	-1.1[d]	-0.7
Inflation	5.4	10.9	11.6	4.0	13.6	3.4
Depreciation	0.6	11.3	11.2	0.0	16.1	6.1
Interest rates: Short term	8.2	3.5	6.5	..	12.0	21.2[d]
Interest rates: Long term	14.6	12.2	6.4	6.5	11.7 [d]	18.9[d]

Source: IMF, IFS statistics, various issues.

Notes: GDP in USD billions; FX Reserves in SDR millions;

[a] Figures for 1999;

[b] Figures for 2007;

[c] Figures for 2005;

[d] Figures for 2008.

In the region, India is the largest country and its relative size has risen over the years but Sri Lanka has had the highest per capita income. India also has seen the largest inflows and reserve accumulation, but has been the most conservative in that it has had the smallest trade and current account (CA) deficits. Net exports are exports minus imports or the trade surplus. For most the countries of the region, this has normally been negative, resulting in trade deficits. The current account, which includes invisibles, such as remittances and payments for services, has also been in deficit. The smaller countries have had to rely more on exports. Their higher export to GDP ratios have made them more open. But all the countries had higher reserves in the later period.

The countries had similar inflation, exchange and interest rates. Sustained unrest in Sri Lanka pushed up its inflation rates, while in the other countries inflation rarely reached double digits. Exchange rates also varied compensating for the inflation; most countries had some sort of flexible exchange rate regimes in the later years. Interest rates tended to move downwards in the reform period. But since foreign exchange markets were thin, and currencies were not fully convertible, the exchange rates were not fully determined by the market and considerable intervention took place.

Figure 1 shows the growth rates over the period 1980-2010. With the exception of Sri Lanka and the Maldives, the rates fluctuated within a 0-10 per cent range. India and Bangladesh had the steadiest growth rates, with India overtaking most of the other countries in the new century. For all the countries, the late 1980s, early 1990s and late 1990s were periods of relatively low growth. These were also periods of external shocks: oil prices, the Kuwait war and East Asian crisis.

The wholesale price index (WPI) and the consumer price index (CPI) inflation are shown in figures 2 and 3. Indian and Bangladeshi inflation was low and stable compared to the other countries, illustrating the argument that countries with unstable political regimes tend to have greater inflation fluctuations. Inflation rates, in general were capped at 25 per cent, never reaching the heights seen in Latin America. This illustrates the damping effects on inflation of dense low capita income populations vulnerable to inflation. However, on the other hand, inflation rates were almost never negative, implying that chronic inflation pushed up costs and price levels. The price indices and their sub-components reflected the effect of supply shocks.

Figure 4 shows the current account deficits of each country. Most of the countries ran deficits over the period, with only a few registering a balance of payment in surplus intermittently. Again deficits were larger for Sri Lanka, Nepal, and Pakistan, illustrating more volatile policy-making or the impact of political instability. Even so, the deficits in general as a percentage of GDP rarely exceeded ten per cent, and for most countries, the deficits widened in periods of low growth such as in the late 1990s, when they were driven by supply rather than demand shocks.

Figures 5 to 7 graph the components of demand, government revenue expenditure (G), private consumption (C) and gross fixed capital formation (GFCF), as a percentage of GDP at current market prices for each country. The government spending ratio shows the highest fluctuations in Sri Lanka and Pakistan, where notably it had been increasing for the former and falling for the latter in the recent period. India registered one of the highest and most consistent percentages. Among the countries, government spending was the least in Bangladesh. The peak in 1988 is probably an error due to some kind of measurement change causing a break in many Bangladesh macroeconomic series at that time.

The consumption ratios for most countries remained steady between 60 and 80 per cent. However, the ratios for India fell as the country's GFCF convincingly overtook other countries in the recent period. Bangladesh's GFCF also rose steadily from the being the lowest to the second highest, while for the

Figure 1. GDP growth rates (constant prices)

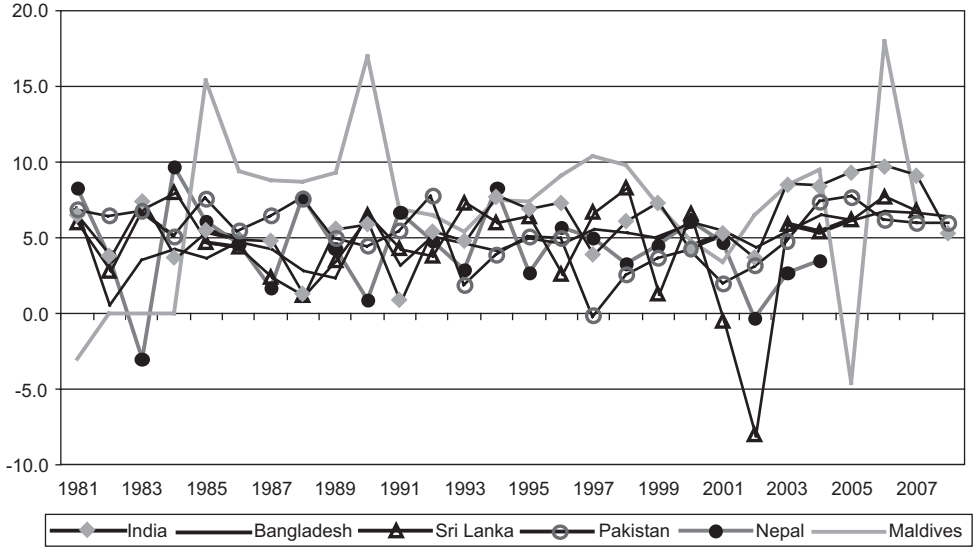


Figure 2. WPI inflation

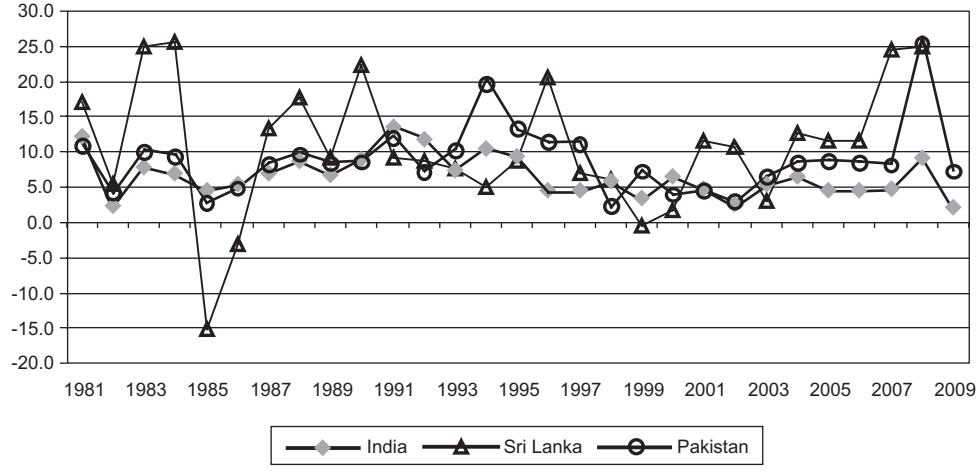


Figure 3. CPI inflation

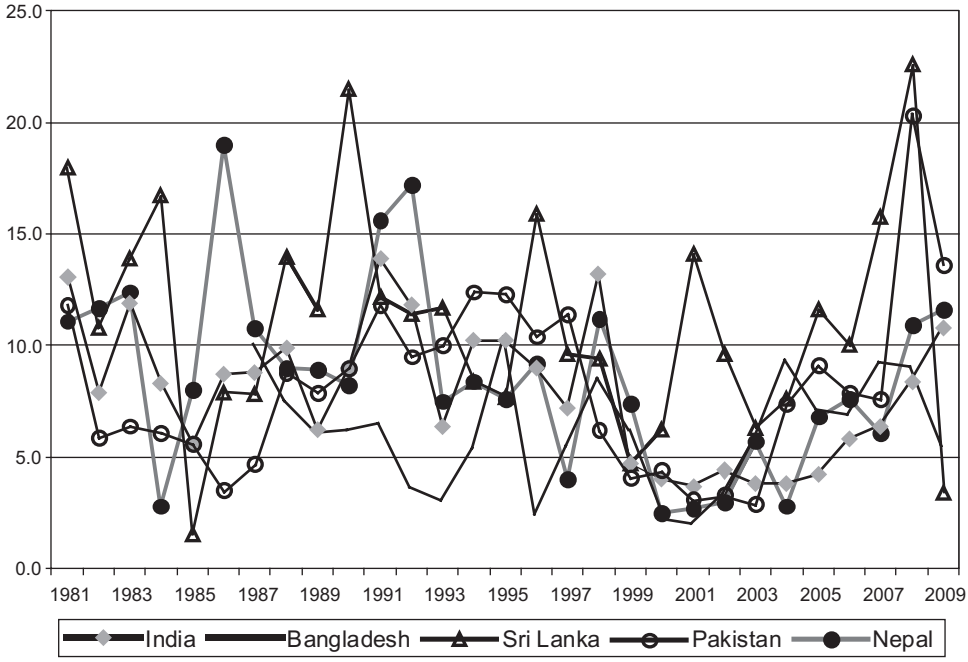


Figure 4. CAD/GDP (%)

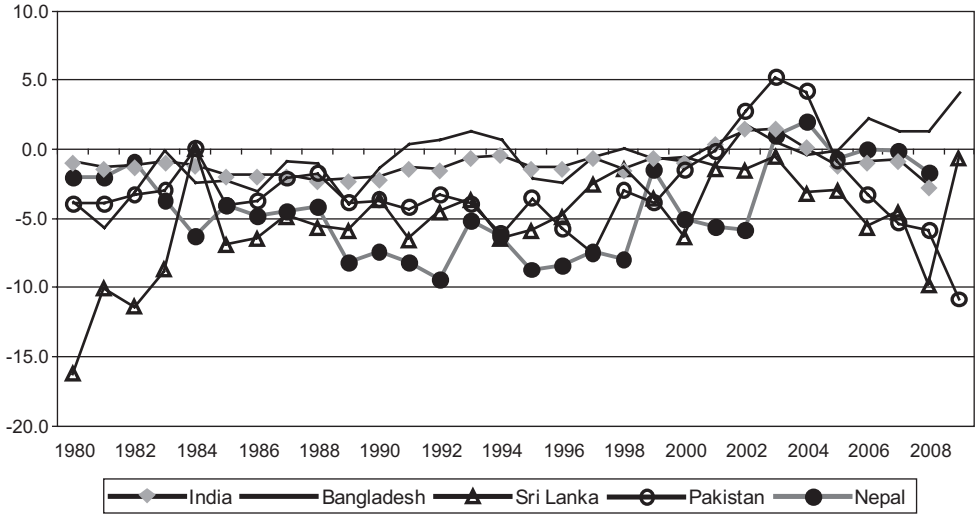


Figure 5. G/GDP (%)

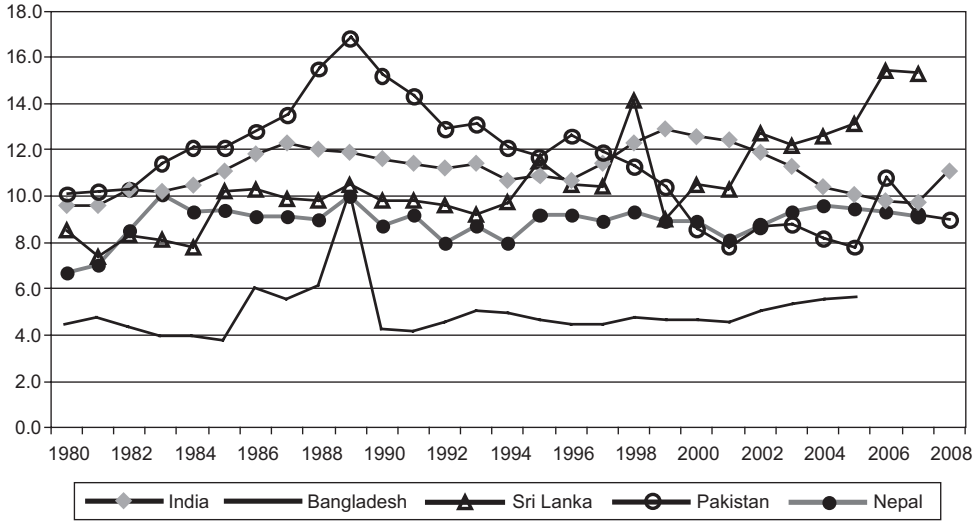


Figure 6. C/GDP (%)

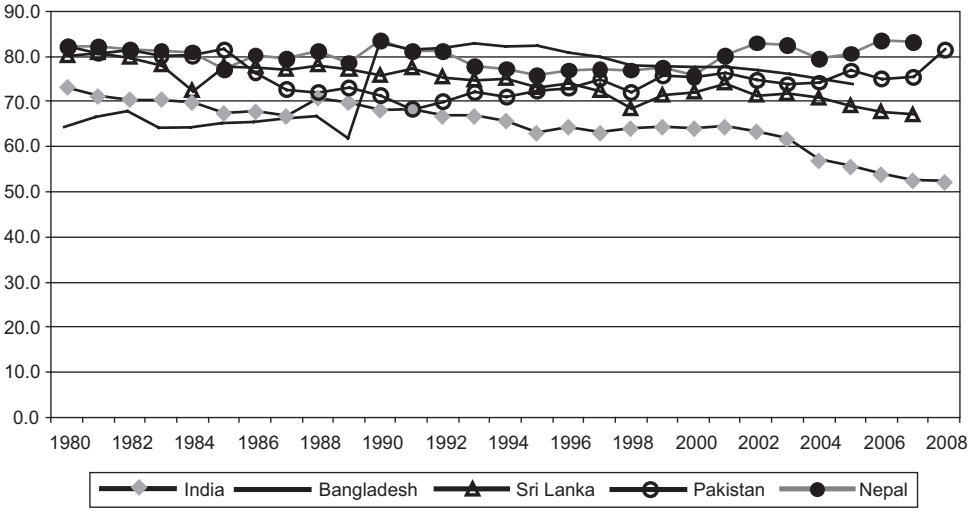


Figure 7. GFCF/GDP (%)

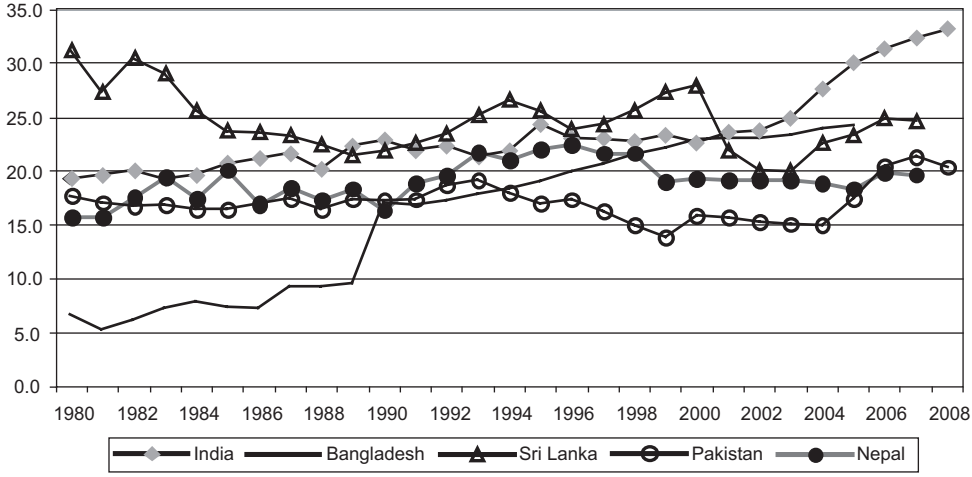
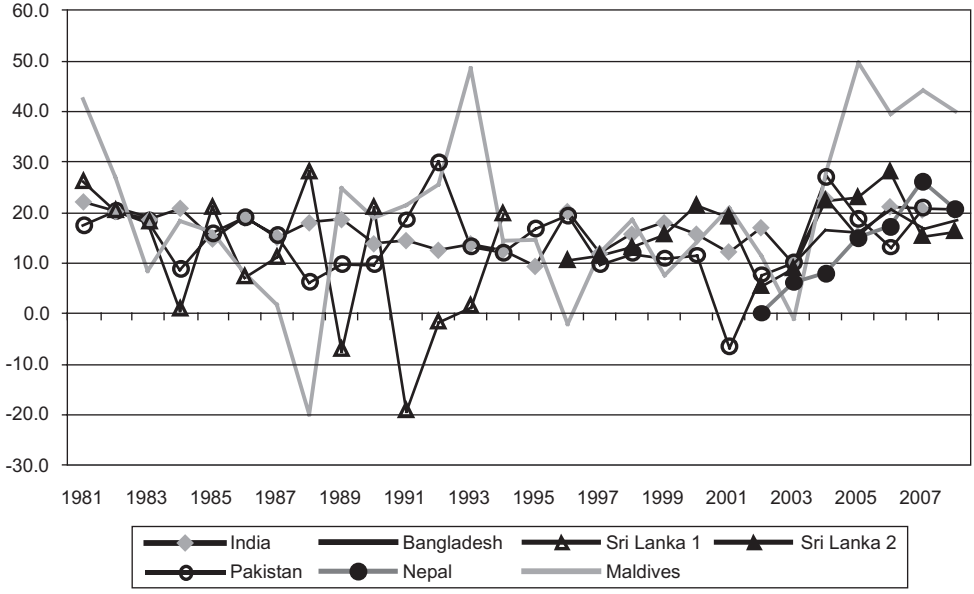


Figure 8. Credit growth rates

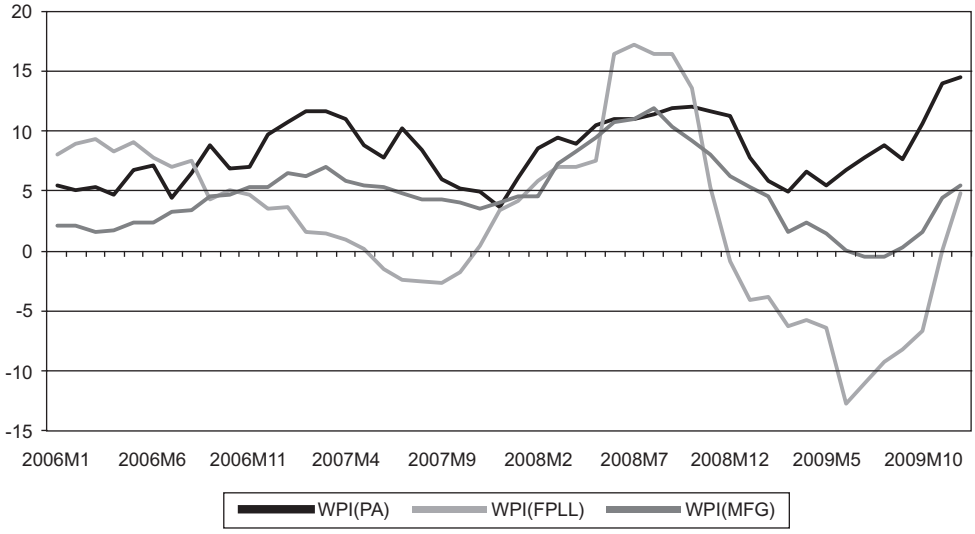


other three countries, the rates fluctuated in a 5-10 per cent band. Among the demand components, consumption ratios and GFCF held steady, G showed restrained fluctuations. Output levels and growth rates fluctuated, and demand components largely fluctuated synchronously. So demand categories might not have been major independent sources of shocks.

Figure 8 shows that with the exception of Maldives, credit growth rates never exceeded 30 per cent. Pakistan, Sri Lanka and Maldives experienced periods of negative credit growth. In general, this is a relatively good record for emerging markets as it indicates there was stability in the financial systems which, in turn, prevented large credit fuelled demand booms.

The major source of volatility, therefore, must have been on the supply side. The components of the WPI are used as a proxy for supply shocks. Figure 9 shows the primary articles (PA), fuel, power, light and lubricants (FPLL), and manufacturing (MFG) components of the monthly WPI of India for the period 2006-2009. The large volatility of the first two components is evident while the pass through of international oil shocks, through a complex administered price system, drove FPLL inflation.

Figure 9. Year-on-year inflation rate for Indian monthly series



A. Stylized Facts

Some stylized facts can be extracted from the initial data analysis above as well as from results of Goyal (2011) on correlations and volatilities of time series, in which a smooth trend is extracted using the Hodrick Prescott filter.[3] Frequent shocks, and less ability to smooth shocks, imply that output, consumption, investment and growth rates are more volatile than in mature economies. Less financial sector development, lower per capita incomes and low wealth imply that consumption of a large proportion of the population is limited by income. In addition, since the frequent supply shocks are largely temporary, savings adjust rather than consumption. Therefore, the correlation of consumption (C) and investment (I) with output is higher, making ratios of C, and of I to output stable (Figures 6 and 7). C and I vary in response to output variation, but do not drive income volatility.

During the period, net exports, or the trade surplus, was procyclical, meaning output rose with net exports. This could be due to export-driven growth or to a deflationary rise in commodity prices. The latter raises the import bill and reduces output and net exports together. The current account then becomes a source of shocks. This contrasts with standard behaviour in emerging markets in which rising consumption and imports in good times make the current account countercyclical — the deficit rises in good times. Consumption is procyclical and more volatile than in developed countries. In Asia, income shocks affect savings rather than consumption.

Supply side or terms of trade shocks are to be expected in economies that are still agriculture dependent, have severe infrastructure bottlenecks, and are dependent on oil imports.

III. ANALYSIS

A. Aggregate demand and supply

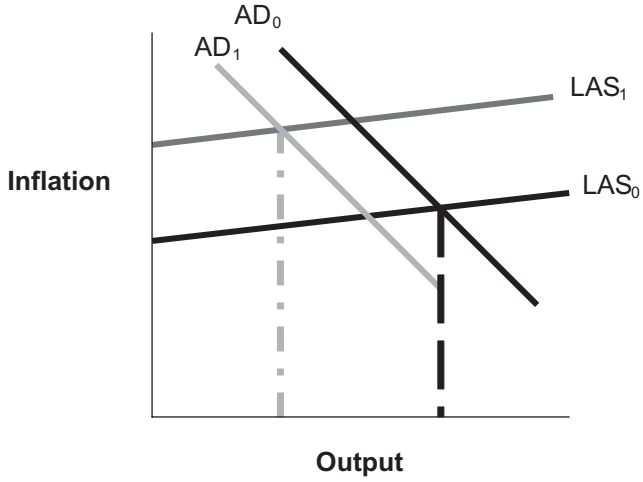
It is difficult to find unemployment estimates on South Asia but the numbers are believed to be very large. Output in developed countries is regarded as below potential because the crisis left 22 million unemployed. In South Asia, the more than 300 million people living below the poverty line are not meaningfully employed. In India alone, given the youthful demographic profile, 10-12 million are expected to enter the labour force every year. The Planning Commission estimates it would

[3] This is commonly used to separate the trend from fluctuations in macroeconomic time series.

take economic growth of 10 per cent per annum together with an employment elasticity of 0.25 to absorb them. Capital, as a produced means of production, is no longer a constraint because of high domestic savings and capital inflows. Therefore, that 10 per cent rate of growth should be regarded as the potential output.

In mature economies, the modern macroeconomic approach focuses on employment (Woodford, 2003). When that approach is followed in emerging markets, the large informal sector is relegated to development economics. However, once a populous emerging market crosses a critical threshold and high catch-up growth is established, higher labour mobility blurs the distinction between formal and informal sectors. A macroeconomics of the aggregate economy becomes both necessary and feasible.[4] Central banks in South Asia, however, define full capacity as the potential output of the small manufacturing sector, even though in India, for example, this accounts for only 25 per cent of the output and 5 per cent of the employment. The economy is considered to be supply constrained, but figure 10 defines more precisely the way in which the economy is really supply constrained and better captures the macroeconomic structure of an economy in transition.

Figure 10. Aggregate demand and supply



[4] As compared to the standard practice in which development economics is the framework used to analyse the large informal sector and macroeconomic theory is applied only to the small modern sector.

The longer-run aggregate supply (LAS) is elastic (figure 10). But inefficiencies, distortions and cost shocks push aggregate supply upwards, over an entire range, rather than only at full employment, since that is not reached at current output ranges and output can increase. The LAS becomes vertical only as the economy matures and full productive employment is reached. With such a structure, demand has a greater impact on output and supply on inflation. This is the sense in which the economy is supply constrained.[5]

The food price wage cycle is an important mechanism propagating price shocks and creating inflationary expectations. Monsoon failures or international oil price shocks have been dominant inflation triggers. A political economy of farm price support, consumption subsidies and wage support, with built-in waste, inefficiencies and corruption, contributes to chronic cost push inflation. Poor targeting of consumption subsidies imply that nominal wages rise with a lag pushing up costs and generating a second round of inflation stemming from a temporary supply shock. The political economy indexes wages informally to food price inflation. If the rise in average wages exceeds that in agricultural productivity, prices rise, propagating inflation. Other types of populist policies that give short-term subsidies but raise hidden or indirect costs also contribute to cost push inflation. For example, neglected infrastructure and poor public services increase costs.

Rigorous empirical tests based on structural vector autoregression (VAR), time series causality, generalized method of moments (GMM) regressions of aggregate demand (AD) and aggregate supply (AS), and calibrations in a dynamic stochastic general equilibrium (DSGE) model for the Indian economy support the elastic longer-run supply and the dominance of supply shocks (Goyal, 2009b, 2008, 2005).

Shocks that have hit the Indian economy serve as useful experiments in helping reveal its structure. Consider, for example, the summer of 2008 when the economy was thought to be overheating after a sustained period of more than 9 per cent growth. During that period food and oil spikes had contributed to high inflation. Sharp monetary tightening, which sent short-term interest rates above 9 per cent during the summer, and the fall of U.S. investment bank Lehman Brothers, which froze exports, were large demand shocks that hit the economy. Industrial output declined sharply in the last quarter of 2008, but WPI-based inflation only fell after the drop in oil prices at the end of the year while CPI inflation remained

[5] The analysis draws on and extends earlier work. See Goyal (2011). References not given because of space constraints are available at www.igidr.ac.in/~ashima.

high.[6] Demand shocks with a near vertical supply curve, should affect inflation more than output. But the reverse happened. Output growth fell much more than inflation.

The V shaped recovery, which set in by the summer of 2009, also indicates a reduction in demand rather than a leftward shift of a vertical supply curve. A destruction of capacity would be more intractable and recovery would take longer. Since labour supply ultimately determines potential output for the aggregate economy, the potential is large in the region.

The impact of a sustained high CPI inflation on wages possibly explains the quick resurgence of WPI inflation in November 2009 when industry had barely recovered. The manufacturing price index fell for only for a few months before rising to its November 2008 value of 203 by April 2009. A booming economy does add pricing power, but supply side shocks also can contribute to manufacturing inflation.

Such outcomes are possible only if inflation is supply determined, but demand determines output. Components of demand such as consumer durable spending and housing are interest-rate sensitive. During the crisis, the lag from policy rates to industry was only 2-3 quarters for a fall and one quarter for a sharp rise. Policy rates have affected output growth since 1996. Nevertheless, the economy is supply constrained.

Since the recent inflationary episodes in South Asia have included a sharp rise in food prices, based in part on international food, oil and commodity shocks, the next section develops a simple analytical structure that opens the closed economy analysed above to bring in international shocks. Both it and section IV on political economy identify some of the mechanisms that convert a relative price shock into inflation.

B. Open economy

The AD-AS apparatus in the section above depicted the internal balance of an emerging market. Internal balance holds when aggregate demand for domestic output equals aggregate supply at full employment of resources, with inflation remaining low and stable. An open economy must also be concerned with external balance or equilibrium in the balance of payments. The current account surplus or

[6] Indian data show industrial growth slumped to 0.32 per cent over October-December 2008, but WPI inflation remained at 8.57 per cent and CPI inflation at 10 per cent. WPI inflation began falling gradually from January 2009.

the net balance of trade (exports minus imports) must be financed by sustainable capital flows. Adjustment to full internal and external balance normally requires a combination of a change in relative prices (real exchange rates) and in demand or expenditure (Goyal, 2009a, 2004).

The real exchange rate (*Z*), is a relative price comparing the world purchasing power with the purchasing power of the domestic currency. It is given by the ratio of the nominal exchange rate (*E)*, multiplied by the foreign price level and divided by the domestic price level ($Z = EP^*/P$). If there is perfect purchasing power parity, *Z* should equal unity.

A key conceptual distinction for a small country is that it must take international prices as given. If markets are competitive, traded goods (exportables and importables) can be combined into a single category because in a perfectly elastic world, demand for exports and a perfectly elastic world supply of imports makes their prices independent of domestic variables. But this means that the terms of trade, or the ratio of export to import prices, cannot change to help make the adjustment to full equilibrium or balance. Therefore, the distinction between traded and non-traded goods is required. Since trade equalizes the domestic to the border price of the traded good, the real exchange rate is given by the ratio of the prices of traded to non-traded goods ($Z = EP_T/P_N$). This is the dependent economy model[7] in which the real exchange rate and domestic absorption (A = C+G+I) are the two means of reaching internal and external balance. Exchange rate policy, which changes the nominal exchange rate (E), and fiscal policy which changes government expenditure (G), are the two policy instruments, affecting Z and A respectively. The first is an expenditure-switching policy. It changes the direction of demand and supply. Demand shifts between domestic output and imports, and domestic resources shift between sectors producing traded and non-traded goods. The second is an expenditure-changing policy. It changes the level of total demand.

Figure 11 reproduces the Swan diagram and Figure 12 the underlying labour market equilibrium. The curve IB gives internal balance or the combinations of Z and A at which output demand equals full employment output, Y_f. The curve is downward sloping because depreciation and a rise in demand both raise output. As domestic absorption rises, Z must appreciate to reduce foreign demand for exports, and total demand, to the full employment output level. Values above the curve generate inflation, as a more depreciated exchange rate and higher absorption raise demand. Those below the curve generate unemployment.

[7] The dependant economy model was first applied to Australia (see Swan, 1960 and Salter, 1959) but has been used extensively and generalized to other times and countries. Trevor Swan developed a convenient diagrammatic representation known as the Swan Diagram.

Figure 11. Internal and external balance with a real wage target

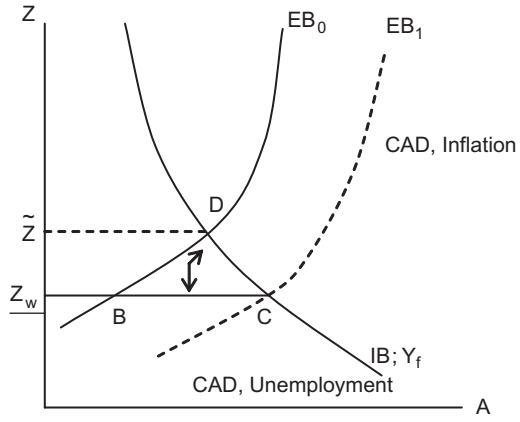
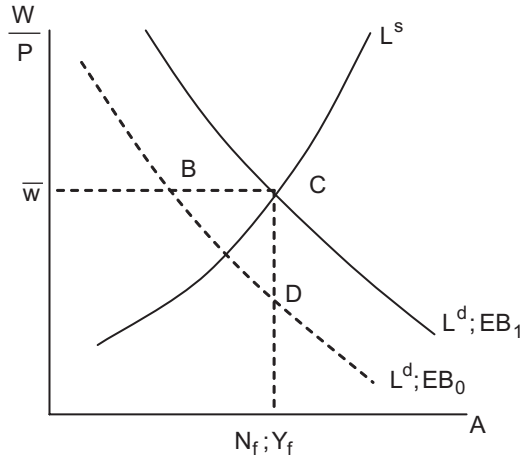
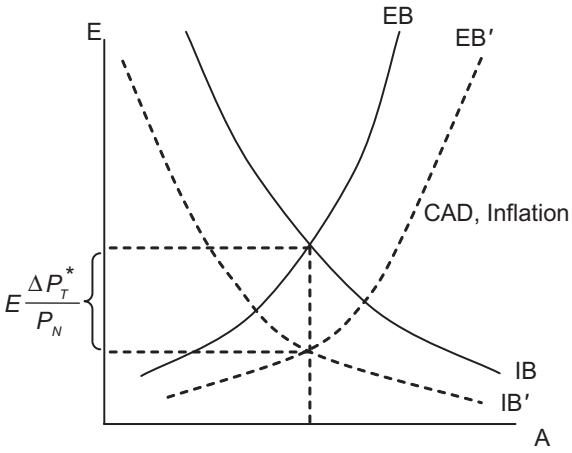


Figure 12. The labour market



For external balance (EB), capital flows (B) must equal net imports (M-X). Curve EB_0 gives external balance or the combinations of the two variables that yields an acceptable current account deficit (CAD) of the balance of payments where B = M-X. At a given current account, output and imports can only rise if exports rise. The latter requires depreciation in Z, so the curve slopes upwards. The CAD is lower than capital inflows can safely finance above the EB curve, that is, B > M-X. Below the curve inflows are inadequate to finance the deficit or B < M-X. IB and EB are satisfied at the equilibrium real exchange rate, $\tilde{Z}$.

Figure 13. Aborting a foreign price shock



In a low per capita income emerging market, wages depend on the price of food. The level of real wages must be high enough to cover the purchase of the basic consumption basket, in which food has a large share. Productivity falls if wages are below this point so employers will not reduce wages below that level. Employment becomes demand determined. But wages cannot rise above the threshold because workers in large numbers make themselves available for employment at the threshold and even below it in the short-run. The efficiency wage determines a real wage target:

$$\overline{w} = \frac{W_t}{P_{T,\,t}} \tag{1}$$

Despite continuing tariff barriers, agricultural liberalization has been sufficient to make agricultural products traded goods. Therefore nominal wages, *W*, are raised in line with traded goods prices, P_T, to maintain the real wage target (1) in the medium-term.[8]

[8] The argument carries through if *P* is a weighted average of traded and non-traded goods prices, with weights given by respective consumption shares. It just complicates the algebra.

Perfect trade arbitrage ensures that the prices of traded goods are set by world prices multiplied by the nominal exchange rate. The prices of non-traded goods are set as a markup on unit labour costs where β_N is labour per unit output and m is the profit share.

$$P_{N,t} = \frac{\beta_N}{(1 - m)} W_t \quad (2)$$

If W is substituted out using the wage target, the value of the real exchange rate ($Z = P_T/P_N$) can be set to a level that satisfies the wage-price relations equations 1 and 2, and is called Z_w, or the target level of the real exchange rate. It is the target level because it satisfies the real wage target equation 1. Z_w decreases with the real wage target and increases with a rise in productivity, that is, a fall in unit labour cost β_N.

$$Z_w = \frac{(1 - m)}{\overline{w}\beta_N} \quad (3)$$

The horizontal line at Z_w in figure 11 graphs equation 3, or the level where Z satisfies the real wage target. If $\tilde{Z}$ exceeds Z_w, sustained inflation results. The reason behind this is that a triangular region DBC, an area of unemployment and a current account deficit, is formed. The arrows show the direction of motion in DBC. If $Z > Z_w$ real wages are below the target value. That is, Z or P_T/P_N is higher than that required by the wage target. Since the target wage is not attained, wages rise in an attempt to reach $\overline{w}$. Therefore, W will rise. If W rises from equation 2 so will P_N, pushing Z back towards Z_w. Nominal depreciation to improve the CAD will spark another rise in W. Inflation will be above its steady-state value as long as $Z > Z_w$, and there will be a CAD if $\tilde{Z} > Z$. The system does not settle down; inflation continues. A steady state is achieved when $Z = Z_w = \tilde{Z}$.

Figure 12 shows the corresponding labour market equilibrium. Labour supply rises with real wages. The labour demand curve L^d, corresponding to EB_0, slopes downwards. It shows how, for a given current account, employment rises as the real wage falls, with absorption adjusted to achieve the given current account. Along EB, as Z rises, real wages must decline since as P_T rises, wages in terms of traded goods must be falling. Even if the consumption basket includes non-traded goods and the prices of these goods hold steady, aggregate price will still rise with P_T.

The real wage rigidity prevents the effective use of price switching, and can keep the economy in the region of unemployment and a current account deficit. Since a rise in absorption makes the CAD worse, it may be stuck around B,

(Figures 11 and 12), with large unemployment. Output is demand determined below the IB schedule and limited by available labour supply above it. Note that even with unemployment, there is inflation, supporting the flat but upward rising AS curve of section III.A. Aggregate supply is elastic since there is unemployment, but cost driven inflation is pushing it upwards.

Any policy that closes the triangle DBC is a solution. A rise in capital flows that shift EB_0 to EB_1 allows absorption and employment to rise along BC with the wage target satisfied. The accompanying rise in imports is met through the inflows. The more appreciated exchange rate along EB_1 shifts L^d up in figure 12 so real wages can rise. Without a rise in productivity shifting up BC in figure 11, however, inflows may consequently widen the CAD to a risky point that could trigger a reversal.

A rise in productivity of non-traded goods can reduce the region of the triangle DBC, shifting up the target real exchange rate. The wage target can be satisfied at a more depreciated exchange rate. Equation 3 shows that Z_w rises with productivity $1/\beta_N$.

If a rise in agricultural productivity reduces food inflation, that is the domestic price of T goods falls, E can appreciate, satisfying $P_T = E\, P_T^*$ and shifting Z towards Z_w. Prices of non-tradable goods also fall with wages, reducing domestic inflation.

Sometimes the wage price cycle is set off by an international shock such as a rise in P_T^*, which in turn raises Z above Z_w. A nominal appreciation in response to such a shock can abort the cycle. Figure 13 graphs the IB and EB curves in the E and Y space in a demand determined short-run. A rise in P_T^* shifts both curves downwards proportionately by the amount by which the real exchange rate depreciates ($E\Delta\, P_T^*/P_N$). The earlier equilibrium would now be in a position of excess demand and a current account surplus, and domestic prices would tend to rise as a result, with additional support from wages rising with the traded goods prices. A simple nominal appreciation proportional to the change in P_T^* can abort the entire process, shifting the IB and EB back to the original position, and preventing a rise in nominal wages in response to the rise in P_T^*.

A number of recent studies have shown that the real wage rate has been rising in the Indian rural and informal sectors. Rural employment assurance schemes such as the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) have contributed to this. But a slower than potential output growth rate and persistent but small inflation rate can be explained in our model if the trend rise in the wage target has exceeded that in agricultural productivity, so that the economy

is caught in the inflationary triangle. The analysis underlines the importance of a rise in agricultural productivity to allow higher real wages without a rise in inflation.

IV. CHRONIC COST PUSH INFLATION: THE POLITICAL ECONOMY OF FOOD PRICES

In section III.A, it is argued that ill-designed government interventions may initially provide short-term benefits but lead to chronic cost-push inflation over time. Because of the importance of food prices in South Asia, a good example of this is illustrated through actions by the Indian Government with regard to food economy,[9] which shows the doubtful short-term benefits and longer-term supply-side inefficiencies.

As such, multiple government interventions were designed to ensure food security in this populous country where a large number of inhabitants lived below the poverty line. Consumers needed food availability at affordable prices and farmers had to be motivated to increase production to feed the growing population. An elaborate procurement system guaranteed a market and price support for key foodgrains. This supported a public distribution scheme that provided subsidized foodgrains to the poor. Buffer stocks and trade policy (taxes and tariffs) complemented these objectives. Additional incentives for farmers came from subsidized inputs and total exemption from income taxes. Also, some restrictions were placed on the movement and marketing of some agricultural goods to restrain speculative hoarding, and on exports to ensure domestic supply.

The Indian Government sets procurement prices based on recommendations from an independent regulator, the Commission for Agricultural Costs and Prices (CACP). Multiple agencies are involved in the process. The Food Corporation of India (FCI) is responsible for procurement and buffer stocks. The Ministry of Agriculture has a say in policies that affect agricultural pricing and marketing. The Ministry of Consumer Affairs is concerned with prices consumers pay. Since agriculture is a State subject, State policies also affect outcomes, especially in the production, marketing and movement of commodities across borders.

In such a setup, the interests of farmers were pitted against those of consumers. There was limited coordination among the multiple agencies, which

[9] Other countries in the region had similar programmes. For Bangladesh see Rahman and others (2008). Most net food importers such as Asian developing countries intervene to ensure affordable food. Bangladesh and Sri Lanka are among the top ten global food importers. India is a marginal net exporter (Nomura, 2010).

tended to be insular. Vested interests developed and enforced status-quoism in large programmes. As argued below, the greater opening out entailed in the 1990s reforms aggravated dysfunctional parts in the system. It created additional shocks the system could not adapt to.

Border prices became a focal point for the farmers' lobby. Although agricultural liberalization was slow and fractional, it meant a closer link between domestic and border prices. Agricultural exports grew from $4 billion when reforms began to $17 billion in the period 2008-2009. The comparative figures for imports were only $1 billion to $5 billion. Sharp rises occurred in exports of meat, dairy, rice, vegetables and fruits, sugar, animal feeds and vegetable oils. Therefore, border price changes could be expected to have a large impact. The World Trade Organization (WTO) permissible aggregate measure of support was 10 per cent and in this case, it was considered to be negative to the extent border prices exceeded domestic prices. WTO compatible tariff rates are much higher at 100 per cent compared to the 30 per cent that are actually applied on agricultural imports.

Since some agricultural exports were restricted, farmers could argue they were discriminated against, in order to ensure food security and supply the Public Distribution System (PDS). Thus, when the gap between border prices and domestic prices rose, there was strong pressure to raise domestic procurement prices. This created a clear pattern in procurement price increases, changes in stock, and domestic inflation impulses.

Higher procurement prices were set in the 1970s, when the green revolution commenced, as incentives to farmers to adopt new techniques. The distinction between the procurement and support price was lost after the 1970s, and the support price, at which farmers could make assured sales, approached the market price. In the 1990s, it had overtaken the latter. In the 1980s, meanwhile, the rate of increase was kept low to share the gains of better productivity with consumers. In the 1990s, as productivity growth slowed more rapid price increases were granted. A double devaluation of the exchange rate contributed to upward pressures by widening the gap between domestic and border prices. The steady increase in stocks held by the Government indicated that prices were set too high. The average level rose from 10.1 million tonnes in the 1970s to 13.8 in the 1980s and 17.4 in the 1990s (Goyal, 2003). In July 2002, it peaked at 63 million tonnes, then fell. But in 2010, there was another peak. This cyclic movement in stocks was a new feature after the reforms.

Table 2. Price policy and its consequence

Year	Wheat stocks (million tonnes)	Wheat inflation (base: 81-82)	Unit value (Rs./Qtl)	MSP (Rs./Qtl)	+/- overmsp[a]	Agricultural growth
1989-1990	..	..	..	..	..	2.1
1990-1991	5.6	13.9	223.2	215	8.2	3.8
1991-1992	2.2	15.5	219.3	225	-5.7	-2.0
1992-1993	2.7	10.3	278.2	275	320.0	4.2
1993-1994	7.0	10.4	525.0	330	195.0	3.8
1994-1995	8.7	7.1	488.9	350	138.9	5.8
1995-1996	7.8	-0.5	579.9	360	219.9	-2.5
1996-1997	3.2	18.4	609.5	380	229.5	8.7
1997-1998	5.0	0.6	679.8	475	234.8	-5.1
1998-1999	9.7	9.0	750.0	510	240.0	7.9
1999-2000	13.2	13.1	650.0	550	100.0	-1.8
2000-2001	21.5	1.1	510.3	580	-69.8	-6.0
2001-2002	26.0	-0.7	502.1	610	-107.9	7.6
2002-2003	15.7	0.2	479.4	620	-140.6	-13.2
2003-2004	6.9	3.1	584.0	620	-36.0	21.0
2004-2005	4.1	1.5	727.5	630	97.5	-2.7
2005-2006	2.0	3.9	755.5	640	115.5	4.7
2006-2007	4.7	11.5	757.9	700	57.7	4.3
2007-2008	5.8	4.1	946.0	850	96.0	4.6
2008-2009	13.4	5.8	1 041.0	1 000	41.0	1.6
2009-2010	16.1	9.7	..	1 080	..	..
2010-2011	32.1	..	..	1 100	..	..

Source: GOI (2010).

Note: [a] overmsp is the excess of unit export value over minimum support price (MSP).

Table 3. Food regressions

	Whstocks	Whstocks	Rogmsp	Whinfl
	1	2	3	4
Cons	5.53 (0.2)	13.77 (0.00)	6.85 (0.00)	7.52 (0.01)
Rogunit	-.19 (0.05)	-0.13 (0.17)	0.16 (0.09)	
Whstocks				-0.31 (0.11)
Whinfl		-0.36 (0.15)		
Edepre				0.24 (0.05)
Rogagr				0.21 (0.24)
Msp	0.01 (0.26)			
Overmsp		-0.02 (0.15)		
Number of obs	18	18	18	19
Adj R-squared	0.2159	0.4109	0.1201	0.2989
Root MSE	5.9754	5.1792	6.1236	4.975
Prob > F	0.0631	0.0151	0.0872	0.0400

Note: p-value for the regression coefficients is given in brackets; P = 0 implies strong significance of the coefficient.

Table 2 gives details for wheat, in the post-reform period. It clearly shows how minimum support price (MSP) responds to the excess of export price realizations (unit value) over the MSP, and wheat stocks tend to peak with the rise in MSP. Domestic wheat inflation is higher in periods of large exchange rate depreciation.

Regressions reported in table 3 bear out these impressions. MSP and the rate of growth of unit value *(rogunit)* affected wheat stocks *(whstocks)*. *Rogunit* affected *rogmsp*. Exchange rate change *(edepre)* was strongly significant for wheat inflation *(whinfl)*, which also responded to the agricultural growth *(rogagr)*, and *whstocks*. The table reported the best regressions. All the variables were tried in each regression. But to conserve degrees of freedom, insignificant ones were dropped. As the number of observations are low, the regressions are only indicative.

Nevertheless, the data illustrate the importance of border prices for MSP, of MSP for stocks and the exchange rate for wheat inflation. These factors are clearly responsible for the erratic behaviour of food stocks in the post-reform period. The first peak in stocks occurred after a devaluation and excess of unit value over domestic prices (overmsp) led to a sharp increase in the latter in the 1990s. Excess domestic stocks coincided with a slump in world food prices, and some appreciation

of the Indian rupee. Some stocks had to be exported at a loss; MSP did not decrease but only minor increases were registered in those years. As a result, domestic inflation was low. MSP was increased again substantially since stocks had hit a low and unit value again exceeded MSP in the period 2006-2007 after the international food price shocks. Price increases in India were staggered, preventing the prices from peaking in tandem with international prices. However, they did not fall even after international food prices fell.

Stocks built up again dramatically even as domestic food inflation continued in double digits. Steep depreciation and volatility of the Indian rupee contributed to price pressures. The Government was unable to sell its stocks since their cost price exceeded the market price and it was reluctant to offer the stock at a low price on concerns that the commodity would be sold back to the Government. So, the State became the biggest hoarder, helping keep prices high.

In retrospect, is appears that the post-reform Government intervention was dysfunctional. It neither protected the consumer nor was able to induce higher production from the farmer. Policies that meant to help the situation resulted in high storage costs and wastage of grain. These costs, together with the pervasive input subsidies, diverted investment for rural infrastructure. Productivity remained low and supply-side bottlenecks persisted. With regard to the analysis in section III.A, the policies contributed to a chronic upward crawl of the AS curve. Low agricultural productivity and the shocks from MSP kept the economy in the triangular region DBC of figure 11 in section III.B. The analysis illustrates the point that direct subsidies can create indirect costs.

V. EVIDENCE ON INFLATION DRIVERS

This section presents some evidence on demand and supply shocks, the role of policy and the pressures creating chronic inflation.

Table 4 gives Indian aggregate and sectoral growth and inflation rates, and calculates policy responses and macroeconomic outcomes for periods of external shocks. The dollar oil price inflation and the FPLL component of the WPI capture oil price shocks. Agricultural growth and WPI (PA) capture supply shocks emanating from agriculture. For the first three oil price shock episodes, policy and outcome variables starting from one year before and continuing for one year after the price spike are given. Each period saw about a 100 per cent rise in international oil prices, but the pass through to Indian prices was a policy decision.

Table 4. Demand and supply shocks

	Domestic shocks as a percentage of GDP			Growth rates		Inflation				
	Policy	Credit	Demand	GDPfc	Agri	WPI (AC)	WPI (PA)	WPI (FPLL)	WPI (MFG)	$ Oil
External shocks										
Oil shocks										
1972-1973	0.7	5.5	0.4	-0.3	-8.2	10.0	9.7	4.0	11.3	-0.6
1973-1974	-2.1	-1.7	1.3	4.6	10.6	20.2	28.1	18.6	14.4	15.9
1974-1975	-1.0	-2.3	1.8	1.2	-2.9	25.2	25.2	51.8	21.0	118.6
1975-1976	1.6	6.3	-6.7	9.0	14.5	-1.1	-6.6	10.5	1.4	14.4
1976-1977	1.9	8.8	0.8	1.2	-7.2	2.1	0.8	5.3	2.3	4.9
Oil shocks										
1978-1979	3.8	9.5	3.9	5.5	3.3	0.0	-1.3	4.4	0.2	4.2
1979-1980	-0.4	9.6	-3.0	-5.2	-15.5	17.1	13.8	15.7	20.2	42.2
1980-1981	0.0	0.7	-4.5	7.2	15.1	18.2	15.0	25.2	19.2	58.4
1981-1982	-2.0	-0.9	-5.4	5.6	7.0	9.3	11.3	20.7	5.2	25.5
1982-1983	1.1	4.7	-1.3	2.9	-4.0	4.9	6.7	6.5	3.5	-9.6
Macro stabilization										
1990-1991	-1.1	-2.0	1.2	5.3	3.8	10.3	13.0	12.3	8.4	23.7
1991-1992	-1.7	-1.6	-4.6	1.4	-2.0	13.7	18.1	13.2	11.3	-14.2
Asian crisis										
1995-1996	-1.2	-1.7	-1.9	7.3	-2.5	8.0	8.2	5.1	8.5	10.5
1996-1997	-2.2	-3.7	-1.4	8.0	8.7	4.6	8.4	10.4	2.1	20.2
Oil shocks										
1998-1999	0.7	2.6	-0.1	6.7	7.9	5.9	12.1	3.3	4.4	-34.2
1999-2000	-1.1	5.6	3.7	6.4	-1.8	3.3	1.2	9.1	2.7	39.9
2000-2001	0.3	11.1	-2.0	4.4	-6.0	7.2	2.8	28.5	3.3	61.4
2001-2002	0.8	6.9	-0.8	5.8	7.6	3.6	3.6	8.9	1.8	-18.8
2002-2003	1.1	12.5	3.4	3.8	-13.2	3.4	3.3	5.5	2.6	5.0
Oil and food price shocks, global crisis										
2007-2008	3.0	7.7	1.1	9.2	5.0	4.7	7.7	1.0	5.0	12.8
2008-2009	0.4	13.5	-1.5	6.7	1.1	8.3	10.0	7.4	8.0	46.7
2009-2010	1.4	11.6	..	7.4	1.1	3.8	11.0	-2.4	3.2	-37.9

Source: Reserve Bank of India website www.rbi.org.in; data for international fuel prices from www.eia.doe.gov

Notes: fc – factor cost; Agri – Agriculture; AC – All Commodities; PA – Primary Articles; MFG – Manufacture; $ oil is for calendar years

The table captures the monetary and fiscal response in the "Policy" variable. This is calculated as the rate of change of reserve money, Central Government revenue, and capital expenditure, each as a percentage of GDP. That is, period t gives the total of the three variables each minus their respective values in period t-1. A negative value implies policy contraction exceeding that in GDP. The table shows this to be negative in years when the GDP growth rate fell due to an external shock. Thus policy amplified the shocks.

The "credit" variable does a similar calculation for broad money M3, bank credit to the commercial sector and total bank credit, capturing outcomes of policy tightening. This was more severe in the earlier shocks. The availability of more financial substitutes and of external finance reduced the impact of policy tightening on credit variables. Policy was now acting more through prices (interest rate changes) than quantities. The world over, as financial markets deepen, central banks switch to targeting short-term interest rates, as nominal money targets become difficult to achieve with unstable money multipliers. Quantitative response is moderated since it becomes less effective.

Finally, the "demand" variable is the sum of changes in C, G, Gross Domestic Capital Formation (GDCF),[10] and CAD as a percentage of GDP. Thus, each shock plus the policy response imparted a considerable negative impulse to aggregate demand. While the supply shock pushed up the As of section III.A, the policy response shifted the AD leftwards. The general perception is that demand and supply factors cause inflation (Mohanty, 2010). But the analysis suggests that if demand falls when supply side shocks are pushing up inflation, demand cannot be contributing to inflation.

The first oil shock saw a drastic cut in reserve money growth, and some reduction in government expenditure. Inflation was negative by the third year, but growth loss was high. In the second oil shock the contraction was milder and was moderated also by the smaller effect the contraction in reserve money had on broad money. Inflation showed neither the peaks nor the troughs of the earlier episode and took a bit longer to moderate. The growth loss was concentrated in the first year, driven by a fall in agricultural output. Deficits expanded with subsidies. The third oil shock had a similar fiscal tightening and an even milder monetary squeeze. M3 growth was quite stable. Yet inflation moderated quickly; output growth was respectable and deficits narrowed. Apart from milder monetary contractions, a key difference accounting for improved outcomes was lower agricultural inflation compared to the earlier two episodes. Despite stagnating

[10] In figure 7 and figure 14 GFCF is used for India, since this is available in the IMF data set. In table 4, however, GDCF, since the data source is the Reserve Bank of India.

domestic agriculture, falling international prices in a more open regime had countered political pressures to ratchet up procurement prices.

The crude price shock during period 2002-2005 was equivalent to earlier episodes but the world, including India, bore it better than past episodes. The reasons behind this were openness, cheap imports, rising productivity that lower costs, less dependence on oil and more credible anchoring of inflation. There was also the absence of other adverse shocks.

But falling international food prices reversed in 2003, and the rise was particularly steep in 2007 (45.28 per cent) and 2008 (12.5 per cent), as competition from biofuels intensified. After being almost stationary from 1999, Indian procurement prices also jumped in the period 2006-2007, and inflation in primary articles reached 7.8 per cent. Crude oil rose sharply: more than 100 per cent during the period 2002-2005, and another 100 per cent since then. The oil pool account and administered price mechanism created in 1974 was dismantled in 2002 but administered prices were retained for petrol, diesel, kerosene and gas. The Government did not fully pass on these shocks. However, it was unable to subsidize the sheer magnitude of the rise and finally raised prices in 2008. Since fuel prices neither rose nor fell as much as in the international market, cumulative Indian fuel inflation had exceeded international fuel inflation until 2005; after that it was less. In 2010, petrol prices were also deregulated. As in the case of food policy, intervention did not lead to the price rises seen in the international market, but prices did not fall with the international market, so that costs moved in only an upward direction.

The global financial crisis followed the oil shock. Oil prices crashed but large liquidity made available by stimulus programmes fuelled inflation in commodities. For the first time, counter cyclical macroeconomic policy, enabled by the coordinated global stimulus, created a demand stimulus, although the overall demand shock was still negative. But high food price inflation led to a rapid resurgence of inflation, and a delayed exit failed to anchor inflation expectations.

Figure 14 graphs the demand shocks for the countries of South Asia. The policy aggravation of supply shocks was even higher in other countries. The series in the graph are calculated leaving out the CAD. A large CAD implies domestic resources are less than domestic requirements, but it is a consequence of domestic demand, rather than an additional demand component. A CAD also implies domestic demand is leaking abroad. Including it in the calculation of demand shock reduces demand even more as it widens during downswings. The two series for Bangladesh accommodate the data break that leads to an outlier in 1988.

Figure 14. Demand shocks

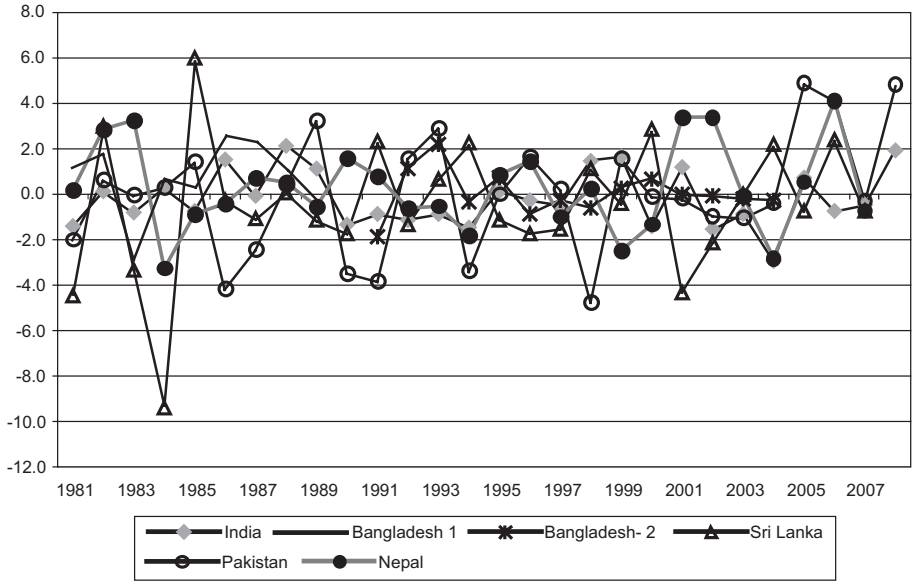


Table 5. Averages and volatilities of inflation, exchange and interest rates

		Change in spot bilateral USD exchange rate	Inflation (WPI)	Call money rate	Long interest rate
Bangladesh	**1980-1990**				
	Average	8.6	7.4	11.7	13.6
	Standard dev	7.0	1.8	1.1	2.0
	1991-2000				
	Average	4.2	5.3	8.4	14.6
	Standard dev	2.4	2.6	1.8	0.7
	2001-2009				
	Average	3.2	6.4	8.4	15.4
	Standard dev	3.4	2.5	0.8	0.8
India	**1980-1990**				
	Average	8.4	8.9	9.8	16.5
	Standard dev	4.3	2.3	2.3	0.0
	1991-2000				
	Average	10.2	9.1	11.0	15.1
	Standard dev	8.8	3.4	4.4	2.2

Table 5. ***(continued)***

		Change in spot bilateral USD exchange rate	Inflation (WPI)	Call money rate	Long interest rate
	2001-2009				
	Average	1.0	5.7	5.9	11.9
	Standard dev	6.1	2.5	1.5	0.9
Maldives	**1985**	0.7	..	9.0	9.1
	2001	4.0	..	..	7.0
	2009	..	..	..	6.5
Nepal	**1980-1990**				
	Average	9.5	10.2	5.4	12.6
	Standard dev	4.9	4.1	0.9	1.9
	1991-2000				
	Average	9.5	9.1	6.6	10.5
	Standard dev	7.9	4.6	3.0	1.8
	2001-2009				
	Average	1.1	6.4	3.8	6.1
	Standard dev	6.0	3.3	1.4	0.4
Sri Lanka	**1980-1990**				
	Average	9.3	12.4	18.7	12.7
	Standard dev	4.1	5.8	3.8	2.4
	1991-2000				
	Average	6.8	9.7	22.6	14.7
	Standard dev	2.9	3.3	7.7	2.0
	2001-2009				
	Average	4.7	11.2	15.9	12.7
	Standard dev	5.4	5.7	7.8	4.5
Pakistan	**1980-1990**				
	Average	8.3	7.0	7.8	9.0
	Standard dev	6.0	2.5	1.3	0.9
	1991-2000				
	Average	9.5	9.2	9.8	10.6
	Standard dev	3.4	3.2	7.7	3.9
	2001-2009				
	Average	5.1	8.4	7.6	7.4
	Standard dev	8.3	5.6	3.6	2.9

Source: Calculated from IMF, IFS data.

Table 5 reports averages and standard deviations in exchange rate depreciation, inflation, and short- and long-term interest rates for South Asian countries during the pre-reform decade, the decade when reforms commenced and one post-reform decade. In the pre-reform decade, administered price and quantitative interventions repressed markets and kept volatilities low, but as the equilibrium was fragile, this led to a large impact of external shocks. Countries in the region lifted controls and liberalized markets in the 1990s. Initially volatility increased. Openness was itself a source of shocks as it increased diversity, which together with the deepening of markets reduced volatility. India shows an initial low, then rise fall pattern in volatility. Deeper markets are able to absorb shocks without high volatility in prices. In smaller, more open countries, volatility remains high. In Pakistan and Sri Lanka internal unrest and political instability also vitiated the pattern. But all the countries in the table adopted more flexible exchange rates, resulting in a drop in average levels of inflation and interest rates.

During the period 1996-2003, average interest rates rose sharply and their volatility exceeded that of exchange rates, partly due to the East Asian crisis and the use of interest rate defence, explaining the large fall in credit and demand during the Asian crisis (table 4). Exchange rate movements were restricted at the cost of higher interest rate movements. During the recent global financial crisis, the fall in credit and demand was much lower partly because more exchange rate flexibility allowed interest rates to target the domestic cycle.

The current consensus is that a managed float is one of the best exchange rate regimes for an emerging market (Corden, 2002). Svensson (2000) emphasizes that the exchange rate is an important tool of monetary transmission for a small open economy, with the lowest lag for the consumer price index. In line with the consensus, exchange rates in the region have moved to greater flexibility, but they are still managed.

The differential response of exchange rates to the food and oil price shocks during 2007 and 2008 provides a useful comparative static experiment to understand both the structure of the economies and of inflation (figures 15 to 19). In Pakistan and Sri Lanka, the international rise in foodgrain prices was passed on to the consumer, contributing to double-digit inflation. In India, procurement prices were raised but not as much and consequently, food price inflation was lower but more persistent as the price support system prevented domestic prices from falling when international prices fell. In countries that prevented much exchange rate depreciation during the global crisis, such as Sri Lanka and Bangladesh, inflation dropped to low single digits by 2009. In Pakistan, Nepal and India, food inflation remained high.

Figure 15. India price indices and E rates: rate of change

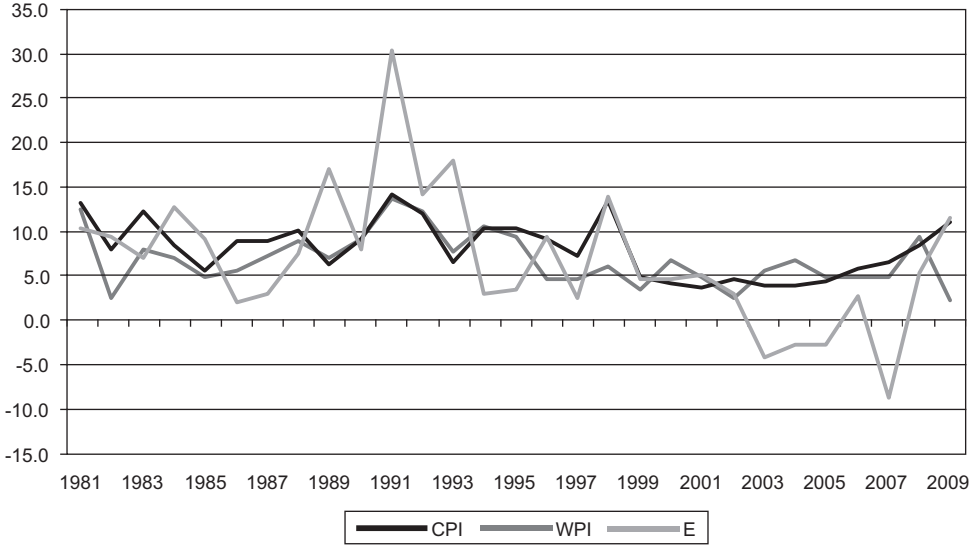


Figure 16. Bangladesh price indices and E rates: rate of change

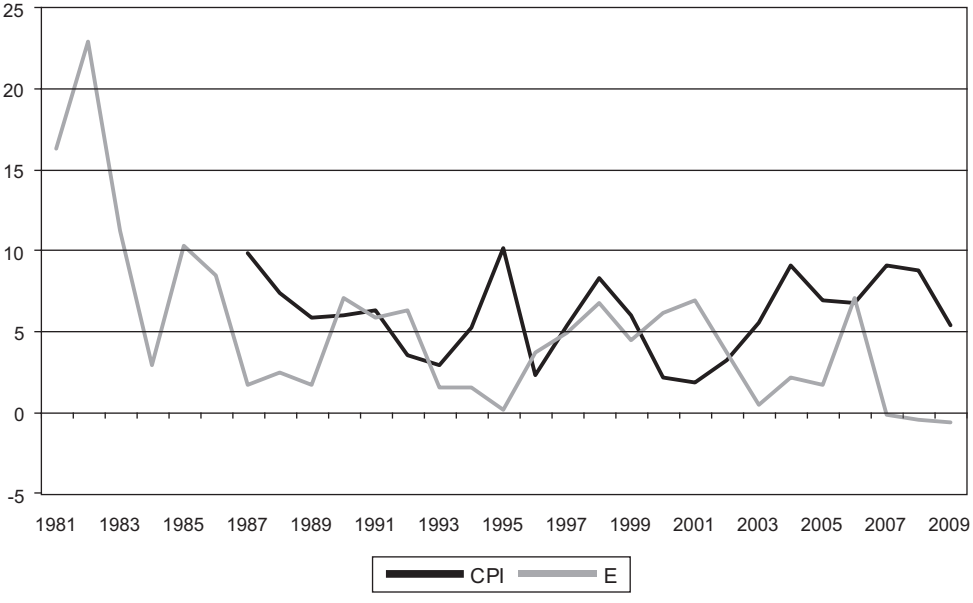


Figure 17. Sri Lanka price indices and E rates: rate of change

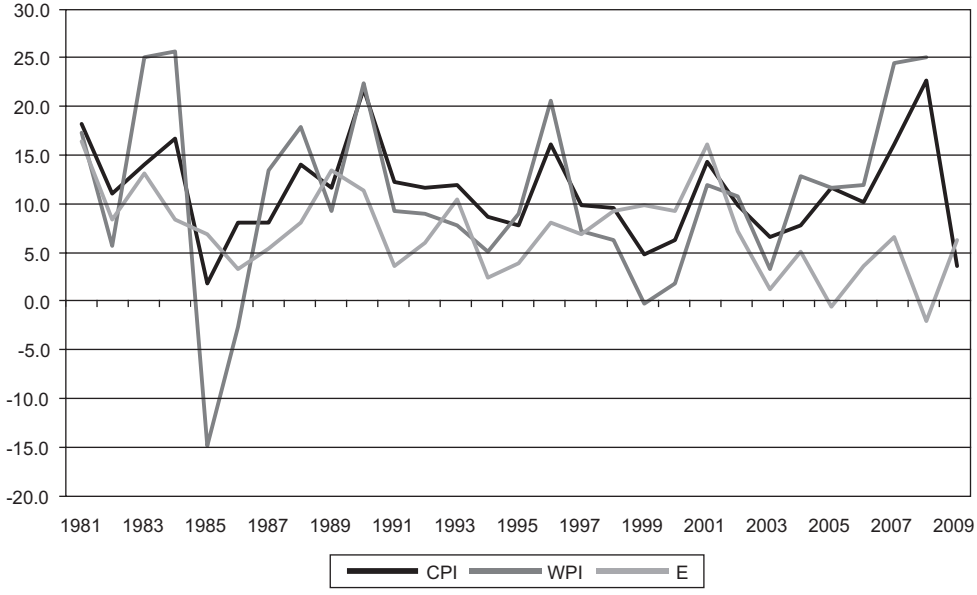


Figure 18. Pakistan price indices and E rates: rate of change

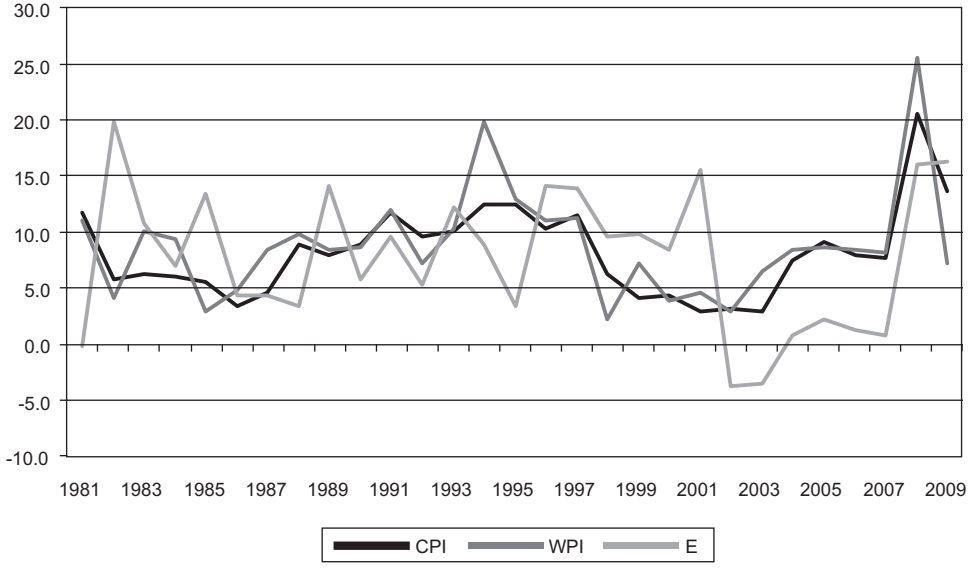
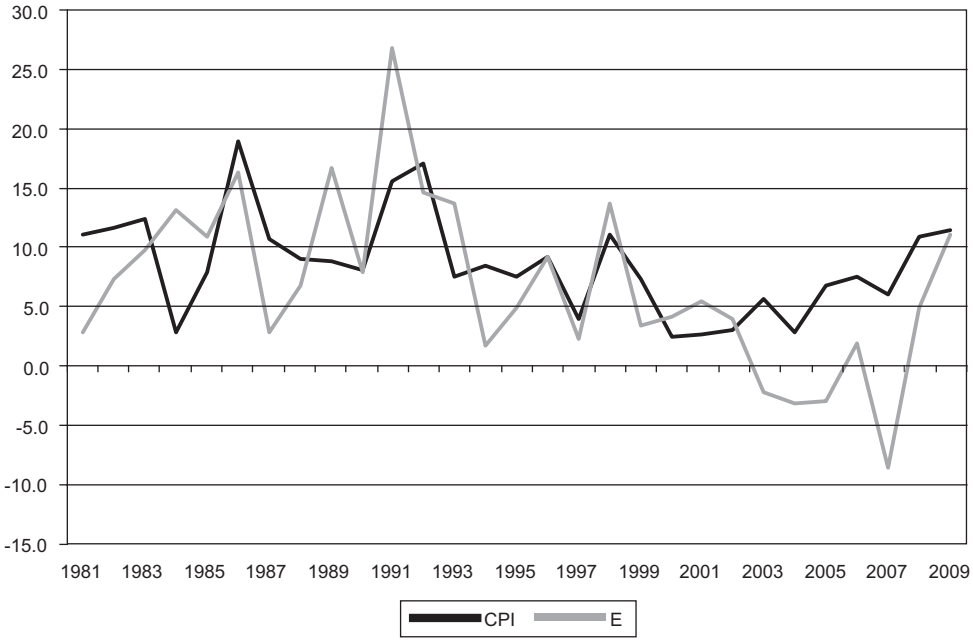


Figure 19. Nepal inflation and E rates: rate of change



The analysis of section III gives a useful framework to interpret the interaction between inflation and exchange rates. Countries whose currencies depreciated steeply during the food price shocks most likely put themselves in the triangle DBC of figure 11 where the wage-price cycle sustained inflation. Even with the two-step Indian exchange rate depreciation of the early 1990s, inflation peaked, suggesting that the gap $Z–Z_w$ had become positive. These experiences corroborate the link between food prices, wages, inflation and their implications for a sustainable real exchange rate.

VI. POLICY SUGGESTIONS

Once frequent supply shocks and the demand-supply elasticities are identified, policy implications follow. They may include a policy induced downwards shift of the supply curve in response to a supply shock; avoiding a larger than needed demand contraction; identifying and removing propagation mechanisms. These policy options are explored below.

A. Temporary shocks

Examples of temporary shocks that raise domestic prices are monsoon failures and international oil or other commodity shocks that raise border prices. These have been dominant inflation triggers. Mild monetary tightening after a cost shock can prevent inflationary wage expectations from setting in and further shifting up the supply curve. But a sharp tightening that shifts aggregate demand leftwards would have a large output cost with little effect on inflation. Reasonable interest rates encourage the supply response. A first round price increase from a supply shock should be allowed, but a second round wage-price increase should be prevented from setting in.

If the nominal exchange rate rises[11] (falls) with a fall (rise) in world foodgrain prices, domestic prices stay unchanged.[12] This applies similarly for oil price shocks in South Asia as the region is heavily dependent on oil imports. An opposite change in the nominal exchange rate in response to a temporary shock can prevent distorting administrative interventions that affect the food and oil sector.

There are short-term fiscal policies that shift down the supply curve, such as tax-tariff rates, and freer imports. Trade policy works best for individual country shocks that are not globally correlated. Nimble private trade can defeat speculative hoarders.

These short-run policies work only for a temporary shock. A permanent shock requires a rise in productivity to successfully prevent inflation. This is examined in sections B and C below.

B. Preventing chronic cost-push inflation

Food prices play a major role in propagation mechanisms, since they raise nominal wages with a time lag. A fundamental reason for chronic supply side inflation is that target real wages exceed labour productivity, so the solution is to raise worker productivity. Higher agricultural productivity is especially necessary to anchor food price inflation.

---

[11] Goyal (2003) simulated such a policy using wheat prices. It led to a coefficient of variation of 0.2 for the nominal exchange rate, and removed the high wheat inflation of the 1990s.

[12] Shifting to winter daylight savings time in the United States of America saves thousands of firms from having to change their working hours. However, changing one exchange rate prevents thousands of nominal price changes that then become sticky and persist, requiring a painful prolonged adjustment.

With some liberalization, farm produce become traded goods and consequently, border prices begin to affect domestic food prices. A target real wage in terms of food prices then implies a target real exchange rate or ratio of traded to non-traded goods prices. In this case, the exchange rate contributes to inflation propagation mechanism. If the real exchange rate required to satisfy a real wage target rate appreciates above the rate required for equality of aggregate demand and supply, wages rise, raising the prices of non-traded goods. A nominal depreciation to increase demand helps sustain the cycle of continuous inflation. Higher productivity of non-traded goods can shift up the target real exchange rate, so the wage target can be satisfied at a more depreciated exchange rate, breaking a potential wage-price chain.

A rise in agricultural productivity allows the nominal exchange rate to appreciate, bringing the real exchange rate closer to the target real exchange rate and closing the inflationary gap between them, even while agricultural prices continue to equal border prices.

Inflows appreciate the exchange rate and remove chronic inflation. The wage target is reached and the accompanying rise in imports met through the inflows. But it involves a risky widening of the current account deficit as appreciation encourages imports. Rising productivity increases the level of inflows that can be safely absorbed since the target exchange rate is more depreciated, encouraging exports. The CAD then still allows investment to exceed domestic savings but does not become too large.

C. Governance

Better governance and delivery of public services is necessary to improve productivity. Reform of food policy is urgent given the relentless food inflation. East Asian countries were careful to moderate food price increases and focus on a rise in agricultural productivity as long as food budget shares remained high. Food prices and the nominal rate of protection in agriculture was allowed to rise only after the food budget shares fell (Goyal, 2003). In addition, agriculture was taxed to fund development. Nevertheless, low food prices did not prevent agricultural incomes from rising, since at low per capita income levels demand for food is elastic. When development proceeded sufficiently to lower budget shares below 50 per cent, farm incomes began falling and governments turned from taxing to subsidizing agriculture. Since the share of the population in agriculture was now small, this was not a burden. In this period, food prices began to rise. Since food was now a small part of the budget, prices could rise without putting pressure on wages and inflation. As food budget shares fall agriculture must shrink.

In India, the move to subsidize agriculture came when food budget shares were still high. Food still accounted for more than 50 per cent of household expenditure among 95 per cent of rural households and 80 per cent of urban households in the 1990s (Goyal, 2003). More than 70 per cent of the population was still in rural areas even in the 2000s. The weight of the food group is 48.46 per cent in the new CPI-Industrial Workers base 2001. For low-income groups the share exceeds this while for high-income groups, it is lower.

Although the increase in the absolute agricultural price level was lower in the 1980s, output growth was more rapid. India is still in the range where income elasticities of demand for agriculture are high,[13] so that agricultural incomes rise more with increases in output, even after correcting for the effect of buffer stock and public food distribution policy. A more moderate nominal price increase enables better agricultural output and income growth.

Rising agricultural price levels do not guarantee favourable agricultural terms of trade, as nominal wages and industrial prices also increase. Over time, stable prices provide better incentives for farmers. If the procurement price were to become a true support price, foodstocks would reduce in a bad agricultural season when market prices rise, and increase as market prices fall in a good year. Farmers would get some assured income support even as the removal of restrictions on the movement and marketing of agricultural goods and better infrastructure allows them to diversify crops. Since price support can also use the option of just paying the difference between market and support prices, stocks need not rise when they are already high.

In reaction to the lower average stocks, public distribution schemes should focus on remote places where there are no private shops, or on very poor areas. Food coupons or cash transfers to women can provide support to those below the poverty line[14] while allowing them to diversify their food basket, as recent studies indicate. Foodgrains, for which the elaborate food policy structure is designed, now account for only 25 per cent of agricultural output. Thorough supply-side reform is required.

But such reform may take time to achieve. The analysis in this section has brought out the focal role of the unit value, which acts as a trigger for multiple interest groups to force undesirable policies such as a rise in MSP. Political jostling

[13] Nomura (2010) puts $3,000 as the per capita income level after which income elasticities of demand fall.

[14] Basu (2010) has argued for such a policy redesign. Cash transfers to women are effective because women are more likely to apply them for family needs.

focuses on the short-term, ignoring negative long-term effects. Poor coordination among multiple agencies means they do not factor in each other's costs. They also neglect the big picture. Until thorough food policy reform occurs, a possible appreciation of the nominal exchange rate can prevent a sharp rise in border prices from triggering multiple interest group action and resulting in complex domestic distortions.

D. International

Emerging markets must find non-distortionary ways to respond to spikes in food and commodity prices, but large global spikes imply macro distortions beyond supply shocks (Gilbert, 2010), which should also be prevented. Policies such as quantitative easing that aim to drive up prices across asset categories should be implemented sparingly if at all. Excess liquidity creation in the West and poor real sector response are sending funds into commodities, and this may be contributing to price spikes. Investors have turned to commodity markets for speculation or for portfolio diversification.

What is the role of futures markets? A large number of studies of the 2008 commodity spike, surveyed in Irwin and Sanders (2010), have on balance not found evidence that the large-scale entry of index funds in commodity derivatives drove up prices. A correlation did occur but the correlation does not necessarily imply causality. Time series tests on the whole reject causality but they have their own flaws. Lack of convergence between spot and futures prices in certain markets also suggest problems in the working of these markets. A price spike above equilibrium levels in a storable commodity should raise its stocks, but stocks were declining in most commodity markets during that period. Moreover, prices of agricultural commodities without futures markets also rose at the same time. An Indian committee was set up to examine the effect of commodity futures markets as agricultural inflation rose (GOI, 2008). It found no unambiguous evidence of the effect of futures trading on inflation. For some commodities, inflation had accelerated after the introduction of futures, for others it had slowed down. Commodities where futures were banned such as sugar, tur and urad dals had higher inflation.

When inventories of a storable commodity are low, a demand or supply shock can result in a sharp price rise for that particular commodity. This is because it takes time for supply to increase. In such conditions, trading sends the prices higher merely because the market expects the prices to increase. Buying futures does not have the same effect as hoarding a commodity. Opposite paper positions can be generated in deep and liquid markets. As long as informed traders dominate

the markets, values are unlikely to deviate far from fundamentals. But herd behaviour, momentum trading and overreaction, make price discovery in financial markets flawed. Since futures markets serve the purpose of helping producers plan future output and to hedge risks, the answer is not to ban them, but to improve their operations.

Restricting participants in the market is counterproductive to creating liquidity. However, position limits can be used to reduce the share of speculative transactions. Contracts can be designed to encourage hedging over speculation by distinguishing between hedgers and speculators with differential margins and discounts in fees or taxes for each category. Margins that increase with price could reduce momentum trading. Since spot and futures markets around the world are becoming tightly integrated, convergence to common regulatory standards is necessary. One region with lax standards can affect others, especially during irrational periods of fear or hype. For example, most regulators impose position limits. The U.S. regulator finally proposed position limits in four energy commodities in 2010, but the European Union and a few other markets still do not have them. In 2009, a U.S. Senate subcommittee suggested a position limit of 5,000 contracts per wheat trader. The practice of giving position limit waivers should be discontinued. Arbitrage occurs in response to selective or regional regulatory tightening. Coordinated improvements in financial regulation are required to reduce global commodity price spikes.

VII. CONCLUSION

The similarities yet differences across South Asian countries, and their differential response to the severe food, oil price and other external shocks, provides a useful opportunity to better understand the structure of inflation in these economies. The analysis and evidence in this paper implies output is largely demand determined but inefficiencies on the supply side cause inflation. Since output volatility exceeded that of demand components, the latter were not an independent source of shocks. Procyclical policy, however, amplified the negative impact of supply shocks on output. Reduction in inflation was achieved at a high output cost. But well-intentioned administrative interventions turned relative price shocks into chronic cost-push inflation. The analysis shows why food price shocks can aggravate inflation. It is very important to protect the poor from inflation, especially food inflation. But it must be done effectively.

Controlling inflation is important for the very survival especially of democratic governments in the region. But complex and counterproductive schemes provide temporary respite, only to pass the problem on to the future. Onions are

widely consumed by the poor; so when the prices of onions shot up in 1998, the anger of the electorate almost brought down the Indian Government. A cartoon pictured Amartya Sen, who had recently been awarded the Noble prize in economics, talking on the phone: "Yes Minister, thank you Minister, no, I do not have a theory to bring down the price of onions". The year 2010 again saw a sharp 600 per cent rise in onion prices. The problem continues to be as urgent as it is unresolved. Knowledge of structure and behaviour makes successful anticipation and prevention possible. Structural features and supply-side policies offer additional instruments to reduce inflation.

REFERENCES

Basu, K. (2010). "The economics of foodgrain management in India", Ministry of Finance Working Paper No. 2/2010-DEA.

Corden, W.M. (2002). *Too Sensational: On the Choice of Exchange Rate Regimes* (Cambridge MA, MIT Press).

Gilbert, C.L. (2010). "How to understand high food prices", *Journal of Agricultural Economics*, vol. 61, No. 2, pp. 398-425.

Gokarn, S. (2010). "The price of protein", *Inaugural Address at Special Conference in honour of Dr. Kirit Parikh at IGIDR*, Mumbai on October 26.

Goyal. A. (2011). "Exchange rate regimes and macroeconomic performance in South Asia", in Raghbendra Jha (ed.) *Routledge Handbook on South Asian Economies,* forthcoming.

Goyal, A. (2009a). "Swan diagram", in Ramkishen S. Rajan, Kenneth A. Reinert (eds.) *Princeton Encyclopedia of the World Economy*, (Princeton, New Jersey, Princeton University Press).

Goyal, A. (2009b), "The natural interest rate in emerging markets", in Bhaskar Dutta, Tridip Roy, and E. Somanathan (eds.), *New and Enduring Themes in Development Economics*, (World Scientific Publishers).

Goyal, A. (2008). "Incentives from exchange rate regimes in an institutional context", *Journal of Quantitative Economics*, January & July, vol. 6, No. 1&2, pp. 101-121.

Goyal A. (2005). "Exchange rates, food price stabilization & inflation", in M. Sharma (ed.), *Leading Issues in Indian Economy*, (Delhi, Atlantic Publishers and Distributors).

Goyal A. (2004). "The impact of structure and openness on the causal ordering of interest, inflation and exchange rates"*, Journal of Quantitative Economics, Special Issue in Memory of M.J. Manohar Rao,* July, vol. 2, No. 2, pp. 223-242.

Goyal A. (2003). "Agriculture and industry: enhancing mutual gains", *Decision*, July-December, vol. 130, No. 2.

Goyal A. and A.K. Pujari. (2005). "Identifying long-run supply curve in India", *Journal of Quantitative Economics*, July, vol. 3, No. 2, pp. 1-15.

GOI (Government of India) (2010). Reports of the Commission for Agricultural Costs and Prices: for the crops Sown During 2009-10 Season. Commission for Agricultural Costs and Prices (CACP).

GOI (Government of India) (2008). *Report of the Expert Committee on Commodity Futures,* May.

Irwin, S.H. and D.R. Sanders. (2010). "The impact of index and swap funds on commodity futures markets: preliminary results", OECD Food, Agriculture and Fisheries Working Papers, No. 27, OECD Publishing.

Joshi, V. and I.M.D. Little. (1994). *India: Macroeconomics and Political Economy 1964-1991*, (Delhi, Oxford University Press).

Mohanty, D. (2010). "Perspectives on inflation in India", *Speech given at the Bankers Club, Chennai,* 28 September.

Nomura. (2010). *The Coming Surge in Food Prices*. Nomura Global Economics and Strategy.

Rahman, M., D. Bhattacharya, W.B. Shadat, and U. Deb. (2008). "Recent inflation in Bangladesh: trends, determinants and impact on poverty", Centre for Policy Dialogue: Dhaka.

Salter, Walter E. (1959). "Internal and external balance: the role of price and expenditure effects", *Economic Record,* August, vol. 35, Issue 71. pp. 226-238.

Swan, Trevor W. (1960). "Economic control in a dependent economy", *Economic Record,* March, vol. 36, Issue 73, pp. 51-66.

Svensson, L.E.O. (2000), "Open-economy inflation targeting", *Journal of International Economics*, vol. 50, pp. 155-183.

Woodford, M. (2003). *Interest and prices: Foundations of a Theory of Monetary Policy*, (New Jersey, Princeton University Press).

Data sources

International Monetary Fund, *International Financial Statistics,* various issues.

India, Central Bank and Government of India (GOI) websites.

India, *RBI Handbook of Statistics on the Indian Economy,* Reserve Bank of India.

For crude oil: www.eia.doe.gov.

EVALUATING ECONOMIC INTEGRATION IN ASEAN: PERSPECTIVES FROM A CLUSTER ANALYSIS

*Maria Estela Varua, Arlene Garces-Ozanne and Rachel Benic**

This paper uses hierarchical cluster analysis to examine the degree of economic integration among member countries of the Association of Southeast Asian Nations (ASEAN), and Japan, China and the Republic of Korea during three time periods: 1969-1984, 1985-1994 and 1995-2009. The results indicate that the five founding members of ASEAN, Indonesia, Malaysia, the Philippines, Singapore and Thailand, have become less integrated over time. Moreover, the region as a whole does not appear to have attained the degree of integration that was hoped for at the time the Association was established 30 years ago.

JEL Classification: F15, O53.

Key words: ASEAN, economic integration, cluster analysis, Japan, China, Republic of Korea, Asian economies.

I. INTRODUCTION

ASEAN was jointly established on 8 August 1967 in Bangkok by five countries, Indonesia, Malaysia, the Philippines, Singapore and Thailand, to promote regional peace and stability, and to accelerate economic growth, social progress and cultural development within the region.

The underlying motivations for the creation of ASEAN were related to the escalating war in Viet Nam and the Cultural Revolution in China. Thus, it was initially political and security objectives, as opposed to economic ones, that prompted increased cooperation within the region. ASEAN has since expanded to include five additional countries: Brunei Darussalam joined in 1984; followed by

* Maria Estela Varua and Rachel Benic, School of Economics and Finance, University of Western Sydney, NSW, Australia; Arlene Garces-Ozanne, Department of Economics, University of Otago, New Zealand

Viet Nam in 1995; Lao People's Democratic Republic and Myanmar in 1997; and Cambodia in 1999. Currently, economic, rather than political cooperation, is the primary goal of the Association.

In addition to increasing economic cooperation and integration within its membership, ASEAN has strengthened ties with other Asian nations. In November 1999, leaders of Japan, China and the Republic of Korea issued a joint statement with some of the leaders of ASEAN member countries outlining areas of cooperation among them. The grouping of these countries with ASEAN is referred to as ASEAN+3. Since the tie-up, ASEAN has also stepped up efforts to establish a unified economic community, the ASEAN Economic Community, similar to that of the European Union (EU), by 2015. One objective is to have a free flow of goods, services, investment and skilled labour within the next few years. Recently, there have also been proposals for a single EU-style ASEAN visa in the hopes of encouraging more trade and tourism among member nations.

The main objective of this paper is to examine whether ASEAN is achieving its goal of becoming more economically integrated. This will be verified using hierarchical cluster analysis to discern the natural grouping of countries within the region. The findings of this analysis can help determine whether the clustering of ASEAN member countries have changed over the years, and if the members have become more similar, which is an indication that current efforts of ASEAN towards economic integration have been successful, or at least moving in that direction.

The remainder of the paper is organized as follows. The next section presents a review of existing literature on economic integration in general and ASEAN economic integration in particular. Section III describes the data and the method of analysis used in this study. Section IV presents the results of the cluster analysis, and finally, section V summarizes and concludes the paper.

II. REVIEW OF LITERATURE

Economic Integration

The benefits and costs of economic integration and trade liberalization in developing countries are often debated. While the advantages of lower trade barriers among economies in a particular region are extensive, the costs can be disastrous, especially for the smaller economies in the region. Theoretically, free trade maximizes welfare as it fosters specialization on the basis of comparative advantage. This, in turn, results in lower cost imports. Alternatively, economies of

scale may arise at the regional level through increased cooperation, which would not be possible in individual economies that are too small to support such activities.

However, Hussey (1991) notes that trade liberalization generally benefits the more economically developed members but could retard growth in the less developed countries. Thus, in regions that include countries at various stages of development, trade liberalization may not be in the best interest of all of its members.

Venables (2000) considers the implications of regional economic integration, although, he focuses more narrowly on trade liberalization in the form of free trade areas and customs unions. He argues that welfare losses may arise from importing intraregional products in preference to lower cost imports from the rest of the world (trade diversion). Conversely, gains from trade may arise if domestic production is displaced by cheaper intraregional products (trade creation). Venables further points out that changes in tariffs as a result of trade liberalization results in a loss in government tariff revenue. This cost can be severe in developing countries where tariff revenue comprises a significant portion of government income. He cites the example of Cambodia, which derived 56 per cent of its total tax revenue from customs duties prior to its entry into ASEAN.

Trade diversion may also result in an improvement in the terms of trade for the integrating region, as demand for extraregional imports falls. Winters and Chang (2000) demonstrate that the membership of Brazil in the Southern Common Market (MERCOSUR) has been accompanied by a significant decline in the relative prices of imports from non-member countries. While this is clearly beneficial for regional members, any economic gain is at the expense of outside countries.

ASEAN Economic Integration

The discussion of whether the economic integration of ASEAN has been beneficial is controversial within the literature on this subject. Authors have been divided on many issues ranging from whether integration has been achieved to whether the Association has assisted in easing the detrimental effects of economic shocks. Despite disagreement over the economic success of ASEAN, it is widely agreed that the Association has fostered a strong regional identity among its members.

For instance, Hussey (1991) notes that although ASEAN has had limited success in promoting economic cooperation, it has, nonetheless, been more effective at curbing the outbursts of intraregional hostility and conflicts among the member countries prior to the establishment of the Association. Kurus (1993) also criticizes the progress ASEAN had made prior to the joining of Viet Nam, the Lao People's

Democratic Republic, Myanmar and Cambodia in the late 1990s. He notes, like Hussey, that the region has been substantially more successful in the political arena than in generating economic cooperation among members. The notion that ASEAN has achieved only limited success in its primary objective of developing economic cooperation and integration is shared by others (see also Buszynski, 1987 and Denoon and Colbert, 1999). Nevertheless, the possibility that greater political and diplomatic cooperation has both directly and indirectly led to economic gains within the region cannot be ignored.

The ASEAN free trade agreement (AFTA) of 1992 is considered by many scholars to be the first major step towards economic integration taken in the region since the inception of the Association in 1967. However, there are mixed opinions regarding its success. Angresano (2004) believes the agreement has not had a substantial impact, while Stubbs (2000) concedes a limited amount of success. Regardless of whether success has been achieved in trade circles, literature generally agrees that economic cooperation within the region increased as a result of AFTA.

In terms of lessening the effects of the 1997 Asian financial crisis and subsequently accelerating the economic recovery among members, Denoon and Colbert (1999) conclude that neither ASEAN as a whole nor any individual country were able to provide the resources to alleviate the crisis and restore financial and economic stability. They argue that the region's inability to deal effectively with the crisis affected the international status of the Association, which will take a lot of work to restore. Similarly, Ruland (2000) observes that the response of ASEAN to the crisis focused on alliance-building rather than designing a blueprint for better cooperation. He emphasizes the failure of the establishment of the Asian Monetary Fund (AMF), which the ASEAN finance ministers, with the support of Japan, proposed as an alternative to the International Monetary Fund (IMF). The IMF adamantly rejected the proposal. Ruland points out that, except for Singapore, no ASEAN country had the means to contribute to the fund in the first place.

Both Denoon and Colbert (1999) and Ruland (2000) concede that although the degree of cooperation within ASEAN was inadequate as a means of dealing with the crisis, it did reveal the importance of greater economic integration. The crisis served as a catalyst to reinforce the organization's focus on economic cooperation, resulting in such plans as the ASEAN Vision 2020.[1]

[1] The ASEAN Vision 2020 is a commitment that heads of states/governments of ASEAN member countries reaffirmed during the fortieth anniversary of the establishment of ASEAN, calling for a stable, prosperous and highly competitive ASEAN economic region.

III. DATA AND METHOD OF ANALYSIS

The countries examined are classified into: ASEAN, which includes the current members:[2] Cambodia; Indonesia; Lao People's Democratic Republic; Malaysia; Myanmar; Philippines; Singapore; Thailand; and Viet Nam; ASEAN+3, which includes the current member countries plus China, Japan and the Republic of Korea; and ASEAN–5, which includes only the five founding members of ASEAN: Indonesia; Malaysia; Philippines; Singapore; and Thailand.

The rationale for including ASEAN–5 is derived from the fact that these countries have been integrated through their membership in ASEAN since 1968. It is presumed that ASEAN–5 would exhibit a higher degree of economic integration than ASEAN; hence, the comparison of these two regions is made to test whether this is in fact the case.

To provide a more comprehensive analysis and allow for data constraints, three time periods are examined, 1969-1984, 1985-1994 and 1995-2009. Data for a number of countries outside ASEAN–5 are not available prior to 1995; hence, only this subgroup is examined in all three periods. Breaking the period from 1969 to 1994 into two (1969-1984 and 1985-1994) is justified from an historical perspective since it was during that time that Brunei Darussalam became the first non-founding member to join the Association.[3] ASEAN and ASEAN+3 are only investigated in the 1995-2009 period.

In this study, the optimum currency area (OCA) theory helps define and measure economic integration. To measure economic integration, variables of economic integration suggested by the OCA theory as well as other variables measured in other studies are considered. Deepening institutional integration is most beneficial among member nations participating in the regional arrangement. Inflation convergence, for example, is a key element of the Maastricht Treaty for the creation of a single European currency. As to exchange rate, low levels of exchange rate variability is a corollary of the OCA property on convergence. If real exchange variability is low and currencies are stable with each other, then the cost of exchange rate flexibility is lower. Likewise, monthly market returns are included as a measure of financial integration. Under a high degree of financial integration, even modest changes in interest rates, would elicit equilibrating capital movements

[2] Brunei Darussalam has been a member of ASEAN since 1984. It has been excluded from the analysis due to data availability constraints. Hence, during the period 1969-1994, data from only the original member countries of ASEAN are included in the analysis.

[3] Similarly, the third period (1995-2009) can be justified since the other members of ASEAN only became members in the late 1990s.

across partner counties. Also, interest rates are included as a measure of economic integration as they indicate the degree of similarity of the monetary policy stance across countries. Finally, this paper argues that economic integration enhances the convergence across countries in a region. Previous studies argue (Ben-David, 1993) that more integration and openness lead to more mobility of factors of production, which may result in convergence of income levels.

Data for the ASEAN economic integration analyses were obtained from the International Financial Statistics (IFS) published by the IMF and the statistical database Datastream.[4] Annual gross domestic product (GDP) per capita, annual consumer price indices (CPI) and monthly real exchange rates in United States dollars were taken from IFS. Data on quarterly interest rates and monthly stock price indices have been collected from Datastream and Yahoo Finance, respectively. GDP per capita figures were converted into real GDP per capita in United States dollars[5] at 2005 prices, annual inflation rates were calculated from the CPI, and quarterly percentage change in stock prices were derived from the stock price indices. Data on interest rates and stock prices were only available for the ASEAN–5 region, and only during the 1995-2009 period.

For each country, means and standard deviations are presented for the variables real GDP per capita in United States dollars, inflation, real exchange rates in United States dollars and stock market returns, in tables 1, 2, 3 and 4, respectively. Descriptive statistics for the ASEAN–5 countries are calculated for periods 1970-2009 (the entire sample period) and 1995-2009 (the period for which data from other countries are available). The descriptive statistics for the other countries are calculated only for the period 1995-2009.

Table 1 clearly shows that the mean per capita income of Singapore and Japan has been significantly higher than that of the other ASEAN members. Singapore has also had a low, stable rate of inflation over the period, and its real exchange rate has shown only small fluctuations although it has not been as steady as the exchange rates of some other countries whose currencies have been pegged to the United States dollar over the past three decades.

---

[4] Accessed 2 April 2010 at the University of Western Sydney, Parramatta, Australia.

[5] United States dollars have been chosen to standardize the data as most countries have traditionally pegged their currencies against the United States dollar. In addition to this, Lim (2005) finds that none of the East Asian currencies, except the Hong Kong dollar, have a long-run co-integrating relationship with the Japanese yen. The countries common to this paper and that of Lim include: Indonesia; Malaysia; Philippines; Singapore; Thailand; Japan; and the Republic of Korea.

Table 1. Descriptive statistics for real GDP per capita (United States dollars)*

Country	1969-2009		1995-2009	
	Mean	S.D.	Mean	S.D.
Indonesia	671.4252	459.3323	1 123.3038	444.1550
Malaysia	3 753.5965	1 394.8127	5 075.8275	1 084.2451
Philippines	3 718.8004	2 785.9190	1 380.5886	292.2147
Singapore	15 153.3297	9 931.1506	26 658.9676	4 901.5564
Thailand	2 233.7989	750.9448	2 796.7314	669.3222
Viet Nam			522.4436	95.7187
Lao People's Democratic Republic			418.1786	152.7752
Myanmar			293.3859	95.5625
Cambodia			421.1788	119.5418
Japan			34 983.6248	3 020.4518
China			1 372.3250	763.9754
Republic of Korea			13 919.1691	4 262.7407
Average	5 106.1901	3 064.4319	7 413.8104	1 325.1883

Note: *at constant 2005 prices (CPI 2005 = 100).

The global recession of the early 1970s had a considerable effect on ASEAN–5 countries. Inflation rates peaked at 40.6, 17.3, 34.2, 22.4 and 23.3 per cent in Indonesia, Malaysia, the Philippines, Singapore and Thailand, respectively. In spite of the high inflation rates, ASEAN–5, as a whole, was not as affected by the second economic downturn in the early 1980s. The Philippines, however, experienced a recession during the period 1984-1985, which resulted in per capita incomes and exchange rates plummeting by 104.4 and 77.9 per cent, respectively, over the two years, and inflation rates reaching 46.7 per cent in 1984. This was caused by political instability during the presidency of Ferdinand Marcos.

Also of note are the particular trends in individual countries. Indonesia, the Philippines, the Lao People's Democratic Republic and Cambodia, for example, have all been experiencing lower growth of real GDP per capita over time, while Malaysia, Singapore, Thailand, Myanmar and China have seen increased growth in real GDP per capita during the period 1995-2009.

The Asian financial crisis in 1997 affected the ASEAN countries in varying degrees, but the predominant results have been lower incomes, higher inflation and weaker currencies. The countries most affected by the crisis were Indonesia, Malaysia, Thailand, the Lao People's Democratic Republic and the Republic of Korea. The Philippines, Singapore, Viet Nam, Myanmar and Japan were affected to a lesser degree due to their respective Government policies, and in the case of the Philippines and Viet Nam, remittances from overseas workers and an inconvertible currency, respectively, served as a buffer against the adverse affects of the crisis. On the contrary, China has been virtually unaffected by the crisis due to the closed nature of its economy.

All these differences are factors when considering income, inflation and exchange rate convergence among the countries under study. Whether a region is converging is directly related to the policies of individual countries, and events, such as currency crises and political instability. These factors, therefore, need to be taken into account when assessing the results of the various tests.

Table 2. Descriptive statistics for inflation (percentage)*

Country	1969-2009		1995-2009	
	Mean	**S.D.**	**Mean**	**S.D.**
Indonesia	11.5694	8.0781	11.6829	10.5389
Malaysia	3.6161	2.8922	2.7341	1.3348
Philippines	10.0377	7.4865	5.8201	1.9850
Singapore	2.8695	4.2706	1.3392	1.6448
Thailand	5.1431	4.5167	3.5471	2.2631
Viet Nam			7.9827	9.6003
Lao People's Democratic Republic			20.8124	23.4296
Myanmar			21.6243	12.8533
Cambodia			5.7249	6.2221
Japan			0.0611	0.7635
China			3.4070	4.1147
Republic of Korea			3.5353	1.5524
Average	6.6472	5.4488	7.3559	6.3585

Note: *2005 CPI = 100.

Table 3. Descriptive statistics for real exchange rates (in United States dollars)

Country	1969-2009		1995-2009	
	Mean	S.D.	Mean	S.D.
Indonesia	0.0010	0.0009	0.0002	0.0001
Malaysia	0.3579	0.0653	0.2876	0.0470
Philippines	0.0752	0.0587	0.0243	0.0073
Singapore	0.5199	0.1080	0.6242	0.0564
Thailand	0.0385	0.0091	0.0280	0.0057
Viet Nam			0.0001	0.0001
Lao People's Democratic Republic			0.0003	0.0004
Myanmar			0.1670	0.0110
Cambodia			0.0003	0.0001
Japan			0.0088	0.0008
China			0.1235	0.0066
Republic of Korea			0.0010	0.0008
Average	0.1985	0.0484	0.1054	0.0114

Table 4. Descriptive statistics for monthly stock returns (1995-2009)

Country	1995-2009		
	STOCK INDEX	Mean	S.D.
Indonesia	JKSE	0.84	9.79
Malaysia	KLSE	0.15	8.12
Philippines	PSE	0.11	8.16
Singapore	STI	0.26	8.11
Thailand	SET	0.07	9.83
Average		0.28	8.80

To determine whether there is a natural grouping of countries present within the ASEAN, ASEAN+3 and ASEAN–5 regions, a hierarchical cluster analysis has been carried out. An agglomerative method is used in which the twelve countries are successively fused into groups (or clusters) until there is only one cluster

containing all the countries. The manner through which this fusion takes place is based on some distance formula, which combines the countries depending on their proximity to each other in terms of the series of selected economic integration variables discussed in the previous section. A further relevant issue is the normalization of the data. As a starting point, equal weight is given to each of the economic integration variables. Under the assumption that the variables are each distributed normally, the data are transformed to have the same mean and standard deviation. A mean of zero and a standard deviation of unity are selected. The cluster analysis is carried out for each of the three regions, and in regard to ASEAN–5, in each of the three time periods.

There are six common agglomerative methods that may be used to perform a hierarchical cluster analysis: The Single Linkage (Florek and others, 1951); the Complete Linkage (Sorensen, 1948); the Group Average Linkage and the Centroid Clustering (Sokal and Michener, 1958); the Median Linkage (Gower, 1967); and Ward's Method (Ward, 1963).

There is no specific process by which to identify the best method to use in a hierarchical cluster analysis. This study makes use of Ward's method, which is often considered the preferred method in the empirical literature (see for example Duflou and Maenhout, 1990; Baxter and Crucini, 1995; and Hands and Everitt, 1987).

Ward's method uses the error sum of squares to link clusters. Two clusters are fused together if this results in the smallest increase in the total error sum of squares (E) of all clusters,

$$E = \sum_{c=1}^{m} E_c \tag{1}$$

Where the total error sum of squares is the sum of the error sum of squares of all clusters $c = 1, ..., m$, and

$$E_c = \sum_{i=1}^{n_c} \sum_{k=1}^{p} \left(x_{cik} - \bar{x}_{ck} \right)^2 \tag{2}$$

Where the error sum of squares for cluster c (E_c) is the sum over all individuals in that cluster $i = 1, ..., n_c$ and all variables $k = 1, ..., p$, of the squared Euclidean distance between the mean of cluster c for variable k ($\bar{x}_{ck}$), and each individual's score for that variable (x_{cik}).

This study essentially follows Ward's method, except that the variables are first standardized to the range of 0 to 1 before calculating the distance between clusters. The distance metric used in this analysis is a revised squared Euclidean distance, whereby:

$$D(i, j) = \sum_{k=1}^{p} \left(x_{ik} - x_{jk}\right)^2 \quad (3)$$

Where $D(i, j)$ measures the squared Euclidean distance between country i and country j for all economic integration variables $k = 1, ..., p$. $D(i, j)$ may also be expressed as the dissimilarity between countries i and j.

The calculations were performed in statistical package for the social sciences (SPSS). This programme identifies which countries were fused together at each stage of the analysis. This fusion process continues until there is only one cluster containing all countries. While this provides some useful information regarding the similarities between countries, it is more within the objectives of this study for the analysis to stop at a certain "optimal" number of clusters. The decision on the numbers to proceed with must be determined in a transparent manner.

The simplest way of selecting the optimal number of clusters is to look at a dendrogram (a pictorial representation) of the results. By essentially "chopping" the dendrogram at a certain point, two or more clusters remain. Large changes in the fusion levels are a good indication of where the hierarchy should be cut. While this method is quick, it is very subjective and contains the inherent possibility of bias on the part of the researchers as expected results may cloud their vision.

An objective method of choosing the optimal number of clusters is the upper tail rule (Mojena, 1977), which is specified by the following inequality:

$$\alpha_{j+1} > \bar{\alpha} + ks_{\alpha} \quad (4)$$

Where fusion levels $\alpha = 0, ..., n - 1$ correspond to stages with $c = n, ..., 1$ clusters. The terms $\bar{\alpha}$ and s_{α} are respectively the mean and standard deviation of the j previous fusion levels, and k is a constant. A value of k of 1.25 is suggested (Everitt and others, 2001). The first stage of the dendrogram to satisfy equation (4) is an indication of the optimal number of clusters.

Table 5. Resulting clusters

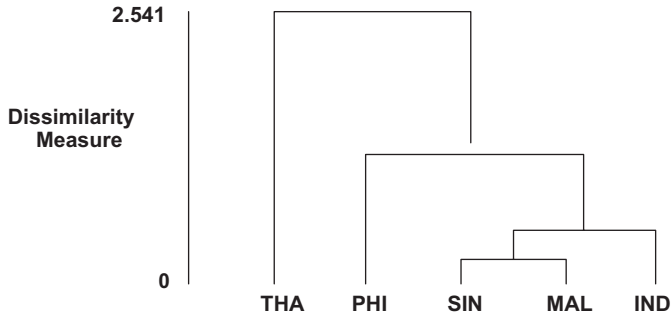
Region	Time period	Cluster one	Integration coefficient	Cluster two	Integration coefficient	Cluster three	Integration coefficient	Cluster four	Integration coefficient	Cluster five
ASEAN–5	1969-1984	Indonesia Malaysia Philippines Singapore	1.105	Thailand		–		–		–
	1985-1994	Malaysia Philippines Thailand Singapore	1.138	Indonesia		–		–		–
	1995-2009	Indonesia Malaysia Philippines Thailand	0.165	Singapore				–		–
ASEAN	1995-2009	Cambodia Indonesia Philippines Thailand Viet Nam	0.013	Malaysia	0.074	Lao People's Democratic Republic Myanmar	0.238	Singapore		
ASEAN+3	1995-2009	Cambodia China Indonesia Republic of Korea Philippines Thailand Viet Nam	0.012	Japan	0.604	Lao People's Democratic Republic Myanmar	0.217	Malaysia	0.071	Singapore

IV. RESULTS

The results of the hierarchical cluster analysis are presented in table 5. Additionally, figures 1 to 5 provide pictorial representations (dendrograms) of the resulting clusters.[6] The results of the cluster analysis are fairly consistent across the different ASEAN regional subgroups under consideration. For instance, in the 1970-1984 period, the ASEAN–5 countries form two clusters, one containing only Thailand, with the remaining ASEAN–5 members in the other cluster. Despite the expectation that the region would form a cluster comprising all five countries, thus justifying the establishment of ASEAN, there are various reasons for this particular division.

In the 1970s, the growth rate in Thailand was comparable to that of Malaysia. However, in 1981 and 1982, the country recorded negative growth rates, partially due to a global recession. In the early 1980s, Thailand's main trading partners were Japan, the United States, the European Union countries and Australia despite the preferential trade agreements with other ASEAN members. In addition, political instability stemming from a series of military coups in the late 1970s and early 1980s may also have contributed to the country's adverse economic situation.

Figure 1. Hierarchical cluster analysis – dendrogram for ASEAN–5 1970-1984

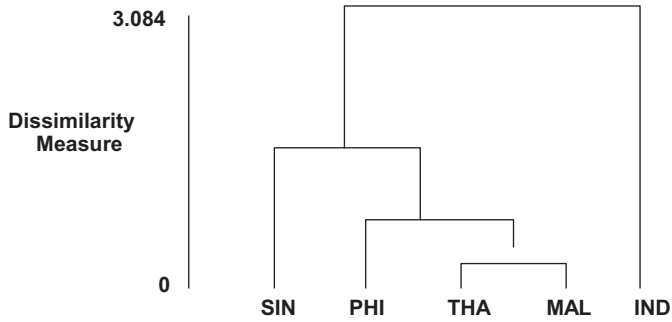


[6] All dendograms created with Microsoft Drawing following SPSS output.

Despite Thailand's economic downturn, exchange rates during this period were particularly steady (real exchange rate variability was 0.274) as a result of the baht being pegged at a rate of 20 baht per United States dollar. On the contrary, the average exchange rate variability in the other ASEAN–5 members was 52.3 per cent higher over the period, thus providing a further reason for the low correlation observed between Thailand and the remaining ASEAN–5 during the period 1970-1984.

Similarly, ASEAN–5 is also separated into two clusters for the period 1985-1994. This time, Indonesia is in a cluster of its own. The Thai economy picked up in the late 1980s despite continued political instability as the Government led by General Chatichai Choonhavan implemented a series of policy changes in 1988, which fuelled a rapid increase in GDP. Growth rates exceeding an average of 10 per cent over the period, second in the region only to Singapore, were realized. The exchange rate was also revalued in 1985 to 25 baht per United States dollar and exchange rate variability during the decade was more in line with Malaysia, the Philippines and Singapore.

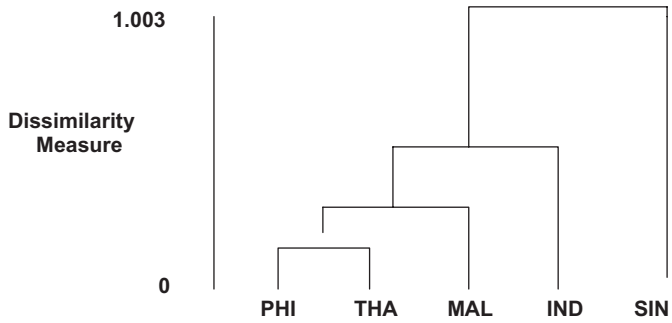
Figure 2. Hierarchical cluster analysis – dendrogram for ASEAN–5 1985-1994



By contrast, the Indonesian rupiah sustained two major devaluations in the period from 1985 to 1994, the first in 1983 and the second in 1986. Specifically, the exchange rate depreciated from 625 rupiah per United States dollar to 970 rupiah per United States dollar and 1,641 rupiah per United States dollar in 1983 and 1986, respectively. Financial market integration, when capital flows freely in the economy, was the lowest in the region, while inflation continued to be an issue for the troubled economy. Following a significant decline in petroleum prices in the mid-1980s, Indonesia realized the need to restructure its export market

away from oil and gas and towards manufacturing. As a result of these reforms, output in the manufacturing sector exceeded that of agriculture for the first time in 1991. This led to a sustained period of economic growth, although not at a level comparable to other countries in the region. Thus, it appears that high exchange rate variability, above average inflation rates and a low correlation of equity market returns, set Indonesia apart from the other ASEAN members in 1985-1994. The above average growth rates of Malaysia, Singapore and Thailand during this period were also a contributing factor.

Figure 3. Hierarchical cluster analysis – dendrogram for ASEAN–5 1995-2009

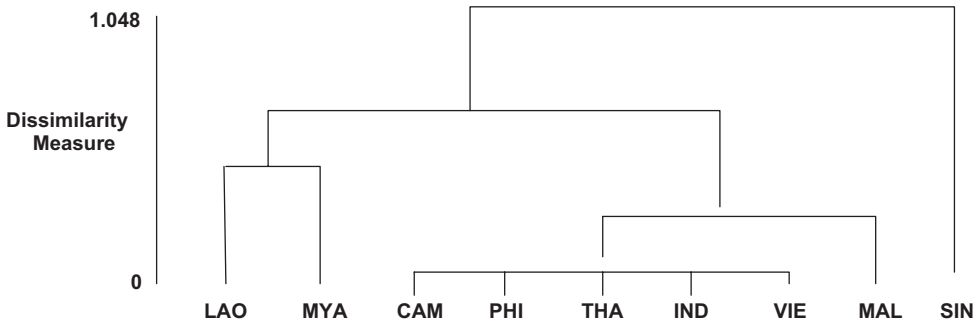


Due to similarities in the economic policies, Indonesia, the Philippines, Thailand and Malaysia are clustered together in the period 1995-2009, with Singapore forming its own individual cluster. In terms of real per capita GDP, Singapore has outperformed the main cluster by a considerable degree, in addition to sustaining a low, stable inflation rate and exchange rate.

On the contrary, Indonesia and Thailand were deeply affected by the financial crisis, which caused their GDP, inflation rates and exchange rates to suffer. The Philippines, although not as affected by the crisis, was still dealing with the repercussions of political instability in the 1980s, and a series of natural disasters in the 1990s further contributed to the country's poor economic situation. Malaysia, meanwhile, was significantly affected by the financial crisis, but the country recovered quickly with growth rates in 1999, almost reaching pre-crisis levels. Following the crisis, the Malaysian ringgit was pegged at a rate of 3.80 ringgits per United States dollar, creating a degree of exchange rate stability after a large currency depreciation in 1998. If not for the detrimental effect that the financial crisis had on the Malaysian economy, the country could have been clustered with Singapore.

The ASEAN region as a whole has been segregated into four clusters in the period 1995-2009. The groupings appear to have been determined along historical lines (at least for the three original ASEAN members), with Indonesia, the Philippines, Thailand, Viet Nam and Cambodia forming the first cluster. Viet Nam and Cambodia are two of the fastest growing economies in the Asian region. During

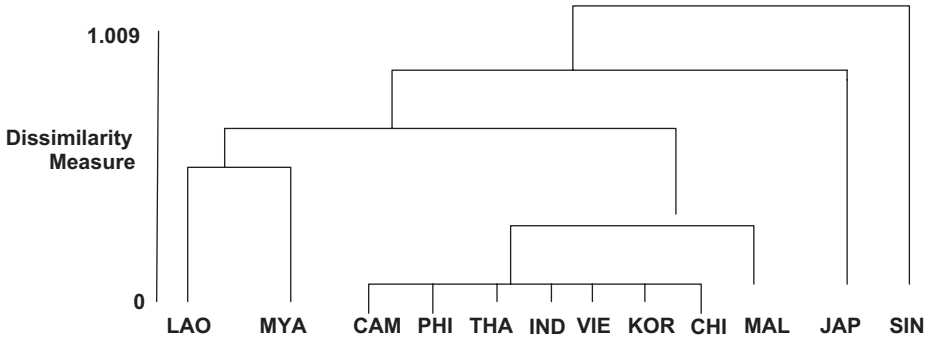
Figure 4. Hierarchical cluster analysis – dendrogram for ASEAN 1995-2009



2004-2007, Cambodia grew approximately 10 per cent per year, due largely to the export of garments. The Government of Viet Nam, on the other hand, continues to reaffirm its commitment to transforming the country into a market economy with a "socialist orientation", since the launching in 1986-1992 of the reform programme, *Doi Moi*, which literally means renovation. Hence, it is not surprising that since 1995, the country has been in a cluster with market economies such as Indonesia, the Philippines and Thailand. Although Malaysia is in a cluster of its own, it is not very dissimilar to the members of the first cluster as the integration index suggests. The Lao People's Democratic Republic and Myanmar form the third cluster most likely because both were ruled by military regimes, and have not fully adopted a market economy, but are catching up with the rest the ASEAN members. Singapore has again been separated from the ASEAN–5 to form its own individual cluster. The results show that although there are four clusters, the dissimilarity measure is very small.

When Japan, China and the Republic of Korea are included in the analysis, a similar breakdown occurs. This time, the original ASEAN member countries (except Singapore and Malaysia) are joined by Cambodia, China, the Republic of Korea and Viet Nam in the first cluster. It may appear surprising at first to see the Republic of Korea in this cluster, however, this is perhaps an after-affect of the

Figure 5. Hierarchical cluster analysis – dendrogram ASEAN+3 1995-2009



Legend:

CAM	Cambodia
LAO	Lao People's Democratic Republic
MYA	Myanmar
IND	Indonesia
VIE	Viet Nam
PHI	Philippines
THA	Thailand
CHI	China
KOR	Republic of Korea
MAL	Malaysia
JAP	Japan
SIN	Singapore

Asian financial crisis, which resulted in a sharp drop in the country's growth rate. Japan's economic performance since the early 1990s has been sluggish due to the bursting of asset and housing bubbles, making it logical that the country is in a cluster of its own. The Lao People's Democratic Republic and Myanmar again form a cluster together, while Malaysia and Singapore each form a cluster of their own. Although there are more clusters, the results still suggest that there is movement towards integration as the integration index has become much smaller through the years.

Table 6 reports the measure of the dissimilarity of each region obtained from the hierarchical cluster analysis. These results may be used as an informal indication of the depth of economic integration. From the table, it is clear that the dissimilarity between the ASEAN–5 countries has increased over the three decades in question. During the period 1995-2009, the ASEAN region as a whole possessed the least dissimilarities of the three regions examined.

Table 6. Measuring economic integration in ASEAN

Time Period	ASEAN–5	ASEAN	ASEAN+3
1970-1984	2.541	–	–
1985-1994	3.084	–	–
1995-2009	1.003	1.048	1.009

V. SUMMARY AND CONCLUSIONS

The hierarchical cluster analysis does not group the ASEAN–5 countries together in any time period. However, the establishment of ASEAN appears to be reasonable, as only Thailand is placed in an individual cluster during 1970-1984. The Thai baht was pegged to the U.S. dollar during this period, thus the nation exhibited very low exchange rate variability compared to the remaining ASEAN–5 countries. This is a key reason for the resultant division in countries. In all, political instability and the Asian financial crisis appear to be the predominant factors in explaining the resultant cluster compositions.

The hierarchical cluster analysis indicates that in the present period, ASEAN possesses a greater degree of economic integration than both ASEAN–5 and ASEAN+3. However, contrary to expectations, ASEAN–5 has become slightly less economically integrated over the past four decades (from 1969 to 2009), in particular with respect to Singapore, and to a much lesser extent, Malaysia. Again, this may be partly attributed to the unequal growth rates of member countries, with Singapore registering the highest growth rate over the period. Other factors that may have contributed to the slight decline in economic integration include: the 1970s global recession; extended periods of political instability within countries (particularly in the Philippines in the 1980s); and, the Asian financial crisis in 1997, which affected the member countries in varying degrees. The results suggest that there is a need for better cooperation among the original member countries in terms of aligning their economic policies, and perhaps a more cohesive regional plan of action, especially when facing a financial crisis. The crisis spread like a contagion in Asia, with many of the ASEAN members suffering, some more than others. Although the affected countries were able to rebound from this crisis rather quickly, within one to two years, perhaps a more coordinated regional effort, for example coming up with uniform banking transparency laws across the region, careful monitoring of macroeconomic variables, such as interest rates, private and government debt levels, exchange rates and inflation rates, could have helped prevent the crisis. An agreement, similar to the Stability and Growth Pact that Euro members adhere to,

could be drafted for ASEAN member countries. This would force member countries to keep their macroeconomic fundamentals aligned with each other, and if any of the countries were to stray out of line, other member countries could quickly give the erring country a warning before the problem escalates.

The division of the ASEAN region along historical lines in the 1995-2009 period suggests that Viet Nam and Cambodia are already integrated with the original members, while the Lao People's Democratic Republic and Myanmar have yet to be completely assimilated into the Association. This indicates that further effort from both the original and newer members of ASEAN to reaffirm their resolve to implement initiatives towards regional cooperation is imperative.

REFERENCES

Angresano, J. (2004). "European Union integration lessons for ASEAN+3: the importance of contextual specificity", *Journal of Asian Economics*, vol. 14, pp. 909-926.

Baxter, M. and Crucini, J. (1995). "Business cycles and asset structure of foreign trade", *International Economic Review*, vol. 36. pp. 821-854.

Ben-David, B. (1993). "Equalizing exchange: trade liberalization and income equalization", *Quarterly Journal of Economics*, vol. 108. pp. 653-679.

Buszynski, L. (1987). "ASEAN: a changing regional role", *Asian Survey*, vol. 27, No. 7, pp. 746-786.

Denoon, D.B.H. and E. Colbert (1999). "Challenges for the Association of Southeast Asian Nations (ASEAN)", *Pacific Affairs*, vol. 71, No. 4, pp. 505-523.

Duflou, H. and W. Maenhout (1990). "Application of principal component and cluster analysis to the study of the distribution of minor and trace elements in the normal human brain", *Chemometrics and Intelligent Laboratory Systems*, vol. 9, No. 3, pp. 273-286.

Everitt, B.S., S. Landau and M. Leese (2001). *Cluster Analysis* (New York, Arnold).

Florek, K., L. Lukaszewicz, L. Perkal, H. Steinhaus and S. Zorzchi (1951). "Sur la liaison et liaison et la. division des points d'un ensemble fini", *Colloquium Mathematicum*, vol. 2, pp. 282-285.

Gower, J.C. (1967). "A comparison of some methods of cluster analysis", *Biometrics*, vol. 23, No. 4, pp. 623-637.

Hands, S. and B.S. Everitt (1987). "A Monte Carlo study of the recovery of cluster structure in binary data by hierarchical clustering techniques", Multivariate Behavioral Research, vol. 22, No. 2, pp. 235-243.

Hussey, A. (1991). "Regional development and cooperation through ASEAN", *Geographical Review*, vol. 81, No.1, pp. 87-98.

Kurus, B. (1993). "Understanding ASEAN: benefits and raison d'etre", *Asian Survey*, vol. 33, No. 8, pp. 819-831.

Lim, L.K. (2005). "A dollar or yen currency union in East Asia", *Mathematics and Computers in Simulation*, vol. 68, No. 5-6, pp. 507-516.

Mojena, R. (1977). "Hierarchical grouping methods and stopping rules: an evaluation", *Computer Journal*, vol. 20, No. 4, pp. 359-363.

Ruland, J. (2000). "ASEAN and the Asian crisis: theoretical implications and practical consequences for Southeast Asian regionalism", *The Pacific Review*, vol. 13, No. 3, pp. 421-451.

Sokal, R.R. and C.D. Michener (1958). "A statistical method for evaluating systematic relationships", *University of Kansas Science Bulletin*, vol. 38, pp. 1409-1438.

Sorensen, T. (1948). "A method of establishing groups of equal amplitude in plant sociology based on similarities of species content and its application to analyses of the vegetation on Danish commons", *Biologiske Skrifter*, vol. 5, pp. 1-34.

Stubbs, R. (2000). "Signing on to liberalization: AFTA and the politics of regional economic cooperation", *The Pacific Review*, vol. 13, No. 2, pp. 297-318.

Venables, A.J. (2000). "International trade: regional economic integration", prepared for the *International Encyclopaedia of Social and Behavioural Sciences*, article 3.4 34, 1-16, accessed from http://econ.lse.ac.uk/staff/ajv/regenc2.pdf, on 20 May 2005.

Ward, J.H. (1963). "Hierarchical grouping to optimize an objective function", *Journal of the American Statistical Association*, vol. 58, No. 301, pp. 236-244.

Winters, L.A. and W. Chang (2000). "Regional integration and the prices of imports: an empirical investigation", *Journal of International Economics*, vol. 51, No. 2, pp. 363-377.

FINANCIAL DEPRESSION AND THE PROFITABILITY OF THE BANKING SECTOR OF THE REPUBLIC OF KOREA: PANEL EVIDENCE ON BANK-SPECIFIC AND MACROECONOMIC DETERMINANTS

*Fadzlan Sufian**

The paper provides new empirical evidence on factors that determine the profitability of the banking sector of the Republic of Korea. The empirical findings indicate that the banks of the Republic of Korea with high capitalization levels tend to have higher profitability levels. However, the impact of credit is consistently negative under both controlled and uncontrolled macroeconomic and financial conditions. Meanwhile, the effect of the business cycle towards the profitability of banks are mixed. On the one hand, inflation displays a pro-cyclical impact, while gross domestic product (GDP) has a counter-cyclical influence on the banks' profitability. The findings also indicate that the industry concentration of the national banking system has a positive as well as a significant effect on the banks. The study is based on data from the period 1994-2008. This period is broken down into 4 sub-periods, the tranquil period before the Asian financial crisis (1994-1996), the Asian financial crisis (1997-1998), the tranquil period between the Asian financial crisis and recent global financial crisis (1999-2008) and recent global crisis (2008). The impacts of both the Asian financial crisis and the recent global financial crisis are negative, while the banks have been relatively more profitable during both the tranquil periods.

JEL Classification: G21.

Key words: Banks, profitability, financial depression, Republic of Korea.

---

* Fadzian Sufian is Assistant Vice President of Khazanah Research and Investment Strategy, Khazanah Nasional Berhad, Malaysia and the Department of Economics and the Faculty of Economics and Management, Universiti Putra Malaysia. The author may be contacted at fadzlan.sufian@khazanah.com.my; fsufian@gmail.com. The author is thankful to the anonymous referees for their constructive comments and suggestions. The author is responsible for any remaining errors.

I. INTRODUCTION

Major structural changes have occurred in the banking sector of the Republic of Korea following the Asian financial crisis in 1997, when the country suffered severe economic damage. The transformation is the result of a comprehensive financial reform programme agreed upon by the Government of the Republic of Korea and the International Monetary Fund (IMF). Under the reform programme, for example, five commercial banks were liquidated, with their assets and liabilities were transferred to stronger banks under a purchase and assumption (P&A) arrangement. This came on the heels of an evaluation conducted by the Financial and Supervisory Commission (FSC), which found them to be unviable. In other cases, Commercial Bank and Hanil Bank, were conditionally approved for restructuring by the FSC and then merged into one bank, and Korea First Bank and Seoul Bank, both declared insolvent, were recapitalized by the Government and later sold to foreign banks.

Since the Asian financial crisis, corporate governance in the country's banking sector has also improved dramatically and various financial deregulation measures have been introduced. The ownership and governance structure of commercial banks has been changed extensively by a series of amendments to the Banking Act.[1] In addition, new standards have been implemented to better protect shareholders' rights. The limit of a 4 per cent corporate ownership ceiling for foreign investors has been lifted and most of the regulations concerning foreign banks have been abolished.[2]

Yet, a decade after the Asian financial crisis, the banking sector of the Republic of Korea is currently under threat of escalating into a deeper crisis. The global financial turmoil, which started in mid-2008, is posing serious challenges to the export-driven economy. If the crisis is not managed well, the problem could worsen and the economy of the Republic of Korea could succumb into a much more serious crisis than what it experienced during the Asian financial crisis.

---

[1] The Banking Act (Republic of Korea) was enacted on 5 May 1950, as Act No. 911, in order to contribute to the stability of the financial markets and the development of the national economy by ensuring the sound operation of banks: by elevating the efficiency of their financial intermediary functions; by protecting the depositors; and by maintaining orderly credit transactions. Following the Asian financial crisis, the Act was amended three times during 1998-1999. Interested readers can get detailed information on the Banking Act from http://www.moleg.go.kr/english/.

[2] One of the notable changes in financial market of the Republic of Korea in recent years is the increasing ownership by foreign investors. The share of total market capitalization of foreigners' shareholdings has steadily risen and totalled more than 40 per cent in January 2004. In addition to the above examples, Kookmin Bank is a 74 per cent foreign-held bank.

It is reasonable to assume that these developments are posing significant challenges to the financial institutions in the Republic of Korea as the rapid transformation of the sector has affected the determinants of their profitability. This relates to comments by Golin (2001), who points out that in a competitive environment, banks must make adequate earnings in order to remain solvent, survive, grow, and prosper.

As the banking sector is the backbone of the economy of the Republic of Korea, and plays an important financial intermediary role, its health is very critical to the overall health of the economy. Given the relationship between the well-being of the banking sector and the growth of the economy (Rajan and Zingales, 1998; Levine, 1998; Levine and Zervos, 1998; Cetorelli and Gambera, 2001; Beck and Levine, 2004), knowledge of the underlying factors that influence the banking sector's profitability is therefore essential not only for bank managers but for the numerous stakeholders, such as the central banks, bankers associations, government agencies, and other financial authorities. Familiarity with these factors would also serve as an useful tool for regulatory authorities and bank managers when formulating policies aimed at improving the profitability of the country's banking sector.

By using an unbalanced bank level panel data,[3] this study seeks to examine the determinants of profitability for banks of the Republic of Korea during the period 1994-2008, which is characterized as a time of significant reform amid a plethora of challenges to the country's financial sector. While there has been extensive literature examining the profitability of financial sectors in developed countries, empirical studies on factors that influence the performance of financial institutions in developing economies are relatively scarce.

This paper is structured as follows. The next section reviews the related studies. The following section outlines the econometric framework. Section IV reports the empirical findings. Finally, section V concludes the paper and offers avenues for future research.

II. RELATED STUDIES

The empirical literature on bank profitability has mainly focused on the banking system of the United States of America (Berger, 1995; Angbazo, 1997;

[3] During the period under study, some of the banks that existed at the start of the study became insolvent prior the end date of the study period. Instead of removing the observations of these banks, we have included them in the analysis whenever possible, such as until the last year these banks existed before they failed or merged.

DeYoung and Rice, 2004; Stiroh and Rumble, 2006; Hirtle and Stiroh, 2007) and the banking systems of other developed countries such as New Zealand (To and Tripe, 2002), Australia (Williams, 2003) and Greece (Pasiouras and Kosmidou, 2007; Kosmidou and others, 2007; Athanasoglou and others, 2008; Kosmidou and Zopounidis, 2008).

In contrast, there have been only a limited number of studies on bank profitability in developing economies. Guru and others (2002), for example, have investigated the determinants of bank profitability in Malaysia, based on a sample of 17 commercial banks during the period 1986-1995. The profitability determinants are divided into two main categories, namely the internal determinants, liquidity, capital adequacy, and expenses management, and the external determinants, ownership, firm size, and economic conditions. The findings show that efficient management of expenses is a significant factor behind high bank profitability. The results also indicate that among macro indicators, a high interest ratio is associated with low bank profitability and inflation has a positive effect on bank performance.

In another study, Chantapong (2005) investigates the performance of domestic and foreign banks in Thailand during the period 1995-2000. The results show that the banks, both domestic and foreign, reduced their credit exposure during the crisis years and have gradually improved their profitability during the post-crisis years. The results also indicate that the average profitability of the foreign banks is higher than the average profitability of the domestic banks. However, of note, during the post-crisis period, the gap between foreign and domestic bank profitability has narrowed, suggesting that the financial restructuring programme[4] has yielded some positive results.

Meanwhile, Ben Naceur and Goaied (2008) have examined the impact of bank characteristics, financial structure and macroeconomic conditions on the net-interest margins and profitability of Tunisian banks during the period 1980-2000. Their results suggest that banks with a relatively high amount of capital and higher overhead expenses tend to have higher net-interest margins and profitability levels, while size is negatively related to bank profitability. During the period under study, they have found that stock market development has had a positive impact on bank profitability. The empirical findings also suggest that private banks are relatively

[4] The restructuring programme involved two main strategies. In the first strategy, several ailing financial institutions were nationalized or merged with other Thai commercial banks or acquired by foreign banks. In the second strategy, the banking sector was re-capitalized by relaxing regulations on foreign shareholding limits of Thai commercial banks. Thai authorities allowed foreign investors to hold more than 49 per cent of the shares in Thai banking markets for up to ten years, as against the 25 per cent foreign shareholding limit before the Asian financial crisis.

more profitable than their state-owned counterparts, and that macroeconomic conditions have had an impact on the profitability of Tunisian banks.

In a working paper, Ben Naceur and Omran (2008) analyse the influence of bank regulations, concentration of bank assets, and financial and institutional development on Middle East and North Africa (MENA) countries commercial banks margin and profitability during the period 1989-2005. The paper finds that bank-specific characteristics, in particular capitalization and credit risk, have positive effects on the net interest margin, cost efficiency and profitability of banks. On the other hand, the paper indicates that macroeconomic and financial development indicators have no significant impact on bank performance.

More recently, Sufian and Habibullah (2009) investigated the determinants of the profitability of the Chinese banking sector during the post-reform period of 2000–2005.[5] They found that liquidity, credit risk and capitalization positively affected the profitability of state-owned commercial banks, while the impact of overhead costs had negative effects on the banks' results. As for commercial banks, their research indicated that joint stock commercial banks with higher credit risk tended to be more profitable, while higher costs cut into the profits of lower joint stock commercial banks. Size and higher costs were also found to be factors behind the lower profit levels of city commercial banks that were not well capitalized, while on the other hand, the more diversified and relatively better capitalized city commercial banks were found to have exhibited higher profitability levels. The researchers' findings also indicate that the impact of economic growth was positive, while growth in money supply was negatively related to the state-owned commercial banks and city commercial banks' profitability levels.

III. DATA AND METHODOLOGY

The bank-specific variables used in this paper are from the financial statements of a sample of commercial banks operating in the Republic of Korea during the period 1994-2008 available in the Bankscope database of Bureau van Dijk. The macroeconomic variables are from the International Financial Statistics (IFS) database of the International Monetary Fund (IMF). Due to the consolidation

[5] The China banking sector has undergone a series of financial sector reforms. The first wave of reforms was in 1979 with the establishment of a two-tier banking system. The system comprised primarily a central bank and four specialized banks that are owned fully by the central government. The second wave of financial reform launched in 1994 involves commercialization of specialized banks, the separation between policy and commercial lending activities and management of non-performing loans.

and exit of banks during the past decade, the number of commercial banks in the sample vary from 35 in 1994 to 17 in 2008, totalling 369 bank year observations.[6]

Performance measure

In the study, bank profitability, typically measured by the return on assets (ROA) and/or the return on equity (ROE), is usually expressed as a function of internal and external determinants. Internal determinants are factors that are mainly influenced by the management decisions and policy objectives of a bank. Such profitability determinants are the level of liquidity, provisioning policy, capital adequacy, expenses management and bank size. On the other hand, the external determinants, both industry- and macroeconomic-related, are variables that reflect the economic and legal environments where the financial institution operates.

Following Sufian and Habibullah (2009), Ben Naceur and Goaied (2008), and Kosmidou (2008) among others, ROA is the dependent variable used in the study. This variable shows the profit earned per dollar of assets and most importantly reflects management's ability to utilize the financial and real investment resources of the bank to generate profits (Hassan and Bashir, 2003). For any bank, ROA depends on the bank's policy decisions as well as uncontrollable factors relating to the economy and government regulations. Rivard and Thomas (1997) suggest that bank profitability is best measured by ROA given that this indicator is not distorted by high equity multipliers, and represents a better measure of the ability of the firm to generate returns on its portfolio of assets. ROE, on the other hand, reflects how effectively the management of a bank is utilizing its shareholders' funds. Since ROA tends to be lower for financial intermediaries, most banks utilize financial leverage heavily to increase ROE to competitive levels (Hassan and Bashir, 2003).

Internal determinants

The bank-specific variables included in the regression models are LNTA (log of total assets), LOANS/TA (total loans divided by total assets), LLP/TL (loans loss provisions divided by total loans), NII/TA (non-interest income divided by total assets), NIE/TA (total overhead expenses divided by total assets), LNDEPO (log of total deposits) and EQASS (book value of stockholders' equity as a fraction of total assets).

[6] The total number of observations which are available for each bank in terms of years. For example, Bank A has observations for years 1994, 1995, 1996, and 1997 only. So, the total number of bank-year observations is 4. On the other hand, Bank B has observations for the whole sample period, giving it a total of 15. In sum, the total number of bank year observations for. Bank A + Bank B is 4 + 15 = 19.

The LNTA variable is included in the regression as a proxy of size. It is used to capture the possible cost advantages associated with size (economies of scale). A positive relationship between size and bank profitability can be expected if there are significant economies of scale (Akhavein and others, 1997; Bourke, 1989; Molyneux and Thornton, 1992; Bikker and Hu, 2002; Goddard and others, 2004). However, other researchers have found that only marginal cost savings can be achieved by increasing the size of the banking firm (Berger and others, 1987; Boyd and Runkle, 1993; Miller and Noulas, 1997; Athanasoglou and others, 2008). In essence, the impact of size on bank performance remains inconclusive.

Liquidity risk, arising from the possible inability of banks to accommodate decreases in liabilities or to fund increases on the asset side of the balance sheet, is considered an important determinant of bank profitability. The loan market, especially credit to households and firms, is risky, and has a greater expected return than other bank assets, such as government securities. Thus, there is generally a positive relationship between liquidity (LOANS/TA) and profitability (Bourke, 1989). However, in some cases, higher profits are expected if less funds are tied up in liquid investments (Eichengreen and Gibson, 2001).[7]

The ratio of loan loss provisions to total loans (LLP/TL) is incorporated as an independent variable in the regression analysis as a proxy of credit risk. The coefficient of LLP/TL is expected to be negative because bad loans generally reduce profitability. In this direction, Miller and Noulas (1997) suggest for financial institutions, greater exposure in high risk loans leads to a higher accumulation of unpaid loans and consequently, lower profitability. Miller and Noulas (1997) also indicate that declines in loan loss provisions are in many instances the primary catalyst for increases in profit margins. Furthermore, Thakor (1987) suggests that a bank's level of loan loss provisions is an indication of its asset quality and signals changes in the future performance.

To recognize that financial institutions in recent years have increasingly been generating income from "off-balance sheet" business, particularly income from stock market trading and derivative financial instruments, and fee income, such as service charges and guarantee fees, the ratio of non-interest income over total assets (NII/TA) is entered in the regression analysis. Non-interest income consists of commissions, service charges and fees, guarantee fees, net profit from sale of investment securities and foreign exchange profit. The ratio is also included in the regression model as a proxy measure of bank diversification into non-traditional

[7] Although a higher loan to total assets ratio implies higher interest revenue because of the higher risk, bank loans have high operational costs because they need to be originated, serviced, and monitored.

activities. The variable is expected to exhibit a positive relationship with bank profitability.

The ratio of overhead expenses to total assets (NIE/TA) is used to provide information on the variations of bank operating costs. The variable represents the total amount of wages and salaries, as well as the costs of running branch office facilities. For the most part, the paper argues that reduced expenses improve the efficiency of an operation and hence, raises the profitability of a financial institution, implying a negative relationship between the operating expenses ratio and profitability (Bourke, 1989). However, Molyneux and Thornton (1992) observes a positive relationship, suggesting that high profits earned by firms may be appropriated in the form of higher payroll expenditures paid to more productive human capital.

The variable LNDEPO is included in the regression model as a proxy variable for network embeddedness. For the most part, banks with large branch networks are able to attract more deposits, a relatively cheap source of funds. Earlier studies, by among others Chu and Lim (1998), point out that large banks tend to attract more deposits and loan transactions, and in the process command larger interest rate spreads, while the smaller banking groups generally have smaller deposits and need to resort to purchasing funds in the inter-bank market, which is costlier (Lim and Randhawa, 2005). However, Lim and Randhawa (2005) also suggest that due to their small deposit bases, small banks have less deposits to transform into loans, giving them higher efficiency levels compared to their larger counterparts.

EQASS is included in the regressions to examine the relationship between profitability and bank capitalization. Even though leverage (capitalization) is deemed to be important in explaining the performance of financial institutions, its impact on bank profitability is ambiguous. As lower capital ratios suggest a relatively risky position, a negative coefficient on this variable seems plausible (Berger, 1995). However, it could be the case that higher levels of equity would decrease the cost of capital, leading to a positive impact on bank profitability (Molyneux, 1993). Moreover, an increase in capital may raise expected earnings by reducing the expected costs of financial distress, including bankruptcy (Berger, 1995).

External determinants

Bank profitability is sensitive to macroeconomic conditions despite the industry trend towards greater geographic diversification and larger use of financial engineering techniques to manage risk associated with business cycle forecasting. Generally, higher economic growth encourages banks to lend more and permits them to charge higher margins. It also improves the quality of banks' assets. Neely and Wheelock (1997) use per capita income and suggest that this variable exerts

a strong positive effect on bank earnings. Demirgüç-Kunt and Huizinga (2001) and Bikker and Hu (2002) identify possible cyclical movements in bank profitability, to the extent to which bank profits are correlated with the business cycle. Their findings suggest that this correlation exists, although the variables used are not direct measures of the business cycle.

To measure the relationship between economic and market conditions and bank profitability, LNGDP (natural log of GDP), INFL (the rate of inflation), CR3 (the ratio of the three largest banks' assets), MKTCAP (the ratio of the stock market capitalization over GDP), DUMTRAN1 (dummy variable that takes a value of 1 for the first tranquil (pre-crisis) period, 0 otherwise), DUMCRIS (dummy variable that takes a value of 1 for the crisis period, 0 otherwise), and DUMTRAN2 (dummy variable that takes a value of 1 for the second tranquil (post-crisis) period, 0 otherwise) are used.

GDP is among the most commonly used macroeconomic indicators to measure total economic activity within an economy. The GDP of an economy is expected to influence numerous factors related to the supply and demand for loans and deposits. Favourable economic conditions also positively affect the demand and supply of banking services. Another important macroeconomic condition, which may affect both the costs and revenues of banks is the inflation rate (INFL). Staikouras and Wood (2003) point out that inflation may have direct effects (e.g. increase in the price of labour) and indirect effects (e.g. changes in interest rates and asset prices on the profitability of banks) on the operations of a bank. Perry (1992) suggests that the effects of inflation on a bank's performance depend on how accurately the inflation is projected. If the projection is accurate, interest rates are adjusted accordingly, enabling revenues to increase faster than costs, which subsequently have a positive impact on bank profitability. On the other hand, if the projection is off the mark, banks may be slow in adjusting their interest rates, resulting in bank costs increasing faster than bank revenues and ultimately cutting into profitability. Earlier studies by Bourke (1989), Molyneux and Thornton (1992) and, Demirgüç-Kunt and Huizinga (1999), among others, have found a positive relationship between inflation and bank performance.

The CR3 variable measured as the concentration ratio of the three largest banks in terms of assets is entered in the regression models as a proxy variable for the banking sector concentration. According to the industrial organization literature, a positive impact is expected under both views (i.e. the collusion and the efficiency views) (Goddard and others, 2001).[8]

[8] Interested readers can refer to an excellent book by Bikker and Bos (2008) for detailed discussions.

MKTCAP is introduced in the regression model to reflect the complementarity or substitutability between bank and stock market financing. Demirgüç-Kunt and Huizinga (1999) have found that stock market capitalization to bank assets is negatively related to bank margins and suggest that relatively well developed stock markets can serve as an alternative to banks for obtaining funds. This variable is expected to be negatively related to bank performance.

To capture the impact of the Asian financial crisis and the recent global financial crisis on the profitability of the banking sector of the Republic of Korea, DUMTRAN1, DUMCRIS, DUMTRAN2, and DUMCRIS2 are introduced in regression models 3, 4, 5, and 6, respectively. The banking sector of the Republic of Korea, has exhibited higher profitability levels during both the tranquil periods (i.e. DUMTRAN1 and DUMTRAN2), while DUMCRIS and DUMCRIS2 are expected to exhibit a negative relationship with the profitability of the banks of the Republic of Korea.

Table 1 lists the variables used to proxy profitability and its determinants. It also includes the notation and the expected effect of the determinants according to the literature.

Table 1. Description of the variables used in the regression models

Variable	Description	Hypothesized relationship with profitability
Dependent		
ROA	The return on average total assets of bank *j* in year *t*.	NA
Independent		
	Internal Factors	
LNTA	The natural logarithm of the accounting value of the total assets of bank *j* in year *t*.	+/-
LOANS/TA	A measure of liquidity, calculated as total loans/ total assets. The ratio indicates what percentage of the assets of the bank is tied up in loans in year *t*.	+
LLP/TL	Loan loss provisions/total loans. An indicator of credit risk, which shows how much a bank is provisioning in year *t* relative to its total loans.	-
NII/TA	A measure of diversification and business mix, calculated as non-interest income/total assets of bank *j* in year *t*.	+

Table 1. *(continued)*

Variable	Description	Hypothesized relationship with profitability
NIE/TA	Calculated as non-interest expense/total assets and provides information on the efficiency of the management regarding expenses relative to the assets in year *t*. Higher ratios imply a less efficient management.	-
LNDEPO	LNDEPO is a proxy measure of network embeddedness, calculated as the log of total deposits of bank *j* in year *t*.	+/-
EQASS	A measure of bank *j*'s capital strength in year *t*, calculated as equity/total assets. High capital asset ratio is assumed to be indicator of low leverage and therefore lower risk.	+
	External factors	
LNGDP	Natural logarithm of gross domestic products.	+/-
ΔGDP	The change real in gross domestic products.	+/-
INFL	The annual inflation rate.	+/-
CR3	The three largest banks asset concentration ratio.	+/-
MKTCAP	The ratio of stock market capitalization. The variable serves as a proxy of financial development.	-
DUMTRAN1	Dummy variable that takes a value of 1 for the first tranquil (pre crisis) period, 0 otherwise.	+
DUMCRIS	Dummy variable that takes a value of 1 for the first crisis period (i.e. 1997-1998), 0 otherwise.	-
DUMTRAN2	Dummy variable that takes a value of 1 for the second tranquil (post crisis) period, 0 otherwise.	+
DUMCRIS2	Dummy variable that takes a value of 1 for the second crisis period (2007-2008), 0 otherwise.	-

Table 2 presents the summary of statistics of the dependent and the explanatory variables.

Table 2. Summary of statistics of the dependent and explanatory variables

	ROA	LNTA	LOANS/ TA	LLP/ TL	NII/ TA	NIE/ TA	LNDEPO	EQASS	LNGDP	INFL	CR3	MKTCAP/ GDP
Mean	0.201	12.879	25.437	1.194	0.754	1.456	12.476	2.498	13.328	3.741	0.389	0.490
Min	-8.530	4.780	0.197	-0.108	-0.610	0.009	4.545	-12.950	12.967	1.400	0.243	0.180
Max	10.970	19.047	93.454	21.110	18.870	17.990	18.724	27.940	13.968	6.600	0.533	1.071
Std. Dev.	1.272	3.628	30.770	2.819	1.996	2.391	3.564	3.705	0.264	1.424	0.102	0.226

Note: The table presents the summary statistics of the variables used in the regression analysis.

Econometric specification

To test the relationship between bank profitability and the bank-specific and macroeconomic determinants described earlier, we estimate a linear regression model in the following form:

$$Y_{jt} = \delta_t + \alpha'_{jt} X_{ijt} + \alpha'_{it} X_{et} + \varepsilon_{jt} \quad (1)$$

where j refers to an individual bank; t refers to year; Y_{jt} refers to the ROA and is the observation of bank j in a particular year t; X_i represents the internal factors (determinants) of a bank; X_e represents the external factors (determinants) of a bank; ε_{jt} is a normally distributed disturbance term. We apply the least square method of the fixed effects (FE) model, where the standard errors are calculated by using White's (1980) transformation to control for cross section heteroscedasticity. The fixed effects model was used instead of a random effects model based on the results of the Hausman test.[9]

Extending equation (1) to reflect the variables as described in table 1, the baseline model is formulated as follows:

$$\text{ROA}_{jt} = \delta_0 + \alpha_1 \text{LNTA}_{jt} + \alpha_2 \text{LOANS/TA}_{jt} + \alpha_3 \text{LLP/TL}_{jt} + \alpha_4 \text{NII/TA}_{jt} + \alpha_5 \text{NIE/TA}_{jt} + \alpha_6 \text{LNDEPO}_{jt} + \alpha_7 \text{EQASS}_{jt}$$

[9] The Hausman test determines whether using random effects would be consistent and efficient. In essence, if the Hausman test statistic is large, the use of the fixed effects over the random effects regression model would be more efficient. On the other hand, if the statistic is small, the random effects regression model should be used.

$$+ \beta_1 \text{LNGDP}_t + \beta_2 \text{INFL}_t + \beta_3 \text{CR3}_t + \beta_4 \text{MKTCAP}_t$$
$$+ \beta_5 \text{DUMTRAN1} + \beta_6 \text{DUMCRIS} + \beta_7 \text{DUMTRAN2} + \beta_8 \text{DUMCRIS2}$$
$$+ \varepsilon_{jt} \quad (2)$$

Table 3 provides information on the degree of correlation between the explanatory variables used in the multivariate regression analysis. The matrix shows that in most cases the correlation between the bank-specific variables is not strong, suggesting that multicollinearity problems are not severe or non-existent. Kennedy (2008) points out that multicollinearity is a problem when the correlation is above 0.80. However, it is worth noting that the correlations between LNDEPO and LNTA and LOANS/TA variables are relatively high. On a similar note, the correlation between LNGDP and CR3 is also high. To address this concern, we have removed the LNDEPO and CR3 variables from the regression models and repeated equation 2. The empirical findings do not qualitatively change the results. Therefore, we have not reported the regression results in the report. The results, however, are available upon request.

IV. EMPIRICAL FINDINGS

It is in the public interest to know what banks can do to improve their profitability so that scarce resources are allocated to their best uses and not wasted during the production of services and goods (Isik and Hassan, 2003). For this purpose, we investigate whether any aspects of the banks are related to the banks' degree of profitability. In the analysis we discuss the performance of the banking sector of the Republic of Korea based on the results derived from a series of parametric and non-parametric tests. Afterwards, we discuss the results derived from a multivariate regression setting.

The performance of the banking sector of the Republic of Korea: A univariate setting

To examine the difference in the relative performance of the banking sector of the Republic of Korea, during the first and second tranquil periods, we have performed a series of parametric (*t*-test) and non-parametric (Mann-Whitney [Wilcoxon] and Kruskall-Wallis) tests. The results are presented in table 4, which show that on average the banking sector has been relatively more profitable during the first tranquil period of 1994-1996 compared to the second tranquil period of 1999-2008. The findings suggest that the banking sector had been relatively larger and disbursed a lower amount of loans (16.115 < 28.000) during the second tranquil

Table 3. Correlation matrix for the explanatory variables

Independent Variables	LNTA	LOANS/TA	LLP/TL	NII/TA	NIE/TA	LNDEPO	EQASS	LNGDP	INFL	CR3	MKTCAP
LNTA	1.000	-0.815**	-0.512**	-0.416**	-0.658**	0.995**	-0.711**	-0.447**	0.159**	-0.291**	-0.412**
LOANS/TA		1.000	0.434**	0.347**	0.626**	-0.815**	0.742**	0.671**	-0.248**	0.436**	0.593**
LLP/TL			1.000	0.574**	0.665**	-0.510**	0.385**	0.143**	-0.025	0.054	0.165**
NII/TA				1.000	0.824**	-0.423**	0.356**	0.027	0.037	-0.036	0.020
NIE/TA					1.000	-0.661**	0.473**	0.195**	-0.011	0.069	0.161**
LNDEPO						1.000	-0.720**	-0.430**	0.137**	-0.264**	-0.398**
EQASS							1.000	0.521**	-0.188**	0.324**	0.506**
LNGDP								1.000	-0.504**	0.843**	0.747**
INFL									1.000	-0.704**	-0.755**
CR3										1.000	0.674**
MKTCAP											1.000

Notes: The table presents the results from Spearman ρ correlation coefficients. The notation used in the table below is defined as follows: LLP/TL is a measure of bank risk calculated as the ratio of total loan loss provisions divided by total loans; NII/TA is a measure of bank diversification towards non-interest income, calculated as total non-interest income divided by total assets; NIE/TA is a proxy measure for management quality, calculated as personnel expenses divided by total assets; LOANS/TA is used as a proxy measure of loans intensity, calculated as total loans divided by total assets; LNTA is a proxy measure of size, calculated as a natural logarithm of total bank assets; LNDEPO is a proxy measure of network embeddedness, calculated as the log of total deposits; EQASS is a measure of capitalization, calculated as book value of shareholders equity as a fraction of total assets; LNGDP is natural log of gross domestic products; INFL is the rate of inflation; CR3 is the three bank concentration ratio; MKTCAP is the ratio of stock market capitalization divided by GDP.

** and * indicates significance at 1% and 5% levels respectively.

period (statistically significant at the 1 per cent level under both the parametric *t*-test and non-parametric Mann-Whitney [Wilcoxon] and Kruskall-Wallis tests).[10]

Table 4 indicates that credit risk of banks of the Republic of Korea has been lower during the first tranquil period (1.132 < 1.417) and is statistically significant at the 1 per cent level under the non-parametric Mann-Whitney [Wilcoxon] and Kruskall-Wallis tests. We also find that Korean banks have derived a higher proportion of income from non-interest sources during the second tranquil period (0.790 > 0.744), but this result is not statistically significant at any conventional levels under both the parametric *t*-test and non-parametric Mann-Whitney [Wilcoxon] and Kruskall-Wallis tests.

It is also apparent that the banking sector of the Republic of Korea incurs lower overhead expenses (1.368 < 1.481), but has better network embeddedness (12.892 > 12.362) during the second tranquil period. Of note, the banking sector seems to be relatively better capitalized during the first tranquil period, but is not statistically significant at any conventional levels under both the parametric *t*-test or the non-parametric Mann-Whitney [Wilcoxon] and Kruskall-Wallis tests.

Table 4. Summary of parametric and non-parametric tests

Individual tests	Test groups				
	Parametric test t-test		Non-parametric Test Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test
Test satistics	*t* (Prb > *t*)		*z* (Prb > *z*)		χ^2 (Prb > χ^2)
	Mean	*t*	*Mean rank*	*z*	
ROA					
Pre-crisis	0.22332		195.51		
Post-crisis	0.12205	0.650	204.73	-0.661	0.437
LNTA					
Pre-crisis	12.71818		193.51		
Post-crisis	13.46369	-1.682*	212.00	-1.326	1.757

[10] The Mann-Whitney test determines whether two groups differ from each other based on ranked scores, while the Kruskall-Wallis test determines whether the distribution of the two groups is the same by comparing the sum of ranks in the groups.

Table 4. ***(continued)***

Individual tests	Test groups				
	Parametric test t-test		Non-parametric Test Mann-Whitney [Wilcoxon Rank-Sum] test		Kruskall-Wallis Equality of Populations test
Test satistics	*t* (Prb > *t*) *Mean*	*t*	*z* (Prb > *z*) *Mean rank*	*z*	χ^2 (*Prb* > χ^2)
LOANS/TA					
Pre-crisis	28.00109		213.58		
Post-crisis	16.11527	3.190***	139.06	-5.342***	28.542***
LLP/TL					
Pre-crisis	1.13160		196.54		
Post-crisis	1.41721	-0.787	140.52	-4.104***	16.844***
NII/TA					
Pre-crisis	0.74393		194.60		
Post-crisis	0.79013	-0.189	208.05	-0.965	0.931
NIE/TA					
Pre-crisis	1.48060		195.02		
Post-crisis	1.36846	0.383	206.52	-0.825	0.680
LNDEPO					
Pre-crisis	12.36165		194.69		
Post-crisis	12.89214	-1.216	207.70	-0.932	0.869
EQASS					
Pre-crisis	2.60559		196.50		
Post-crisis	2.10715	1.099	201.12	-0.331	0.109

Note: Test methodology follows, among others, Aly and others (1990), Elyasiani and Mehdian (1992), and Isik and Hassan (2002). Parametric (*t*-test) and non-parametric (Mann-Whitney and Kruskall-Wallis) tests determine the null hypothesis of equal mean between the two models.

***, **, * indicates significance at the 1%, 5%, and 10% levels respectively.

Determinants of bank profitability: a multivariate analysis

The regression results that focus on the relationship between bank profitability and the explanatory variables are presented in table 5. To conserve space, the full regression results, which include both bank and time specific fixed effects, are not reported in the paper. However, several general comments regarding the test results are warranted. The model performs reasonably well with most variables remaining stable across the various regressions tested. The explanatory power of the models is also reasonably high, while the *F*-statistics for all models is significant at the 1 per cent level.

Table 5. Panel fixed effects regression results

	(1)	(2)	(3)	(4)	(5)	(6)
CONSTANT	-0.2045 (-0.1253)	10.6667** (2.4638)	9.4260* (1.8233)	10.9710** (2.4152)	10.452*** (2.6452)	7.9355* (1.6767)
Bank characteristics						
LNTA	-0.1241 (-0.4550)	-0.1891 (-0.6488)	-0.1963 (-0.6814)	-0.1746 (-0.5931)	-0.1560 (-0.5062)	-0.1315 (-0.4064)
LOANS/TA	-0.0068 (-0.7952)	-0.0019 (-0.2347)	-0.0018 (-0.2179)	-0.0009 (-0.1113)	-0.0014 (-0.1766)	-0.0021 (-0.2612)
LLP/TL	-0.2900** (-2.0239)	-0.2889** (-2.0145)	-0.2868** (-1.9992)	-0.2888** (-2.01610)	-0.2908** (-2.0046)	-0.2912** (-2.0022)
NII/TA	-0.0723 (-0.2468)	-0.0601 (-0.2060)	-0.0590 (-0.2027)	-0.0588 (-0.2013)	-0.0581 (-0.1985)	-0.0550 (-0.1891)
NIE/TA	0.0840 (0.3147)	0.0818 (0.3075)	0.0809 (0.3049)	0.0806 (0.3030)	0.0816 (0.3059)	0.0819 (0.3073)
LNDEPO	0.1375 (0.6600)	0.2264 (0.9234)	0.2364 (0.9864)	0.2165 (0.8724)	0.1954 (0.7441)	0.1705 (0.6196)
EQASS	0.3176*** (2.8281)	0.3204*** (2.8768)	0.3180*** (2.8607)	0.3188*** (2.8462)	0.3199*** (2.8532)	0.3183*** (2.8540)
Economic and market conditions						
LNGDP		-0.9276*** (-2.8250)	-0.8367** (-2.1751)	-0.9551*** (-2.7771)	-0.9193*** (-3.0298)	-0.7271** (-2.1489)
INFL		0.0901*** (2.9329)	0.0788** (2.2774)	0.0958*** (2.6848)	0.1023*** (3.1168)	0.0985*** (3.1688)

Table 5. ***(continued)***

	(1)	(2)	(3)	(4)	(5)	(6)
CR3		1.4641**	1.6143**	1.5027**	1.3957**	1.4202**
		(2.0107)	(2.3072)	(2.2746)	(1.9491)	(2.0018)
MKTCAP/GDP		0.3657	0.2764	0.2801	0.3769	0.4167*
		(1.5364)	(1.0414)	(1.0024)	(1.5989)	(1.7710)
DUMTRAN1			0.1153			
			(1.1923)			
DUMCRIS				-0.0958		
				(-1.2659)		
DUMTRAN2					0.0587	
					(0.7215)	
DUMCRIS2						-0.1647
						(-1.3198)
R^2	0.6655	0.6727	0.6736	0.6734	0.6730	0.6736
Adjusted R^2	0.6117	0.6151	0.6150	0.6148	0.6143	0.6150
Durbin-Watson stat	1.8959	1.9389	1.9357	1.9408	1.9495	1.9576
F-statistic	12.3656***	11.6943***	11.4973***	11.4868***	11.4644***	11.4967***
No. of observations	369	369	369	369	369	369

Notes: $ROE_{jt} = \delta_0 + \alpha_1 LNTA_{jt} + \alpha_2 LOANS/TA_{jt} + \alpha_3 LLP/TL_{jt} + \alpha_4 NII/TA_{jt} + \alpha_5 NIE/TA_{jt} + \alpha_6 LNDEPO_{jt} + \alpha_7 EQASS_{jt} + \beta_1 LNGDP + \beta_2 INFL + \beta_3 CR3 + \beta_4 MKTCAP + \beta_5 DUMTRAN1 + \beta_6 DUMCRIS + \beta_7 DUMTRAN2 + \beta_8 DUMCRIS2 + \varepsilon_{jt}$

The dependent variable is ROE calculated as net profit divided by total shareholders' equity; LNTA is a proxy measure of size, calculated as a natural logarithm of total bank assets; LOANS/TA is used as a proxy measure of loans intensity, calculated as total loans divided by total assets; LLP/TL is a measure of bank credit risk calculated as the ratio of total loan loss provisions divided by total loans; NII/TA is a measure of bank diversification towards non-interest income, calculated as total non-interest income divided by total assets; NIE/TA is a proxy measure for management quality, calculated as personnel expenses divided by total assets; LNDEPO is a proxy measure of network embeddedness, calculated as the log of total deposits; EQASS is a measure of capitalization, calculated as book value of shareholders' equity as a fraction of total assets; LNGDP is natural log of gross domestic products; INFL is the rate of inflation; CR3 is the three bank concentration ratio; MKTCAP is the ratio of stock market capitalization divided by GDP; DUMTRAN1 is a dummy variable that takes a value of 1 for the first tranquil (pre crisis) period, 0 otherwise; DUMCRIS is a dummy variable that takes a value of 1 for the first crisis period, (1997-1998) 0 otherwise; DUMTRAN2 is a dummy variable that takes a value of 1 for the second tranquil (post crisis) period, 0 otherwise; DUMCRIS2 is a dummy variable that takes a value of 1 for the second crisis period (i.e. 2007-2008), 0 otherwise. Values in parentheses are *t*-statistics. ***, **, and * indicates significance at 1%, 5%, and 10% levels respectively.

The relationship between size (LNTA) and the profitability of banks of the Republic of Korea is negative in the baseline regression model as well as when the macroeconomic and market variables are controlled. Hauner (2005) offers two potential explanations for the positive impact size has on bank performance. First, if it relates to market power, large banks should pay less for their inputs. Second, there may be increasing returns to scale through the allocation of fixed costs, (e.g. research or risk management) over a higher volume of services or from efficiency gains from a specialized workforce. However, the coefficient is not statistically significant at any conventional levels in all the regression models estimated.

Referring to the impact of bank liquidity, LOANS/TA is negatively related to the profitability of a bank, indicating a positive relationship between bank profitability and the level of liquid assets held by the bank. As higher figures of the ratio denote lower liquidity, the results imply that more (less) liquid banks tend to exhibit higher (lower) profitability levels. A plausible reason for this is the increased cost for screening and monitoring required by a higher proportion of loans in the financial institutions' assets portfolio since loans are the type of assets with the highest operational cost in a bank portfolio (Ben Naceur and Omran, 2008). Furthermore, it can also be argued that some banks operating in the Republic of Korea may have other policy objectives, which are not necessarily profit-oriented. For example, they could be lending to related parties to meet these objectives, which puts a strain on their resources, limiting their involvement in other revenue enhancing activities.[11]

As expected, the impact of credit risk (LLP/TL) has a negative relationship with bank profitability and is statistically significant at the 1 per cent level in all regression models, suggesting that banks with higher credit risk exhibit lower profitability levels. Table 5 indicates that the intensity of LLP/TL towards profitability of banks operating in the Republic of Korea is relatively high. The results imply that the banks should focus more on credit risk management, which has been proven to be problematic. Serious banking problems have arisen from the failure of financial institutions to recognize impaired assets and create reserves for writing off these assets. An immense help towards smoothing these anomalies could be provided by improving the transparency of the banking sector, which, in turn, would enable banks to evaluate credit risk more effectively and avoid problems associated with hazardous exposure.

[11] These developments could have been argued to have taken place particularly before the Asian financial crisis in 1997-1998. Since the Asian financial crisis struck, banks in the Republic of Korea seem to have been acting on the basis of profitability.

The coefficient of NII/TA is negative under controlled and uncontrolled macroeconomic and market conditions. The results imply that banks which derive a higher proportion of income from non-interest sources such as derivative and stock market trading and other fee-based services tend to report lower profitability levels. The empirical findings are consistent with a study by Stiroh (2004), which suggests that greater reliance on non-interest income, particularly trading revenue, is associated with lower risk-adjusted profits and higher risk. On a similar note, Stiroh and Rumble (2006) find that the benefits holding companies in the United States of America derive from diversification are offset by the increased exposure to non-interest-generating activities, which are much more volatile but not necessarily more profitable than interest-generating activities.

Concerning the impact of overhead costs, NIE/TA exhibits a positive impact on bank profitability. The results imply that an increase (decrease) in these expenses increases (reduces) the profits of banks operating in the Republic of Korea. Interestingly, the empirical findings seem to suggest that expense preference behaviour measured by NIE/TA consistently exhibits positive impacts on bank profitability levels. A plausible explanation for this is that highly qualified and professional management may require higher remuneration packages and thus, a positive relationship with performance measure is natural (Sathye, 2003).

The impact of network embeddedness (LNDEPO) on bank profitability is positive, supporting findings by, Lim and Randhawa (2005) and Sufian (2007), among others, which have found that the large banks are relatively more managerially efficient. It could be argued that the large banks with extensive branch networks across a nation may have the advantage over smaller bank counterparts in attracting more deposits and loan transactions. This advantage enables them to command larger interest rate spreads and subsequently, obtain higher levels of profitability.

The level of capitalization (EQASS) is positively related to the profitability of banks in the Republic of Korea, and is statistically significant at the 1 per cent level or better in the regression models. This empirical finding is consistent with Berger (1995), Demirgüç-Kunt and Huizinga (1999), Staikouras and Wood (2003), Goddard and others (2004), Pasiouras and Kosmidou (2007), and Kosmidou (2008), supporting the argument that well capitalized banks are better able to attract customer deposits, the cheapest source of funds, based on confidence they will remain solvent. Furthermore, a strong capital structure is essential for banks in developing economies, since it provides additional strength to withstand financial crises, and increased safety for depositors during unstable macroeconomic conditions.

The results pertaining to the impact of GDP growth on ROA are negative, and are statistically significant at the 5 per cent level or better. Demand for financial services tends to grow as economies expand and societies become wealthier. However, the volatile economic growth during the period under study could has resulted in lower demand for financial services and increased loan defaults. On the other hand, the impact of inflation (INFL) is positively related to the profitability of banks in the Republic of Korea, implying that during the period under study the banks adequately anticipated the levels of inflation, enabling them to adjust interest rates accordingly and consequently, earn higher profits. The result is consistent with the findings by Pasiouras and Kosmidou (2007), among others.

Our findings show that the impact (CR3) is positive, and is statistically significant at the 5 per cent level in all regression models during the period under study. These results clearly support the Structure-Conduct-Performance (SCP) hypothesis, which states that banks in highly concentrated markets tend to collude, and therefore, earn monopoly profits (Short, 1979; Gilbert, 1984; Molyneux and others, 1996).

The impact of stock market capitalization (MKTCAP) on bank profitability is positive, implying that during the period under study, the stock market of the Republic of Korea was well developed and served as source of complimentary services instead of an alternative place for potential borrowers to obtain funds. However, of note, the coefficient of the variable becomes statistically significant when the recent global financial crisis period (DUMCRIS2) is controlled. The findings, nevertheless, need to be interpreted with caution since the coefficient of the variable is only statistically significant at the 10 per cent level.

As expected, the empirical findings seem to suggest that the banking sector of the Republic of Korea has been relatively more profitable during both the tranquil periods, namely in the years 1994-1996 and 1999-2006, compared to the two crisis periods, the Asian financial crisis (1997-1998) and the recent global financial crisis (2007-2008). However, the results must be interpreted with caution since all the variables are not statistically at any conventional levels.

Robustness checks

In order to check for the robustness of the results, a number of sensitivity analyses have been carried out. In the first analysis, LNGDP with ΔGDP (change in real gross domestic products) are replaced. The results, presented in table 6, indicate that when the LNGDP variable is replaced with the ΔGDP variable, the coefficients of the baseline variables stay mostly the same as they keep the same sign and same order of magnitude, and also remain significant to the same degree as found

in the baseline regression models (albeit sometimes at different levels). Also, with few exceptions, the results do not become significant if they were in the baseline regression models.

Table 6. Panel fixed effects regression results

	(1)	(2)	(3)	(4)	(5)
CONSTANT	-0.4088	-0.6183	-0.3183	-0.5317	-1.0269
	(-0.2442)	(-0.3610)	(-0.1885)	(-0.3225)	(-0.5970)
Bank characteristics					
LNTA	-0.1808	-0.1980	-0.1777	-0.1363	-0.0787
	(-0.6070)	(-0.6818)	(-0.6009)	(-0.4483)	(-0.2447)
LOANS/TA	-0.0067	-0.0059	-0.0060	-0.0062	-0.0052
	(-0.7333)	(-0.6505)	(-0.6592)	(-0.6936)	(-0.6078)
LLP/TL	-0.2868***	-0.2837**	-0.2858**	-0.2895**	-0.2920**
	(-1.9930)	(-1.9783)	(-1.9859)	(-1.9864)	(-1.9921)
NII/TA	-0.0700	-0.0664	-0.0673	-0.0658	-0.0569
	(-0.2390)	(-0.2285)	(-0.2297)	(-0.2238)	(-0.1950)
NIE/TA	0.0821	0.0808	0.0810	0.0820	0.0822
	(0.3068)	(0.3039)	(0.3029)	(0.3058)	(0.3071)
LNDEPO	0.1967	0.2214	0.1988	0.1554	0.1062
	(0.8150)	(0.9588)	(0.8414)	(0.6171)	(0.3978)
EQASS	0.3183***	0.3149***	0.3160***	0.3176***	0.3153***
	(2.8577)	(2.8498)	(2.8254)	(2.8279)	(2.8135)
Economic and market conditions					
ΔGDP	-0.0010	-0.0032	-0.0104	-0.0059	-0.0002
	(-0.1187)	(-0.3806)	(-1.1523)	(-0.5329)	(-0.0419)
INFL	0.0405**	0.0301	0.0456**	0.0608**	0.0752***
	(1.9289)	(1.4936)	(2.1279)	(2.3102)	(2.8653)
CR3	-0.0204	0.3652	-0.3154	-0.2615	0.4928
	(-0.0254)	(0.4145)	(-0.4314)	(-0.2822)	(0.7329)
MKTCAP/GDP	0.1043	0.0413	0.1048	0.2003	0.2942
	(0.3097)	(0.1156)	(0.2958)	(0.5193)	(0.8758)
DUMTRAN1		0.1789**			
		(2.3859)			
DUMCRIS			-0.1441*		
			(-1.7469)		
DUMTRAN2				0.0970	
				(0.8009)	

Table 6. ***(continued)***

	(1)	(2)	(3)	(4)	(5)
DUMCRIS2					-0.2991**
					(-2.0648)
R^2	0.6670	0.6693	0.6679	0.6676	0.6709
Adjusted R^2	0.6084	0.6099	0.6083	0.6079	0.6118
Durbin-Watson stat	1.4762	1.4765	1.4837	1.5004	1.5317
F-statistic	11.3969***	11.2754***	11.2038***	11.1888***	11.3558***
No. of Observations	369	369	369	369	369

Notes: $ROE_{jt} = \delta_0 + \alpha_1 LNTA_{jt} + \alpha_2 LOANS/TA_{jt} + \alpha_3 LLP/TL_{jt} + \alpha_4 NII/TA_{jt} + \alpha_5 NIE/TA_{jt} + \alpha_6 LNDEPO_{jt} + \alpha_7 EQASS_{jt} + \beta_1 \Delta GDP + \beta_2 INFL + \beta_3 CR3 + \beta_4 MKTCAP + \beta_5 DUMTRAN1 + \beta_6 DUMCRIS + \beta_7 DUMTRAN2 + \beta_8 DUMCRIS2 + \varepsilon_{jt}$

The dependent variable is ROE calculated as net profit divided by total shareholders equity; LNTA is a proxy measure of size, calculated as a natural logarithm of total bank assets; LOANS/TA is used as a proxy measure of loans intensity, calculated as total loans divided by total assets; LLP/TL is a measure of bank credit risk calculated as the ratio of total loan loss provisions divided by total loans; NII/TA is a measure of bank diversification towards non-interest income, calculated as total non-interest income divided by total assets; NIE/TA is a proxy measure for management quality, calculated as personnel expenses divided by total assets; LNDEPO is a proxy measure of network embeddedness, calculated as the log of total deposits; EQASS is a measure of capitalization, calculated as book value of shareholders' equity as a fraction of total assets; ΔGDP is change in the real gross domestic products; INFL is the rate of inflation; CR3 is the three bank concentration ratio; MKTCAP is the ratio of stock market capitalization divided by GDP; DUMTRAN1 is a dummy variable that takes a value of 1 for the first tranquil (pre crisis) period, 0 otherwise; DUMCRIS is a dummy variable that takes a value of 1 for the first crisis period (i.e. 1997-1998), 0 otherwise; DUMTRAN2 is a dummy variable that takes a value of 1 for the second tranquil (post crisis) period, 0 otherwise; DUMCRIS2 is a dummy variable that takes a value of 1 for the second crisis period (i.e. 2007-2008), 0 otherwise. Values in parentheses are *t*-statistics. ***, **, and * indicates significance at 1%, 5%, and 10% levels respectively.

Table 6 indicates that the ΔGDP variable entered all the regression models with a negative sign, but is never statistically significant at any conventional levels. On a similar note, the empirical findings suggest that the coefficient of the CR3 variable loses its explanatory power when we replace the LNGDP variable with the ΔGDP variable. On the other hand, the results clearly indicate that the banking sector of the Republic of Korea has been relatively more profitable during the first tranquil period (DUMTRAN1) and is statistically significant at the 5 per cent level. The empirical findings also clearly indicate that the banking sector has been negatively affected by both the Asian financial crisis (DUMCRIS1) and the most recent global financial crisis (DUMCRIS2).

Secondly, we restrict out sample to the banks which have more than three years of observations. All in all, the results remain qualitatively similar in terms of directions and significance levels. Thirdly, we address the effects of outliers by removing the top and bottom 1 per cent of the sample. The results remain robust in terms of directions and significance levels. Finally, we replace ROA with ROE (return on equity) and repeat equation 2. In general, the results confirm the baseline regression results. To conserve space, the full regression results are not reported, but are available upon request.

V. CONCLUDING REMARKS AND DIRECTIONS FOR FUTURE RESEARCH

The Asian financial crisis has had a profound negative impact on the banking sector of the Republic of Korea, with the sharp decline in the domestic currency causing extensive damage to the balance sheets of leading banks. Meanwhile, at the same time, banks were hit a sharp drop in revenues as higher rates could not be passed on to distressed corporate borrowers. The banks, consequently, were functioning in an environment of negative interest rate spreads, which cut into their net income and lowered their capital adequacy ratios.

By using an unbalanced bank level panel data, this study seeks to examine the determinants of the profitability of banks of the Republic of Korea during the period 1994-2008. The empirical findings suggest that the banks with lower credit risk tend to exhibit higher profitability levels, while the level of capitalization shows a positive effect during both the crises and tranquil periods. The effects of a business cycle on banks' profitability are mixed. On the one hand, inflation displays a substantial pro-cyclical impact, while GDP has a counter-cyclical influence on the banks' profitability. We find that the industry concentration of the national banking system has a positive as well as significant effect on the profitability of the banks. The effects of both the Asian financial crisis and the recent global financial crisis are negative, while the banks have been relatively more profitable during both the tranquil periods.

Future research could include more variables such as taxation and regulation indicators, exchange rates as well as indicators of the quality of the offered services. Another possible extension could be the examination of differences in the determinants of profitability between small and large or high and low profitability banks. In terms of methodology, a statistical cost accounting and frontier techniques could also be used.

REFERENCES

Akhavein, Jalal D., Allen N. Berger and David B. Humphrey (1997). "The effects of megamergers on efficiency and prices: evidence from a bank profit function", *Review of Industrial Organization*, vol. 12, No. 1, pp. 95-139. accessed from www.springerlink.com/content/g75121t026166715/fulltext.pdf.

Aly, Hasan Y., Grabowski, Richard, Pasurka, Carl A., and Rangan, Nanda (1990). "Technical, scale and allocative efficiencies in U.S. banking: an empirical investigation", *Review of Economics and Statistics*, vol. 72, No. 2, pp. 211-218.

Angbazo, Lazarus (1997). "Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking", *Journal of Banking & Finance*, vol. 21, No. 1, pp. 55-87.

Athanasoglou, Panayiotis P., Sophocles N. Brissimis and Matthaios D. Delis (2008). "Bank-specific, industry-specific and macroeconomic determinants of bank profitability", *Journal of International Financial Markets, Institutions & Money*, vol. 18, No. 2 (April), pp. 121-136.

Beck, Thorsten and Ross Levine (2004). "Stock markets, banks, and growth: panel evidence", *Journal of Banking & Finance*, vol. 28, No. 3 (March), pp. 423-442.

Ben Naceur, Samy and Mohamed Goaied (2008). "The determinants of commercial bank interest margin and profitability: evidence from Tunisia", *Frontiers in Finance and Economics*, vol. 5, No. 1 (April), pp.106-130. Available from ssrn.com/abstract=1538810.

Ben Naceur, Samy and Mohammed Omran (2008). "The effects of bank regulations, competition and financial reforms on MENA banks' profitability", Working Papers No. 449, Economic Research Forum, October.

Berger, Allen N. (1995). "The Relationship between capital and rarnings in banking", *Journal of Money, Credit and Banking*, vol. 27, No. 2 (May), pp. 432-456.

Berger, Allen N., Gerald A. Hanweck and David B. Humphrey (1987). "Competitive viability in banking : Scale, scope, and product mix economies", *Journal of Monetary Economics*, vol. 20, No. 3 (December), pp. 501-520.

Bikker, Jacob and Bos, Jaap W.B. (2008). *Bank performance: a theoretical and empirical framework for the analysis of profitability, competition and efficiency.* Abingdon: Routledge.

Bikker, J. and H. Hu (2002). "Cyclical patterns in profits, provisioning and lending of banks and procyclicality of the new Basel Capital requirements," *BNL Quarterly Review*, vol. 221, pp. 143-175.

Bourke, Philip (1989). "Concentration and other determinants of bank profitability in Europe, North America and Australia", *Journal of Banking & Finance*, vol. 13, No. 1 (March), pp. 65-79.

Boyd, John H. and David E. Runkle (1993). "Size and performance of banking firms: testing the predictions of theory", *Journal of Monetary Economics*, vol. 31, No. 1 (February), pp. 47-67.

Cetorelli, Nicola and Michele Gambera (2001). "Banking market structure, financial dependence and growth: international evidence from industry data", *Journal of Finance*, vol. 56, No. 2 (April), pp. 617-648.

Chantapong, Saovanee (2005). "Comparative study of domestic and foreign bank performance in Thailand: the regression analysis", *Economic Change and Restructuring*, vol. 38, No. 1, pp. 63-83.

Chu, Sing Fat and Guan Hua Lim (1998). "Share performance and profit efficiency of banks in an oligopolistic market: evidence from Singapore", *Journal of Multinational Financial Management*, vol. 8, No. 2-3 (September), pp. 155-168.

Demirgüç-Kunt, Asli and Harry P. Huizinga (1999). "Determinants of commercial bank interest margins and profitability: some international evidence", *World Bank Economic Review*, vol. 13, No. 2, pp. 379-408.

Demirgüç-Kunt, Asli and Ross Levine (2001). "Financial structure and economic growth: Perspectives and lessons", in Asli Demirgüç-Kunt and Ross Levine, eds. *Financial structure and economic growth: A cross-country comparison of banks, markets, and development*. (Cambridge, Mass.: MIT Press), pp. 3-14. Accessed from mitpress.mit.edu/books/chapters/0262041987chap1.pdf.

DeYoung, Robert and Tara Rice (2004). "Noninterest income and financial performance at U.S. commercial banks", *The Financial Review*, vol. 39, No. 1, pp. 101-127.

Eichengreen, Barry and Heather D. Gibson (2001). "Greek Banking at the Dawn of the New Millennium", CEPR Discussion Paper No. 2791. London: Centre for Economic Policy Research.

Elyasiani, Elyas and Seyed Mehdian (1992). "Productive efficiency performance of minority and nonminority-owned banks: a nonparametric approach", *Journal of Banking & Finance*, vol. 16, No. 5 (September), pp. 933-948.

Gilbert, R. Alton (1984). "Bank market structure and competition: a survey", *Journal of Money, Credit and Banking*, vol. 16, No. 4 (November), pp. 617-644.

Goddard, John A., Philip Molyneux, John O.S. Wilson (2001). *European banking: efficiency, technology and growth*. (New York: John Wiley).

Goddard, John, Phil Molyneux and John O.S. Wilson (2004). "Dynamics of growth and profitability in banking", *Journal of Money, Credit and Banking*, vol. 36, No. 6 (December), pp. 1069-1090.

Golin, Jonathan L. (2001). *The bank credit analysis handbook: a guide for analysts, bankers and investors.* (New York: Wiley).

Guru, B.K., J. Staunton, B. Balashanmugam (2002). "Determinants of commercial bank profitability in Malaysia", Working Paper, Multimedia University.

Hassan, Kabir and Abdel-Hameed M. Bashir (2003). "Determinants of Islamic banking profitability", ERF Paper, in *Proceedings of the ERF 10th Annual Conference*, Marrakesh, Morocco, 16-18 December, accessed from www.erf.org.eg/CMS/getFile.php?id=636.

Hauner, David (2005). "Explaining efficiency differences among large German and Austrian banks", *Applied Economics*, vol. 37, No. 9 (May), pp. 969-980.

Hirtle, Beverly J. and Kevin J. Stiroh (2007). "The return to retail and the performance of US banks", *Journal of Banking & Finance*, vol. 31, No. 4 (April), pp. 1101-1133.

Isik, Ihsan and M. Kabir Hassan (2002). "Technical, scale and allocative efficiencies of Turkish banking industry", *Journal of Banking & Finance*, vol. 26, No. 4 (April), pp. 719-766.

Isik, Ihsan and M. Kabir Hassan (2003). "Efficiency, ownership and market structure, corporate control and governance in the Turkish banking industry", *Journal of Business Finance & Accounting*, vol. 30, No. 9-10, pp. 1363-1421.

Kennedy, Peter (2008). *A guide to econometrics*, 6th ed. Malden, MA: Blackwell.

Kosmidou, Kyriaki (2008). "The determinants of banks' profits in Greece during the period of EU financial integration", *Managerial Finance*, vol. 34, No. 3, pp. 146-159.

Kosmidou, Kyriaki and Constantin Zopounidis (2008). "Measurement of bank performance in Greece", *South Eastern Europe Journal of Economics*, vol. 1, pp. 79-95. Available from www.asecu.gr/Seeje/issue10/kosmidou.pdf.

Kosmidou, Kyriaki, Fotios Pasiouras and Angelos Tsaklanganos (2007). "Domestic and multinational determinants of foreign bank profits: the case of Greek banks operating abroad", *Journal of Multinational Financial Management*, vol. 17, No. 1 (February), pp. 1-15.

Levine, Ross (1998). "The legal environment, banks, and long run economic growth", *Journal of Money, Credit and Banking*, vol. 30, No. 3 (August), pp. 596-613. Available from http://www.econ.brown.edu/fac/ross_levine/finance/rlevine/publication/1998_jmcb_legal environ lr growth.pdf.

Levine, Ross and Sara Zervos (1998). "Stock Markets, Banks, and Economic Growth", *American Economic Review*, vol. 88, No. 3 (June), pp. 537-558.

Lim, Guan H. and Dipinder S. Randhawa (2005). "Competition, liberalization and efficiency: evidence from a two-stage banking model on banks in Hong Kong and Singapore", *Managerial Finance*, vol. 31, No. 1, pp.52-77.

Miller, Stephen M. and Athanasios G. Noulas (1997). "Portfolio mix and large-bank profitability in the USA", *Applied Economics*, vol. 29, No. 4 (April), pp. 505-512.

Molyneux, Philip and John Thornton (1992). "Determinants of European bank profitability: a note", *Journal of Banking & Finance*, vol. 16, No. 6 (December), pp. 1173-1178.

Molyneux, P. (1993). "Structure and Performance in European Banking," Mimeo University of Wales Bangor.

Molyneux, Philip, Yener Altunbas and Edward P.M. Gardener (1996). *Efficiency in European banking* Chichester; New York: Wiley.

Neely, Michelle Clark and David C. Wheelock (1997). "Why does bank performance vary across states?", Federal Reserve Bank of St. Louis *Review*, (March), pp. 27-40.

Pasiourasa, Fotios and Kyriaki Kosmidoua (2007). "Factors influencing the profitability of domestic and foreign commercial banks in the European Union", *Research in International Business and Finance*, vol. 21, No. 2 (June), pp. 222-237.

Perry, Philip (1992). "Do banks gain or lose from inflation?" *Journal of Retail Banking*, vol. 14, No. 2 (Summer), pp. 25-40.

Rajan, Raghuram G. and Luigi Zingales (1998). "Financial dependence and growth," *American Economic Review*, vol. 88, No. 3 (June), pp. 559-586.

Rivard, Richard J. and Christopher R. Thomas (1997). "The effect of interstate banking on large bank holding company profitability and risk", *Journal of Economics and Business*, vol. 49, No. 1 (February), pp. 61-76.

Sathye M. (2003). "Efficiency of banks in a developing economy: the case of India", *European Journal of Operational Research*, vol. 148, No. 3 (1 August), pp. 662-671.

Short, Brock K. (1979). "The relation between commercial bank profit rates and banking concentration in Canada, Western Europe, and Japan", *Journal of Banking & Finance*, vol. 3, No. 3 (September), pp. 209-219.

Staikouras, C. and Wood, G. (2003). "The Determinants of Bank Profitability in Europe", Paper presented at the European Applied Business Research Conference, Venice, 9-13 June.

Stiroh, Kevin J. (2004). "Diversification in banking: Is noninterest income the answer?", *Journal of Money, Credit and Banking*, vol. 36, No. 5 (October), pp. 853-882.

Stiroh, Kevin J. and Adrienne Rumble (2006). "The dark side of diversification: the case of US financial holding companies", *Journal of Banking & Finance*, vol. 30, No. 8 (August), pp. 2131-2161.

Sufian, Fadzlan (2007). "Trends in the efficiency of Singapore's commercial banking groups: a non-stochastic frontier DEA window analysis approach", *International Journal of Productivity and Performance Management* vol. 56, No. 2, pp. 99-136.

Sufian, Fadzlan and Muzafar Habibullah (2009). "Bank specific and macroeconomic determinants of bank profitability: empirical evidence from the China banking sector", *Frontiers of Economics in China*, vol. 4, No. 2 (June), pp. 274-291.

Thakor, Anjan V. (1987). "Asset writedowns: managerial incentives and security returns: discussion", *Journal of Finance*, vol. 42, No. 3, pp. 661-663.

To, Huong Minh and David Tripe (2002). "Factors influencing the performance of foreign-owned banks in New Zealand", *Journal of International Financial Markets, Institutions and Money*, vol. 12, No. 4-5 (October-December), pp. 341-357.

White, Halbert (1980). "A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity", *Econometrica*, vol. 48, No. 4 (May), pp. 817-838.

Williams, Barry (2003). "Domestic and international determinants of bank profits: foreign banks in Australia", *Journal of Banking & Finance*, vol. 27, No. 6 (June), pp. 1185-1210.

RISK MANAGEMENT NETWORKS OF ETHNIC MINORITIES IN VIET NAM

*Isabel Fischer, Tina Beuchelt, Tom Dufhues and Gertrud Buchenrieder**

The utilization of informal social networks is an important risk management strategy of vulnerable households in South-East Asia. To gain insight on this issue, a social network analysis (SNA) was implemented to assess risk management networks of ethnic minority farm households in the northern uplands of Viet Nam. The results from the analysis suggest that kinship relations and the level of wealth play an essential role in enabling basic network services to function. This paper also points out that effective networks require investments to fulfil the requested mutual obligations and that subsequently, social networks among poor farmers are relatively limited. The findings of the analysis show, not surprisingly, that networks cannot completely buffer severe shocks. Consequently, policy measures to reduce the costs of investing in social capital of poor farmers as well as improved access to appropriate social security systems are essential. These findings are applicable to other upland areas of South-East Asia.

I. INTRODUCTION

Life in the world's poorest countries is plagued by many risks that can result in consumption and income shocks. In addition, households must sometimes incur major expenditures, such as funeral arrangements, of which timing is not always foreseeable. With low livelihood resilience at the best of times, unmitigated income and consumption shocks can have devastating consequences (Fafchamps

* Dr. Isabel Fischer and doctoral candidate Tina Beuchelt are affiliated with the University of Hohenheim, Stuttgart, Germany. Dr. Tom Dufhues is a senior research fellow at the Leibniz Institute of Agricultural Development (IAMO), Halle, Germany. Prof. Dr. Gertrud Buchenrieder is a professor at the Universität der Bundeswehr, Munich, Germany. The research for this paper was carried out within the framework of the German-Thai-Vietnamese Collaborative Research Centre: Sustainable Land Use and Rural Development in Mountainous Regions of Southeast Asia (SFB 564), also known as The Uplands Program. Funding from the Deutsche Forschungsgemeinschaft (DFG) is gratefully acknowledged. All errors and omissions are the responsibility of the authors.

and Lund, 2003). Since access to formal insurance services is rarely available in developing countries, rural farm households have developed alternative risk management strategies. While better-off households often have access to so-called (ex-ante) adaptive risk management strategies, such as the accumulation of savings in cash or kind, which keep the level of vulnerability lower, poorer households have to rely primarily on (ex-post) coping strategies, such as the sale of livestock, which negatively affects their long-term level of vulnerability (Carney and others, 1999).

Little is known, however, about the use of social networks as a means of risk management in the upland areas of South-East Asia, which cover around 50 million hectares, with over 100 million people directly dependent upon them (Pandey, 2000). The region comprises most of the Philippines, Indonesia, Thailand, Myanmar, Cambodia, Lao People's Democratic Republic and Viet Nam, and is inhabited by many different ethnic groups. With few exceptions, the upland regions are economically disadvantaged, and are often politically and institutionally marginalized (Heidhues and Rerkasem 2006; Coxhead, 2003; Zeller and others, 2010).

During the past 20 years, the Government of Viet Nam has achieved some remarkable results in poverty reduction, which were mainly accomplished by the launching of the *Doi Moi* reform process in 1986.[1] Nevertheless, Viet Nam is still one of the poorest countries in the world, with 28.9 per cent of the total population (85 million in 2007) living below the national poverty line (UNDP, 2007). The rural mountainous areas of northern Viet Nam, which are mainly populated by ethnic minorities,[2] such as Black Thai, Tay and Hmong, are particularly underdeveloped. According to the General Statistics Office of Viet Nam, in 2006, the poverty rate in this region was still 49 per cent, by far the highest rate in the country. Poverty and vulnerability are closely interlinked. While poverty is usually defined as economic deprivation (lack of income), vulnerability entails "the relationship between poverty, risk and efforts to manage risk" (Alwang and others, 2001: 1). The vulnerability of rural households in northern Viet Nam is intensified by the lack of a formal agricultural or more general rural insurance market (Vandeveer, 2001), and by a non-functioning social welfare system. Hence, in the event of idiosyncratic income shocks, upland households have to rely on informal mutual aid schemes within their social networks to cope with the shocks. Literature on social networks in Viet Nam is sparse. While Hoang and others (2006) have researched social networks of farmers in regard to

[1] The poverty rate, measured as those below the national poverty line, was reduced from 58 per cent in 1993 to 14.7 per cent in 2007.

[2] For more detailed information concerning ethnic minorities in mainland South-East Asia please refer to ADB (2002), Friederichsen and Neef (2010), Michaud (2000); and Rambo and Jamieson (2003).

accessibility to information, and Appold and Phong (2001) has investigated inter-organizational networks in the restructuring process of Viet Nam, only a few publications focus on social networks and risk management, including among them: Beuchelt, 2008; Beuchelt and Fischer, 2006; and Fischer and Beuchelt, 2005.

Social networks or social relations are recognized as an important component of social capital (Stolle and Rochon, 1998), but literature on the subject of social capital in Viet Nam is less sparse (e.g. Chen, 2005; Dalton and others, 2002; Dalton and Ong, 2005; De Silvaa and others, 2006; Ha and others, 2004; Ha and others, 2006; Mutz and Schmidt, 2002; and Van Staveren and Knorringa, 2007). Certain aspects of social capital are important features for the analysis of risk management networks including: it gets stronger with use; it needs to be maintained; and that it does not exist as an attribute of individuals but in the relationship between individuals. Therefore, we include the concept of social capital in our analysis. The amount of social capital and the underlying social networks of a single person or household are seen as an important factor for resilience of poor households to income shocks.

This paper studies how social networks are utilized by farm households in the event of a severe income shock based on an idiosyncratic risk. Traditional agrarian societies are usually founded on family relations. Family ties are, thus, central to social networks. Recent modernization has placed more emphasis on friendship or job-based social networks (Dalton and others, 2002; Ha and others, 2004). However, as modernization has not yet reached the northern uplands of Viet Nam, we hypothesize that risk-sharing networks consist mainly of family members. As most family ties are concentrated within the village, we further hypothesize that risk-sharing networks are mainly village-based. This may change in the future, with family-based social networks increasingly being supplemented by job and friendship-based networks. In addition, migration may disperse networks geographically, as can be seen in Thailand (Clausen, 2002; Korff, 2003). Total network size also affects access to help. For instance, households with more members (especially wealthier members) have a greater ability to use informal insurance (Morduch, 1999b). We, therefore, also hypothesize that richer households have a bigger risk-sharing network.

This paper is organized as follows: the theoretical link between social capital, social networks and risk management in northern Viet Nam is summarized in the following section. Next, an overview of the data and methodology of this SNA is provided. Afterwards, the results of the case studies are presented and summarized in the lessons learned section. Finally, conclusions are drawn and policy recommendations are given.

II. SOCIAL CAPITAL, SOCIAL NETWORKS AND RISK MANAGEMENT

Definitions of social capital[3] vary widely, depending, among other things, on the scope of observation, which encompasses the micro level (among individuals), the meso level (among associations) and the macro level (rule of law, the court system). The micro-level definitions that are relevant for this study focus on the importance and the role of social networks and social ties for individuals and communities (Bourdieu, 1986; Putnam, 2000; Stone, 2001). Following Putnam (2000: 19), social capital refers to "connections among individuals – social networks and the norms and reciprocity and trustworthiness that arise from them". Similarly, Stone (2001: 4) sees social capital "as networks of social relations, which are characterized by norms of trust and reciprocity". According to Bourdieu (1986: 249) social capital "is the sum of resources, actual and potential, that accrue to an individual or a group by virtue of possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition".

Informal safety nets are one manifestation of social capital. They involve drawing on social networks for assistance in times of need, with or without expectations of reciprocity. Hence, informal safety nets are considered an important means of risk management (United Kingdom, DFID, 1999; Devereux, 2001; Dercon, 2002). Focusing on social networks, the most basic definition is delivered by Borgatti (1998), who indicates that a network is a set of dyadic ties, all of the same type, among a set of actors who may be persons or organizations for instance. Wassermann and Faust (1994: 18) indicate that the "defining feature of a tie is that it establishes a linkage between a pair of actors". According to Stahr (2001), social networks consist of individuals who exchange resources on a reciprocal and voluntary basis resources, such as goods and, services, with the aim of maximizing their personal utility.

Even though social networks in developing countries are crucial for many poor and vulnerable households, a number of scholars, such as Dercon, 2002; Fafchamps, 1998; Morduch, 1999a; Platteau, 1991; and Goldstein and others, 2002, conclude that these networks are usually neither able to insure against all kinds of risks nor completely share the risks. Only partial risk sharing exists. The reason is that informal risk-sharing arrangements are based on voluntary participation, which limits the extent of mutual insurance. A better understanding of vulnerability, risk

[3] Information on "the dark side of social capital" or "wicked social capital" can be found inter alia in Dufhues and others (2006) or Wong (2007).

management and social networks is needed to design appropriate policy interventions (Dercon, 2002).

The types of risks that the poor deal with have not changed much over the past decades. Empirical research by Fischer and Buchenrieder (2010) reveals that death of livestock and sickness of (working and non-working) household members are the top two livelihood risks. In order to deal with livelihood emergencies, rural ethnic minority households in the upland areas of northern Viet Nam mainly apply coping strategies, such as sale of assets or dissaving. Another common coping strategy is the acquisition of informal credits, either from relatives, friends or moneylenders. The short-run effect of these strategies is to ensure minimal levels of essential consumption. However, a person's (future) livelihood status deteriorates with each event in which a coping strategy (contrary to adaptive risk management strategies) is applied. The strategies and effects are certainly similar in other upland areas of South-East Asia.

III. DATA AND SOCIAL NETWORK ANALYSIS (SNA)

The research area[4] comprises seven villages in Yen Chau district, Son La Province, and Ba Be and Pac Nam districts in Bac Kan Province. Both districts are located in the uplands of northern Viet Nam. Five different ethnic minority groups (Black Thai, Hmong, Kho-Mu, Nung and Tay) were surveyed. Households that experienced a severe idiosyncratic income shock during the last year were singled out from a random sample of more than 200. Finally, seven households were chosen for the SNA, based on their affiliation to certain ethnic minority groups, their wealth status and the shock experienced. The heads of these households were interviewed, as well as persons connected to the household head.[5] All in all, quantitative network data were obtained in 33 interviews using a semi-structured questionnaire.

The SNA was supplemented by qualitative research (with 80 female and male respondents) that relied on different participatory rural appraisal (PRA) tools. Gender-sensitive group discussions were conducted on issues of livelihood strategies, risk management and social networks, including issues of labour division, power structures, possession of assets and decision-making processes. In addition, key

[4] The presented SNA is one part of the overall research of sub-project F2.2 of The Uplands Program (SFB 564), which focuses on vulnerability and risk management of rural farm households in northern Viet Nam.

[5] However, in some cases, interviewing of all social ties was not possible. In cases in which other households lived in a different hamlet, these households could not be interviewed because research permits in Viet Nam are location-specific. A complete network analysis was, therefore, not feasible.

informant interviews with officials of so-called mass organizations, such as the women's union and political cadres at the commune and district level, provided general information on the research region and gave the researchers clues pertaining to the common risks that rural households face. Special emphasis was placed on difficulties concerning livestock, information on access to public services, such as finances, extension,[6] education and health care, and on differences concerning the wealth strata of rural households.

Social networks can be classified into various types. We use the definition of an ego-centred network, which "consists of a focal person or respondent (ego), a set of "alters"[7] (people) who have ties to [the] ego, and measurements on the ties from ego to alters and on the ties between alters" (Wassermann and Faust, 1994: 53). Accordingly, the ego-centred analysis includes all persons mentioned by the interviewees (not only the ego household), even if they could not be interviewed due to logistical problems.

The network data were analysed using the software UCINET,[8] which facilitates the statistical evaluation of specific structures of networks. The quantitative UCINET results served as a basis to analyse the data descriptively as well as to visualize the networks as sociograms.[9] Wassermann and Faust (1994: 12) point out that visual displays, including sociograms, are widely used in network research. Figures 1 to 5 below represent the sociograms of five household cases that are presented in this article. The sociograms are based on the analysis of different network parameters, including kinship, income classification, size and density of the network, the network ties and their reciprocity and the degree centrality of the different actors. These figures determine the position of network members in the sociograms and their relationships to each other.

The size of a network is determined by the number of possible relationships between all network members. It is considered an important measurement as it "is critical for the structure of social relations because of the limited resources and capacities that each actor has for building and maintaining ties" (Hanneman and

[6] Dissemination of useful and practical information mainly on agriculture and health by the public sector.

[7] "Alters" are persons who are connected to the "ego" because they either provided or received help from each other.

[8] Borgatti, S.P., Everett, M.G., and L.C. Freeman (2000): Ucinet for Windows: Software for Social Network Analysis. (1. Version 1999) Harvard, MA: Analytic Technologies.

[9] A sociogram is a graphic representation of social links that a person has at a specific point in time. It shows the structure and patterns of group interactions and can be drawn on the basis of many different criteria including social relations, channels of influence and lines of communication.

Riddle, 2005: 41). The degree centrality of the ego-centred network presents the out-degree and in-degree, which indicate how many people received help from and provided help to the ego household, respectively. Following Scott (1991), relational data can be either undirected or directed, and either binary or valued. Undirected data indicate the mere existence of a relationship between two actors. As experienced in the interviews and discussions, support is traditionally based on reciprocity. We were interested in the question of whether this reciprocity would also be present in households, which had experienced an income shock. Therefore, the study collected directed data that gave information on whether an actor was giving or receiving help. Valued data were gathered about the actors helping most within the personal networks in order to identify the "backbones" of the networks. Table 1 summarizes some key data of the analysed social networks of the five presented case studies.

According to our hypotheses, the network members display three different attributes: wealth; place of residence; and kinship (table 1). Wealth: In Viet Nam, the Government classifies households once a year according to their living standard into one of five classes: "hungry"; "poor"; "average"; "better off"; or "rich".

The ranking is based on the household's monthly cash income. In the paper, this classification is used as an indicator for the wealth of the household.

Place of residence: The places of residence of the network members are classified into two groups: (1) living in the same village as the ego household; and (2) living in another village.

Kinship: A wide spectrum of kinship relations exists. They are grouped into three classes to avoid confusion that would result if their exact representation were placed in the sociograms. The arrangement follows the authors' own research findings that immediate kin are the most important network actors. The grouping is as follow: (1) Immediate kin – comprising the siblings of the family head and his wife, their parents and the in-laws. The latter are also included as the emphasis is on the household and not on the household head or its spouse. (2) Extended kin – listing nieces and nephews, cousins, aunts and uncles. (3) Friends and neighbours – representing all non-kinship relations. Furthermore, institutions, such as unions, banks or moneylenders are named directly.

Table 1. Key data of poor farm households in the social network analysis

Case study	Figure no.	Ethnic group*	Wealth ranking*	Livelihood crisis*	Who helped the most*?	Kind of support*	Network size	No of network members/ (linked to ego household)	Degree centrality*	
									Out-degree	In-degree
A	1	Black Thai/ Kho-Mu	poor	– Illness/death of family member	Immediate kin Money-lender	Rice, clothing Credit	132	12 (4)	1	4
B	2	Tay	poor	– Illness of family member – Livestock loss	Immediate kin	Credit, accommo-dation of sick person	90	10 (5)	2	5
C	3	Black Thai	poor	– Illness/death of family member – Lack of labour – Livestock loss	Immediate kin	Credit, support on the farm (manpower + buffalo)	992	32 (6)	2	6
D	4	Tay	average	– Livestock loss	Wife's immediate kin	Credit	380	20 (9)	2	8
E	5	Black Thai	average	– Illness of family member	Immediate kin	Farm work	812	29 (9)	3	7

Source: Own data based on interviews carried out in Viet Nam on the purpose to conduct this SNA (see page 6/7).

Note: * Concerning ego household.

IV. RISK MANAGEMENT VIA SOCIAL NETWORKS – RESULTS OF THE SNA

Before turning to the detailed discussion of the five selected case studies, some general findings are presented that are relevant for interpreting the results of the SNA.

Our empirical research reveals that the household's level of wealth is an important and influential factor as regard to the formation and size of its network. Poorer households are usually disadvantaged when it comes to utilization of social networks. They purposely refrain from asking for help from their sparse networks because they fear being unable to reciprocate later in the event of their (often well off) alters being in a crisis. Besides insufficient endowment with natural, physical and financial resources, the poor usually possess little social and human capital. As Cleaver (2005) and Hickson (2001) point out, the chronic poor often possess only human capital in the form of their ability to work. They are often structurally excluded from social networks due to their high level of poverty as being involved in social networks may also imply certain costs. Consequently, they lack access to fruitful relationships with powerful allies. As stated by Thorp and others (2005), destitution leaves little space for networking.

In order to gain further insights, the PRAs address issues related to the households' wealth strata, including reasons why a household might rise/fall from one stratum to another. Idiosyncratic shocks, such as illness or death of a working family member, loss of livestock or loss of the farm due to fire, are considered a major risk for all households, and one that could put a household into a lower wealth stratum.

Reading agricultural manuals and gathering know-how (on crop production and animal husbandry) from richer farmers are mentioned as basic preconditions for improving one's situation, alongside access to financial capital (to buy land and livestock). The participants agree with one party's statement that "it is very hard work to become richer, but very easy to become poor".

When discussing financial capital, informal credit and transfers are seen as crucial for managing shocks within social networks. There are several explanations for this. Barslund and Tarp (2008) state that formal loans in Viet Nam are almost entirely for production and asset accumulation. A complex administrative system and language difficulties are further constraints in accessing funds, particularly by members of ethnic minority groups, especially women members. Moneylenders play only a small role in the informal financial sector and most loans are given by relatives or friends, and are interest-free. The main reasons why formal finance is

rarely used to ease shocks, however, is that it takes time to apply for a loan and households are locally screened.

Furthermore, transfer programmes previously initiated by the Government of Viet Nam,[10] such as health insurance,[11] are limited to a few groups (ILO, 2004). All other households have to rely on suboptimal coping strategies in the event of a crisis, dependent on their endowment with and access to resources and capital assets (often provided by members of their social network). Usually, immediate and extended kin provide material and financial help and/or inexpensive farm labour. This is in line with the findings of Dalton and others (2002), who show that the family plays a vital role within the social networks as well as in daily social life.

Finally, research suggests that among the observed ethnic minorities, a woman becomes fully integrated into her husband's network once they marry and that the wife's kin is liberated from mutual family obligations. Hence, risk management strategies hardly vary between men and women. During a livelihood emergency, the couple refers to the husband's immediate kin. However, if the husband dies, neither kin feels a strong social responsibility to support the widow (see case study A). Irrespective of affiliation with a particular ethnic minority group, kinship relations are a major factor in the composition of networks.

The following five case studies exemplify common livelihood shocks and coping strategies applied by different households. The network structure and flows of help are displayed in the relevant graphs (Figures 1 to 5). Normal help flows (representing a common exchange of goods or services) are represented by thin lines while strong flows of help[12] are represented by thicker lines. The direction of help is indicated by the arrowhead. Those alters that were not interviewed are clearly visible as they have no further connection besides that to the respective ego household (see "A" in figure 1). The networks depicted reflect the major share of the household's total network; the pictured situation may differ slightly from the picture that would have emerged if all network members had been interviewed and

[10] The Government of Viet Nam has a series of programmes, which transfer resources to specific population groups. Households can benefit under the Hunger Eradication and Poverty Reduction (HEPR) programme, while commune-level investments are made under the so-called Program 135.

[11] Our research reveals that even if people possess health insurance cards, they usually face additional expenses including costs for transport, special treatment and medication. People staying in a hospital must cover the expenses for a second family member accompanying the sick to provide for the basic needs of the sick and themselves. For more detailed information concerning health and access to social security in Viet Nam, please refer to Fischer and Salehin (2009) and Tuan (2004).

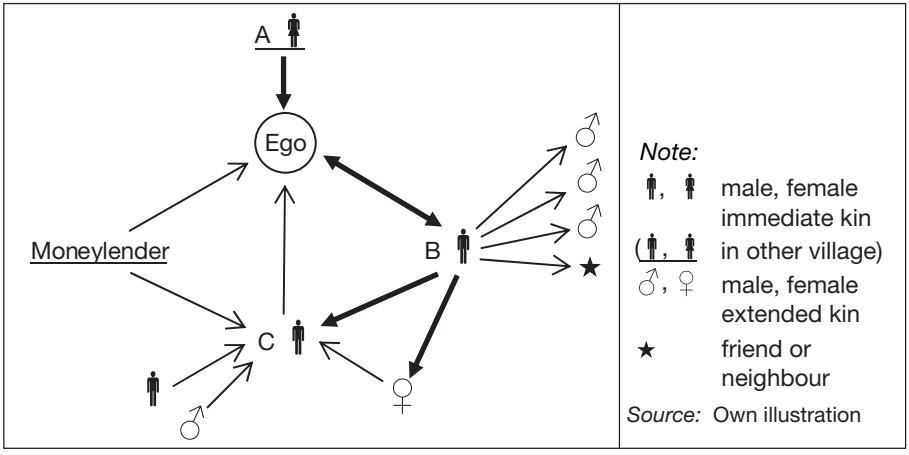
[12] A strong help flow exists whenever ego or alter named a person, who contributed most of all to the risk management of the affected household.

analysed. While case studies A-C display the networks of "poor" households, case studies D-E show the networks of households with "average" wealth.

Case study A: A poor, female headed Black Thai household

Figure 1 shows the network of He Thi G,[13] a Black Thai widow who lives in a Kho-Mu village. He Thi G originates from another village. Since the death of her Kho-Mu husband a year ago (following an illness that lasted three years), she has been the head of a poor household and has had to sustain herself and her four children.

Figure 1. Social network of a poor, female-headed Black Thai household (Case study A)



The total costs of her husband's medical treatment and the funeral expenses (5.5 million Viet Nam dong (₫)[14] were much higher than her annual house income (₫ < 1 million). In addition, she had to rebuild her run-down house, and one of her sons had a serious leg problem. Since the household did not have enough money to buy medicine for him, they had to do without his labour. Her sister (displayed as "A" in figure 1) helped her with rice, clothes and farm work. He Thi G stated that she received the most help from her husband's 'rich' brother (displayed as "B" in

[13] All names have been changed by the authors.

[14] At the time of the survey, ₫ 1 million was equivalent to $40.A household. A monthly income of At the time of the survey, ₫ 1 million was equivalent to $40.A household. A monthly income of < ₫ 80,000 is considered poor by the Government of Viet Nam.

figure 1). She also received a little bit of help on the farm from her husband's other brother (displayed as "🧍 C" in figure 1).

It is clearly visible that the social network of He Thi G is very thin. She is only directly linked to four other people; three of them are immediate kin. Interestingly, the fourth link is to a moneylender because her husband's family (including the rich brother) refused to give her a loan, fearing repayment failure. This shows that the family of the husband does not assume full responsibility for taking care of the widow in the event of an emergency. Loans from moneylenders are usually much more costly than family credit. He Thi G is, therefore, likely to be worse off after repaying the moneylender's loan than if she had obtained credit from family members. This example pinpoints the vulnerability of poor women and highlights the limitations of informal social networks for risk management.

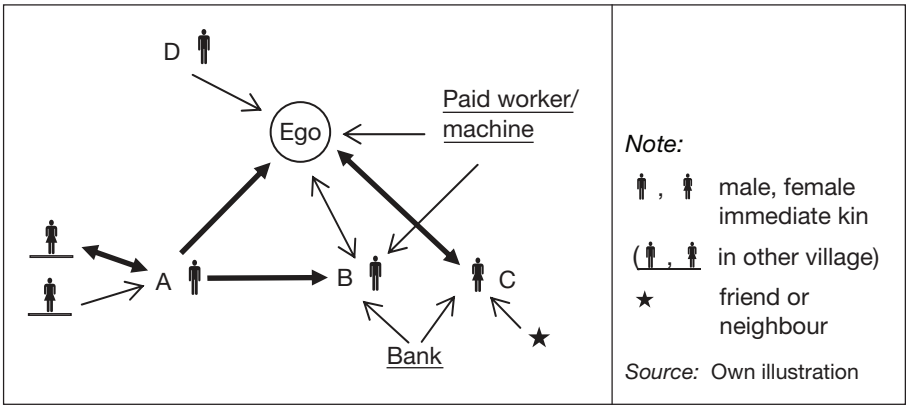
Case study B: A poor, male-headed Tay household

The second example of a poor household is the network of Quang Van Q, a poor Tay farmer in Bac Kan Province. Quang Van Q's livelihood has been under constant severe pressure, as his first wife suffers from mental illness. The sick woman now lives in the house next door in the household of their married daughter, Quang Thi S (displayed as "🧍 C" in figure 2; also classified as a poor household).

Quang Van Q's family has been short of food for many years and, compounding the situation, three of the households' cows were killed in a road accident last year. The total cost of this shock (₫ 5 million) was almost five times the family's annual income (₫ < 1 million). Quang Van Q is directly linked to five other people (see figure 2); four of them are immediate kin. The fifth link is a hired labourer with a plough, who helped with the farm work. Quang Van Q stated that he received the most help from his brother (the village headman,[15] displayed as "🧍 A" in figure 2; classified as an average household), who gave him an informal loan. The second person providing considerable support to Quang Van Q is his daughter Quang Thi S, mentioned above, who takes care of his sick ex-wife. In return, Quang Van Q helps her with farm work. He also works at his other brother's farm (displayed as "🧍 B" in figure 2) in return for rice.

[15] In the SNA interview, the village headmen states that he has not had any difficulties in the past year. Hence, he has not required any help – which explains his rudimentary network. An additional expert interview with the village headmen reveals that he is in charge of compiling a list of those (vulnerable) villagers who are eligible to receive a loan from the Social Policy Bank. The village headman is also responsible for the proper repayment of the credit to the bank. Consequently, he selects villagers that are able to repay in time. However, the hungry and the poor (who are excluded from formal credit) may be able to get an informal loan from relatives who are on the list.

Figure 2. Social network of a poor, male-headed Tay household (Case study B)



This case study is a good example of the finding that only immediate kin provides assistance (besides the hired labourer, who is paid by Quang Van Q's brother). Through his family ties, and especially his well-off brother, Quang Van Q is better "insured" through his social network than poor widow He Thi G of case study A. Nevertheless, Quang Van Q's shock could not be completely offset, which highlights once again that needy households with limited assets and resources do not request all the support they need in order to cope with a crisis. The fear of over-straining relationships is a common feature in social networks, so a household carefully considers whether it will be able to return the help provided when payback day comes.

Case study C: A poor, male-headed Black Thai household

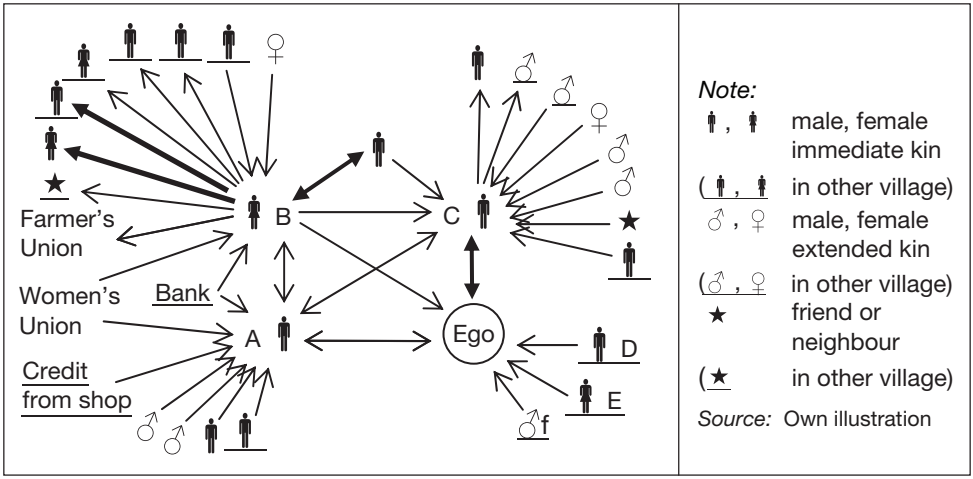
A poor Black Thai family (annual income ₫ < 1 million), lacking money, labour and food, characterized the household used for the third network analysis.[16] In the twelve months prior to the interview, the household's animals perished (representing a loss of ₫ 5 million). In addition, the father of the family head, Ha Van C, died (cost: ₫ 1 million) and Ha Van C had been hospitalized for a while, entailing considerable expenditure. Moreover, the family had to finance the wedding (cost of ₫ 6 million) of one of their sons. At the time of the interview, one of Ha Van

[16] The family has mentioned three people from the same village and three more people from another village who have provided help. Only those living in the same village have been interviewed, as in Viet Nam, research permits are location-specific and cannot easily be extended to cover other areas.

C's sons had been living at the home of his wife's parents for more than one year while the other son was serving in the military, so no children were living at home. This created a severe lack of labour. In order to cope with the crisis, the family had previously sold livestock and received an informal loan and help with the farm and housework from their immediate kin. Additionally, the household was able to borrow a draft animal for the farm work from one of Ha Van C's brothers.

The sociogram of Ha Van C's household is displayed in figure 3. The three other network members interviewed are ranked in different wealth strata. His brother "A" is also poor, his sister "B" is average, and his other brother "C", who is also the village head, is classified as better-off. As in case study B, it is remarkable that Ha Van C's social network consists mainly of actors with very strong family ties, his immediate kin. However, Ha Van C says that the help received was not sufficient to cope with the situation, especially with regard to the farm work. He says the people who did help were very busy with their own farm work. As the family is poor, it would not dare ask for more help out of fear of not being able to return the assistance at a later stage. This again indicates the importance of mutuality.

Figure 3. Social network of a poor, male-headed Black Thai household (Case study C)



Case study D: An average Tay household

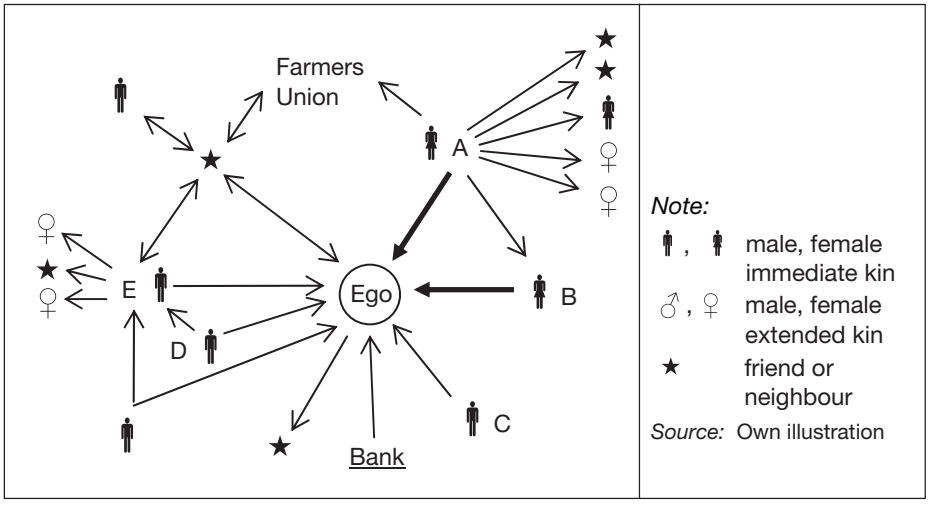
The network of Ca Van C, an average farmer of the Tay ethnic minority group, is displayed in figure 4. Ca Van C's family (annual income of ₫ 4 million)

has endured livestock loss (₫ 4.7 million), including the thief of a cow and two young buffaloes, and the death of a pig. The household is directly linked with eight other households, including six immediate kin and two neighbours, and with the bank.

In contrast to the other networks presented here, the wife's immediate kin provides most of the support, including informal credit. It is noteworthy that the two households that are providing the most help are both classified as better-off households. Regarding degree centrality, Ca Van C receives help from eight alters, but only provides help to two alters, which is a ratio that is more common for poor households.

Although Ca Van C received substantial help and was granted a loan (₫ 5 million) from the Viet Nam Bank for Agricultural and Rural Development (VBARD), he claims that the help has not been sufficient, as the amount of funds received does not cover the cost to replace the lost livestock. When compared to the other case studies, however, this statement may also be interpreted as "complaining from a position of relative comfort".

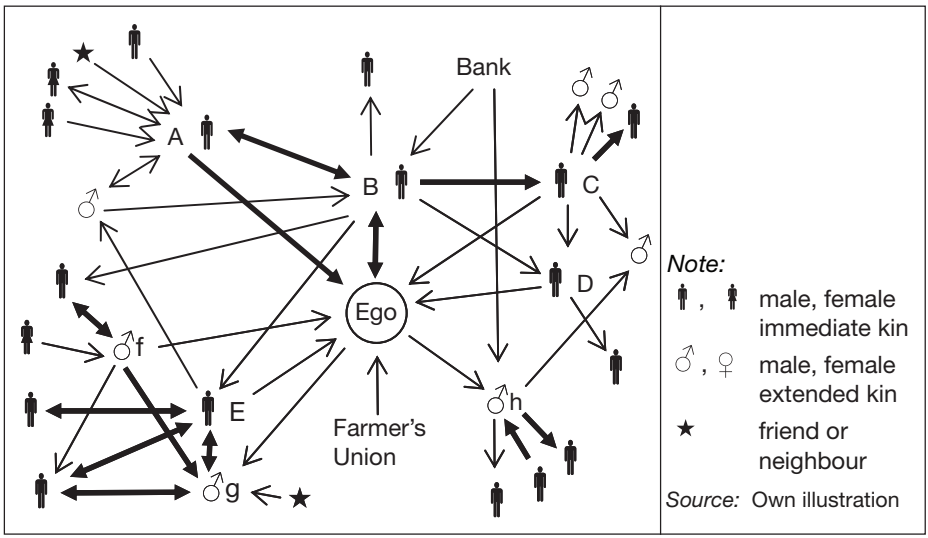
Figure 4. Social network of an average-income Tay household (Case study D)



Case study E: A prosperous average income Black Thai household

Hu Van H (figure 5) is the male head of a Black Thai household officially ranked as average. The household earns an income (₫ 6 million per year) from farm work and a waged job, as Hu Van H is the village headman. However, taking into consideration his wife's salary as a teacher (₫ 800,000 per month), the household could also be classified as better-off. Recently, Hu Van H had to finance medical expenses (cost: ₫ 6 million) and a funeral (cost: ₫ 3 million). Hu Van H's father had been sick for many years and had undergone surgery several times within the twelve months before he died. The mother of Hu Van H was also sick and hospitalized (cost: ₫ 1 million) during the past year. The family had no health insurance.

Figure 5. Social network of a prosperous average-income Black Thai household (Case study E)



Hu Van H has received help from seven persons or households: five immediate kin and two extended kin. In addition, he has received help from the Farmers' Union, a public association of farmers. It is noticeable that there are hardly any actors from other villages in this entire network. Additionally, most actors are immediate kin of each other. These two facts are quite interesting as they differ considerably from most of the other networks presented. This case study, thus, highlights once again the importance of kinship relations and mutuality of help.

Lessons learned[17]

It is often assumed that households that are members of a certain group, such as a village or an extended family, will form a single network. De Weerdt (2002) considers this unlikely to be true as there are many factors influencing the formation of insurance networks, such as smooth information flows, norms, trust, the ability to punish, group size and potential gains from cooperation. Field research in northern Viet Nam confirms that informal risk-sharing networks do not necessarily include all village inhabitants nor all members of the extended family. The networks are usually comparatively small and predominately based within the village boundaries. Poor families, in general, tend to have less insurance potential as they have difficulties forming ties with other households, tend to be excluded from internally cohesive subgroups and belong to relatively more isolated subgroups and subgroups with lower wealth. As a consequence, poor households remain vulnerable to adverse shocks, despite the presence of the informal insurance system (De Weerdt and Van de Gaer, 2003). This is not only true in Viet Nam but seems also to apply to other upland areas of South-East Asia.

The case studies confirm the hypotheses that poorer households have smaller networks than richer households. Furthermore, poorer households are more likely to belong to resource-poor networks and help is usually only exchanged between immediate kin. In contrast, richer households that are endowed with a broader asset portfolio, also extend aid to extended kin and occasionally to neighbours. Hence, households with more friends (especially wealthier friends) have a greater ability to use informal insurance.

The limited size of the networks of poor people in the uplands of South-East Asia may be due to this segment of the population's possible inability to guarantee mutual help. In the case of Viet Nam, mutuality is of utmost significance and when not guaranteed or anticipated, support is very limited, even within a person's own family. Nevertheless, the wealth-related limitation may be eased if the social networks include people in higher income groups or someone of high repute, such as the village headman (see case study B). Another striking feature was that the relatively richer households (see case studies D and E) had more formal actors such as banks and mass organizations in their social risk-sharing network. This again supports the hypothesis that the poorest households as well as members of certain ethnic minorities, such as the Hmong or the Dao, who live in the very remote and most degraded areas, are often excluded from formal institutions even if these claim to exactly serve this population.

[17] Lessons learned are summarizing results gained from the above presented and additional case studies, as well as own qualitative data collected in preparation as well as parallel to this SNA.

Another interesting result from the comparison of the different sociograms is that almost all of the ego as well as the alter households that experienced a shock were not only receiving help but also giving it. The need for conscious reciprocity is rather astonishing as one would anticipate that those households would be exempted from giving it for the time being. However, in terms of the social capital metaphor, risk-sharing networks not only impose maintenance costs for the household, such as in the form of long-term reciprocity, but clearly also impose current costs in the form of reciprocity even in the event of a crisis. Social capital needs maintenance, and maintenance is costly as it requires the investment among other things. Poorer households generally lack the means to invest in social capital. Hence, they are often structurally excluded from social capital, as being engaged in social networks may also imply certain costs (Cleaver, 2005). Destitution leaves little space for networking (Thorp and others, 2005). Women and the ultra-poor, in particular, face constrained access to gift exchanges, informal credit and assets sales to mitigate risks, because they have weak social networks and lack tradable assets, including labour.

Nevertheless, in times of crisis, the networks usually grant minimum access to the resources that are lacking, be it food, labour or an informal loan. Support is usually sufficient to fulfil the most basic food requirements. These statements are in line with Tapsell and others (2007), who state that in-built community-level survival strategies, such as neighbourly assistance, can provide a level of resilience, but without support from the civil society, the plight of the rural poor may never improve.

Finally, concerning the place of residence, the case studies suggest that the majority of help flows remain within the village. Occasionally, help flows come from or are given to the women's village of origin. In this case, the helping household is usually better off than the one receiving help.

V. CONCLUSION AND POLICY RECOMMENDATIONS

In South-East Asia, poor and near-poor households endure considerable livelihood vulnerability due to income and consumption shocks. To buffer these shocks, households apply various risk management strategies, based on their available capital assets. As formal safety nets are non-existent, the formation, maintenance and use of social networks is one of the most important risk management strategies of ethnic minority farm households.

Conclusion

Our Viet Nam country case study provides fundamental insight as it is one of the few, if any, analyses of risk management networks in the uplands of South-East Asia. The results of the this study has been validated by triangulation of different qualitative and quantitative research methods. The sociograms depict the composition and utilization of informal risk-sharing networks of vulnerable farm households. All in all, our research provides evidence that risk management strategies hardly vary between men and women or among different ethnic groups. In the event of a crisis, the household, as a whole, makes use of the available resources and the existing social network and not individual household members. Since the household couple traditionally has to rely on the husband's network, women are usually worse off than men when the spouse dies. Kinship and wealth are the major influential factors concerning the formation and size of social networks.

Social networks, as one part of the household's social capital assets, are able to provide basic support, but are not sufficent enough to completely buffer a major crisis. The networks of poor households are, on average, smaller than those of wealthier households, and it is considered beneficial if people in higher income groups or someone of high repute is included in a poor household's social network. Mutuality of help is crucial. Therefore, needy households with limited resource endowment reach their network threshold earlier than wealthier households. Hence, poor households and especially households headed by women remain vulnerable to shocks despite the presence of an informal insurance system. These households are still forced to sell assets, primarily livestock, in the event of a livelihood emergency. The situation becomes even more acute where a household loses a credit-financed animal. In such cases, the household's vulnerability increases. It substantially limits the household's long-term livelihood strategies and very often directly consolidates poverty or makes the household slip into poverty.

However, if women's access to certain assets, especially knowledge and credit, is increased, their social position improves. Women have begun to socialize more and are increasingly exchanging in activities related to farming knowledge, raising the potential to improve the women's, and in the long-run, the whole household's capabilities of using scarce natural resources more efficiently. This is an efficient risk management strategy which has the potential to decrease the vulnerability of a household in the long-term.

Policy recommendations

From the social capital point of view, the networks are small because poor farmers do not have the means to invest in social capital, as they are usually unable

to cover the current and future costs of reciprocity. This point offers some leverage for policies. Poor farmers would be able to extend their networks if their costs of investing in social capital were to be reduced. Reducing transport costs for poor farmers by issuing a card that grants them free access to public transport could be one way to cut their overall costs. Another approach could be to reduce communication costs by extending mobile telephone networks into rural areas.[18] The latter surely points in the direction of general infrastructure improvements, which are traditionally a top priority in remote areas like the northern uplands of Viet Nam.

Another shortcoming, particular to poorer and female headed households, is that their networks are rather isolated. One way to improve this could be through voluntary mentoring by important and skilled members of the community. This would generate links to powerful allies as well as increase the farmer's knowledge. However, such schemes must be carefully designed to avoid inequalities at the lowest end of the wealth ladder, making those who have no outside support, such as "godparent", through bad luck or are of the "wrong" ethnicity, even more vulnerable. In addition, it would be recommended to not only encourage poor households and women to participate in agricultural training, but to combine it with a special credit programme, such as a women's credit programme.

Furthermore, the combination of credit and insurance, especially loans that are taken to purchase livestock, might help rural farm households decrease their vulnerability and save them from slipping into poverty, now or later. Such a policy measure would, nevertheless, only help households that were able to get the credit in the first place, thus excluding the poorest of the poor. The very poor households can only be reached either by means of a general social security scheme, or by an improved village-based mutual aid scheme, such as a rotating credit scheme.

To date, however, no functioning comprehensive social security system has existed in the uplands of South-East Asia for most of the poor, ethnic minority households. According to Hu and Stewart (2009), various old-age social assistance programmes have previously been initiated in developing countries, but the gained amount is often not believed to be sufficient to meet all basic needs. Hence, the majority of the poor are still relying on family support. Consequently, governments should consider introducing a so-called "zero pillar" pension, which aims to guarantee an appropriate retirement income to all of the older population, people more than 60 years old of age. Following Willmore (2006, cited in Hu and Stewart 2009: 4), such a scheme would not be prohibitively expensive for developing countries – with

[18] Examples can be found in the uplands in northern Thailand and Bangladesh (http://www.grameen-info.org/index.php?option=com_content&task=view&id=9&Itemid=199).

the International Labour Organization (ILO) estimating the cost at a few per cent of GDP, 0.005 per cent for Thailand and 0.5 per cent for Viet Nam. In addition, an efficient and accessible health-care system could serve as an important aspect for securing livelihoods, as the majority of the interviewed households have problems with the high cost to treat illness.

REFERENCES

ADB (Asian Development Bank) (2002). *Indigenous peoples/ethnic minorities and poverty reduction: Viet Nam,* (Manila, ADB).

Adger, W. Neil, P. Mick Kelly, Alexandra Winkels, Luong Quang Huy, and Catherine Locke (2002). "Migration, remittances, livelihood trajectories and social resilience", *Ambio*, vol. 31, No. 4 (June), pp. 358-366, accessed from www.uea.ac.uk/env/people/adgerwn/Ambio Adger.sep.pdf.

Alwang, Jeffrey, Paul B. Siegel, and Steen L.Jørgensen (2001). "Vulnerability: A View From Different Disciplines", Social Protection Discussion Paper Series, No. 0115, June (Washington, D.C., World Bank). accessed from siteresources.worldbank.org/SOCIAL PROTECTION/Resources/SP-Discussion-papers/Social-Risk-Management-DP/0115.pdf.

Appold, Stephen J., and Dinh the Phong (2001). "Patron-client relationships in a restructuring economy: An exploration of interorganizational linkages in Vietnam", *Economic Development and Cultural Change*, vol. 50, Issue 1, (October), pp. 47-76.

Bao Duong, Pham, and Yoichi Izumida (2002). "Rural development finance in Vietnam: A microeconometric analysis of household surveys", *World Development*, vol. 30, No. 2 (February), pp. 319-335.

Barslund, Mikkel, and Finn Tarp (2008). "Formal and informal rural credit in four provinces of Vietnam", *Journal of Development Studies*, vol. 44, No. 4, pp. 485-503.

Beall, Jo (2001). "Valuing social resources or capitalizing on them? Limits to pro-poor urban governance in nine cities of the south", *International Planning Studies*, vol. 6, No. 4 (November), pp. 357-375.

Beuchelt, Tina (2008). "Support networks of rural households – A case study of risk-management in Northern Vietnam", in H. Boland, V. Hoffmann, and U.J. Nagel, eds., *Sozialwiss. Schriften zur Landnutzung und ländlichen Entwicklung*, Nr. 86. (Weikersheim, Margraf).

Beuchelt, Tina, and Isabel Fischer (2006). "What do Vietnamese farmers do when a crisis occurs? Covering lack of resources through social networks", in G. Buchenrieder, and T. Dufhues, eds., *Making rural households' livelihoods more resilient – The importance of social capital and the underlying social networks,* vol. 34 (Halle (Saale), Leibniz-Institute of Agricultural Development in Central and Eastern Europe (IAMO)), pp. 45-57.

Borgatti, Steve P. (1998). "What is social network analysis?", accessed from www.analytictech.com/networks/whatis.htm on September 2010?.

Borgatti, S.P., Everett, M.G., and L.C. Freeman (2000). Ucinet for Windows: Software for Social Network Analysis. (1. Version 1999) Harvard, MA: Analytic Technologies.

Bourdieu, Pierre (1986). "The Forms of Capital", in John G. Richardson, ed., *Handbook of theory and research for the sociology of education* (New York, Greenwood), pp. 241-258, accessed from www.marxists.org/reference/subject/philosophy/works/fr/bourdieu-forms-capital.htm.

Buchenrieder, G., and T. Dufhues (eds.) (2006). "Making rural households' livelihoods more resilient – The importance of social capital and the underlying social networks" Studies on the Agricultural and Food Sector in Central and Eastern Europe vol. 34. Halle (Saale), D: Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO).

Carney, D., M. Drinkwater, T. Rusinow, K. Neefjes, S. Wanmali, and N. Singh (1999). "Livelihood approaches compared: a brief comparison of the livelihoods approaches of the UK Department for International Development (DFID), CARE, Oxfam and the UNDP", a review of the fundamental principles behind sustainable livelihood approaches of donor agencies. (London, Department for International Development).

Chen, Xiangming (2005). "Magic or myth? Social capital and its consequences in the Asian, Chinese, and Vietnamese contexts", in Gerd Mutz and Rainer Klump, eds., *Modernization and social transformation in Vietnam: Social capital formation and institutional building* (Hamburg, Institut für Asienkunde), pp. 49-62. accessed from www.uic.edu/depts/soci/xmchen/xmchen_social capital.pdf.

Clausen, Anne (2002). "Female labor migration to Bangkok: Transforming rural-urban interactions and social networks through globalization", *Asia-Pacific Population Journal,* vol. 17, No. 3 (September), pp. 53-78.

Cleaver, Frances (2005). "The inequality of social capital and the reproduction of chronic poverty", *World Development*, vol. 33, No. 6 (June), pp. 893-906.

Coate, Stephen, and Martin Ravallion (1993). "Reciprocity without commitment : Characterization and performance of informal insurance arrangements", *Journal of Development Economics*, vol. 40, No. 1 (February), pp. 1-24.

Coxhead, Ian (2003). "Development and the environment in Asia", *Asian-Pacific Economic Literature*, vol. 17, No. 1 (May), pp. 22-54.

Dalton, Russell J., and Nhu-Ngoc T. Ong (2005). "Civil society and social capital in Vietnam", in Gerd Mutz and Rainer Klump, eds., *Modernization and social transformation in Vietnam: Social capital formation and institutional building* (Hamburg, Institut für Asienkunde), pp. 30-48.

Dalton, Russell, Pham Minh Hac, Pham Thanh Nghi, and Nhu-Ngoc T. Ong (2002). "Social relations and social capital in Vietnam: findings from the 2001 World Values Survey", *Comparative Sociology,* vol. 1, No. 3/4, pp. 369-386.

De Silvaa, Mary J., Trudy Harphamb, Tran Tuanc, Rosario Bartolinid, Mary E. Pennyd, and Sharon R. Huttlya (2006). "Psychometric and cognitive validation of a social capital measurement tool in Peru and Vietnam", *Social Science & Medicine*, vol. 62, No. 4 (February), pp. 941-953.

De Weerdt, Joachim (2002). "Risk-Sharing and endogenous network formation", WIDER Discussion Paper No. 2002/57. (Helsinki: UNU/WIDER). accessed from www.wider.unu.edu/publications/working-papers/discussion-papers/2002/en_GB/dp2002-57/_files/78091719304610440/default/dp2002-57.pdf.

De Weerdt, Joachim, and Dirk Van de Gaer (2003). "Disentangling networks: Defining and analyzing cohesive subgroups", European Economic Association & Econometric Society, 2003 Parallel Meetings, Stockholm, Sweden, 20-24 August, accessed from www.feb.ugent.be/soceco/sherppa/members/Dirk/documents/paper1.pdf.

Dercon, Stefan (2002). "Income risk, coping strategies and safety nets", WIDER Discussion Paper No. 2002/22 (Helsinki: UNU/WIDER), accessed from www.wider.unu.edu/publications/working-papers/discussion-papers/2002/en_GB/dp2002-22/_files/78091715132719638/default/dp2002-22.pdf.

Devereux, Stephen (2001). "Livelihood insecurity and social protection: a re-emerging issue in rural development", *Development Policy Review*, Special Issue: Rethinking rural development, vol. 19, No. 4 (December), pp. 507-519.

Dufhues, Thomas (2007). "Accessing rural finance: The rural financial market in Northern Vietnam", Studies on the Agricultural and Food Sector in Central and Eastern Europe, vol. 36 (Halle (Saale), Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO)), accessed from ageconsearch.umn.edu/bitstream/92327/2/sr_vol36.pdf.

Dufhues, Thomas, Gertrud Buchenrieder, and Isabel Fischer (2006). "Social capital and rural development: literature review and current state of the art", Discussion Paper No. 96 (Halle (Saale), Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO)), accessed from econstor.eu/bitstream/10419/28490/1/524504954.pdf.

Fafchamps, Marcel (1992). "Solidarity networks in preindustrial societies: rational peasants with a moral economy", *Economic Development and Cultural Change*, vol. 41, No. 1, pp. 147-174.

Fafchamps, Marcel (1998). "Risk Sharing and quasi-credit", Stanford University, Department of Economics, GB, available from www.economics.ox.ac.uk/members/marcel.fafchamps/homepage/irsa.pdf.

Fafchamps, Marcel, and Susan Lund (2003). "Risk-sharing networks in rural Philippines", *Journal of Development Economics*, vol. 71, No. 2 (August), pp. 261-287.

Fischer, Isabel and Tina Beuchelt (2005). "Women, Poverty and Risk Management in Northern Vietnam", paper presented at the 11th European Association of Development Research and Training Institutes (EADI) Global Conference on Insecurity and Development – Regional issues and policies for an interdependent world, Bonn, Germany, 21-24 September.

Fischer, Isabel, and Mohammad Musfequs Salehin (2009). "Health and poverty as challenges for human security: two case studies on Northern Vietnam and Bangladesh", in Hans Günter Brauch, and others, *Facing global environmental change: Environmental, human, energy, food, health and water security concepts*, Hexagon Series on Human and Environmental Security and Peace, volume 4, Part VI, (Berlin, Springer), pp. 563-572.

Fischer, Isabel, and Gertrud Buchenrieder (2010). "Risk management of vulnerable rural households in southeast Asia", 9th European IFSA Symposium, Vienna, Austria, 4-7 July 2010, accessed from ifsa.boku.ac.at/cms/fileadmin/Proceeding2010/2010_WS2.5_Fischer.pdf.

Friederichsen, R. and A. Neef (2010 forthcoming). "Variations of late socialist development: integration and marginalization in the northern uplands of Vietnam and Laos" *European Journal of Development Research*.

Goldstein, Markus, Alain de Janvry, and Elisabeth Sadoulet (2002). "Is a friend in need a friend indeed? Inclusion and exclusion in mutual insurance networks in Southern Ghana", WIDER Discussion Paper No. 2002/25, (Helsinki, UNU/WIDER), accessed from www.wider.unu.edu/stc/repec/pdfs/rp2002/dp2002-25.pdf.

Ha, Nguyen Van, Shashi Kant, and Virginia MacLaren (2004). "The contribution of social capital to household welfare in a paper-recycling craft village in Vietnam", *Journal of Environment & Development*, vol. 13, No. 4 (December), pp. 371-399.

Ha, Nguyen Van, Shashi Kant, and Virginia Maclaren (2006). "Relative shadow prices of social capital for household-level paper recycling units in Vietnam", *Ecological Economics*, vol. 57, No. 3 (May), pp. 520-533.

Hanneman, Robert A., and Mark Riddle (2005). *Introduction to Social Network Methods* (Riverside, CA, University of California, Riverside) accessed from faculty.ucr.edu/~hanneman/nettext/.

Heidhues, Franz, and Benjavan Rerkasem (2006). IRRI's Upland rice research: External assessment, accessed from http://www.sciencecouncil.cgiar.org/fileadmin/user_upload/sciencecouncil/SC_5_Meeting/Item_12_IRRI_Upland_Rice_Review.pdf on February 2007.

Hickson, Robert (2001). "Financial services for the very poor – Thinking outside the box", *Small Enterprise Development,* vol. 12, No. 2, (June), pp. 55-67.

Hoang, Lan Anh, Jean-Christophe Castella, and Paul Novosad (2006). "Social networks and information access: implications for agricultural extension in a rice farming community in northern Vietnam", *Agriculture and Human Values*, vol. 23, No. 4, pp. 513-527. (DOI: 10.1007/s10460-006-9013-5) accessed from www.springerlink.com/content/v71q4wg6r26t8pl8/fulltext.pdf.

Hu, Yu-Wei and Fiona Stewart (2009). "Pension coverage and informal sector workers: International experiences", OECD Working Papers on Insurance and Private Pensions, No. 31, (Paris, OECD).

ILO (2004). "Risk Management Financial Products Available in Vietnam" study undertaken within the ILO project "Extension of Micro-insurance and Micro-finance to Informal Sector Women", VIE/00/M51/FRA, Hanoi.

Korff, Rüdiger (2003). "Rural-urban relations: Constraints or facilitations for rural income diversification and aspects of migration in Thailand" in Gertrud Buchenrieder, ed., *Procedings of the Minisymposium on Poverty Impacts and Policy Options of Non-Farm Rural Employment*, 25th International Conference of Agricultural Economists (IAAE), Durban, South Africa, 16-22 August.

Michaud, J. (2000). "A historical panorama of the montagnards in Northern Vietnam under French Rule". in: J. Michaud, (ed.) *Turbulent Times and Enduring People: Mountain Minorities in the Southeast Asian* (Massif, Surrey: Curzon Press), pp. 51-78.

Morduch, Jonathan (1999a). "Between the state and the market: can informal insurance patch the safety net?" *World Bank Research Observer*, vol. 14, No. 2 (August), pp. 187-207.

Morduch, Jonathan (1999b). "The microfinance promise", *Journal of Economic Literature* vol. XXXVII (Decmber), pp. 1569-1614, accessed from www.nyu.edu/projects/morduch/documents/microfinance/Microfinance_Promise.pdf.

Mutz, Gerd, and Antje Schmidt (2002). "About the use of underlying value-systems: social capital formation and institution building in transitional Vietnam", in Rainer Klump, and Gerd Mutz, ed. *Doi Moi in Wirtschaft und Gesellschaft: Soziale und ōkonomische Transformation in Vietnam* (Marburg, Metropolis), pp. 109-123.

Pandey, Sushil (2000). "Technologies for the Southeast Asian uplands", in John Pender, and Peter Hazell ed. "Promoting sustainable development in less-favored areas", *2020 Vision Focus 4*, November. (Washington, D.C., International Food Policy Research Institute (IFPRI)), Brief 4, accessed from ageconsearch.umn.edu/bitstream/16035/1/vf000004.pdf.

Platteau, J.P. (1991). "Traditional systems of social security and hunger insurance: Past achievements and modern challenges", in Ehtisham Ahmad, and others, *Social security in developing countries*, (New York, Oxford University Press), pp. 112-170.

Putnam, Robert D. (2000). *Bowling alone: The collapse and revival of American community* (New York, Simon & Schuster).

Rambo, A.T. and N.L. Jamieson (2003). Upland areas, ethnic minorities, and development, in Hy V. Luong (Ed.) *Postwar Vietnam: Dynamics of a transforming society*. (Singapore: Institute of Southeast Asian Studies), pp. 139-170.

Scott, John (1991). *Social network analysis: A handbook* (London, SAGE).

Sricharoen, Thitiwan, Gertrud Buchenrieder, and Thomas Dufhues (2008). "Universal health care demand in rural northern Thailand: Gender and ethnicity", *Asia-Pacific Development Journal,* vol. 15, No. 1, (June), pp. 65-92.

Stahr, Kai (2001). *Dörfliche Kommunikationsnetzwerke*. (Weikersheim, Margraf).

Stolle, Diethind, and Thomas R.Rochon (1998). "Are all associations alike? Member diversity, associational type, and the creation of social capital", *American Behavioral Scientist,* vol. 42, No. 1 (September), pp. 47-65.

Stone, Wendy (2001). "Measuring social capital: Towards a theoretically informed measurement framework for researching social capital in family and community life", Research Paper No. 24 (February), (Melbourne, Australian Institute of Family Studies), accessed from www.aifs.gov.au/institute/pubs/RP24.pdf.

Tapsell, Sue M., L. Bosher, and Edmund C. Penning-Rowsell (2007). "Resource accessibility and vulnerability in Andhra Pradesh: caste and non-caste influences", *Development and change*, vol. 38, No. 4, pp. 615-640.

Thorp, Rosemary, Frances Stewart, and Amrik Heyer (2005). "When and how far is group formation a route out of chronic poverty?", *World Development*, vol. 33, No. 6 (June), pp. 907-920.

Tuan, Tran (2004) "Community-Based Evidence about the Health Care System in Rural Vietnam", Ph.D. Doctorate, School of Medicine Practice and Population Health, University of Newcastle, accessed from hdl.handle.net/1959.13/24794.

United Kingdom, Department for International Development (1999). "Sustainable livelihoods guidance sheets" (London, DFID), accessed from training.itcilo.it/decentwork/staffconf 2002/presentations/SLA Guidance notes Section 2.pdf.

UNDP (2007). "HDR 2007/2008 – Country Data Sheet Viet Nam", available at http://hdrstats.undp.org/en/countries/profiles/VNM.html (accessed February 2008).

Vandeveer, Monte L. (2001). "Demand for area crop insurance among litchi producers in northern Vietnam", *Agricultural Economics*, vol. 26, No. 2 (November), pp. 173-184.

Van Staveren, Irene, and Peter Knorringa (2007). "Unpacking social capital in economic development: How social relations matter", *Review of Social Economy,* vol. 65, No. 1, pp. 107-135.

Wasserman, Stanley, and Katherine Faust (1994). *Social network analysis: Methods and applications* (Cambridge, Cambridge University Press).

Willmore, Larry (2006). "Universal pensions for developing countries", accessed from www.globalaging.org/pension/world/2006/universal.pdf.

Wong, Sam (2007). *Exploring 'unseen' social capital in community participation. Everyday lives of poor mainland Chinese migrants in Hong Kong*, (Amsterdam, Amsterdam University Press).

Zeller, Manfred, Tina Beuchelt, Isabel Fischer, and Franz Heidhues (2010). "Linkages between poverty and sustainable agricultural and rural development in the uplands of Southeast Asia", in Teja Tscharntke, and others, eds., *Tropical rainforests and agroforests under global change: Ecological and socio-economic valuations*, (Heidelberg, Springer), pp. 511-527, accessed from www.springerlink.com/content/v7617070j436n787/fulltext.pdf.

GROUNDWATER DEPLETION AND COPING STRATEGIES OF FARMING COMMUNITIES IN HARD ROCK AREAS OF SOUTHERN PENINSULAR INDIA

*Anantha K.H. and K.V. Raju**

This study examines the impact and potential opportunities of groundwater irrigation on rural farm households. Focusing on the size and pattern of the groundwater economy in selected villages located in the hard rock areas of Karnataka, India, the paper argues that the groundwater economy is shrinking due to the depletion of this precious resource. Although investment in groundwater irrigation provides wealth-creating opportunities in addition to helping to meet consumption needs, more often than not, the ongoing need to drill for new wells to counteract severe depletion problems cuts into the investment returns and ultimately affects the pool of assets. Farmers have adopted several coping strategies to overcome the negative externalities of groundwater depletion in this region. Groundwater irrigation has the potential to be a more productive instrument for sustainable rural development in fragile eco-regions. But, in order to make investment in this area a viable option for rural livelihood enhancement, certain policy, institutional factors and other issues need to be addressed.

JEL Classification: O12, Q12, Q15, Q25.

Key words: Groundwater, farming communities, irrigation, economic development, India.

* Anantha K.H. is visiting scientist, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Andhra Pradesh, India, and can be reached at k.anantha@cgiar.org; K.V. Raju is a professor at the Centre for Ecological Economics and Natural Resources (CEENR), Institute for Social and Economic Change (ISEC), Bangalore, Karnataka, India, and can be reached at kvraju@isec.ac.in. The authors would like to thank the anonymous referees for helpful comments on an earlier draft.

I. INTRODUCTION

The ongoing degradation of resources is a formidable challenge that affects both poverty and ecosystem resilience. Land degradation and water scarcity are key factors limiting food production and wealth generation for poor people, and further degradation and scarcity are projected (Sharma and others, 2005). The expanding world population accompanied by higher levels of poverty is exerting greater pressure on natural resources, leading to gradual resource degradation. Poor farmers, globally, tend to be associated with marginal lands and low yields (Rockström and others, 2003). As a consequence, these farmers have a limited livelihood status and face various socio-economic and environmental constraints. Development in Asia is at stake due to the stagnation and declining resource use productivity, alarming degradation of natural resources, particularly soil and water, and declining land-man ratio (Wani and others, 2001). Farmers are operating under these precarious conditions to meet increasing food demand. The hard rock areas are not an exception to this trend. The growing demand for foodgrains to supply the rapidly increasing population has put natural resources, such as land and water, under severe stress in these areas. Thus, efforts have been ramped up to increase the net irrigated area to enhance the productivity of land and water.

Some regions have experienced agricultural prosperity due to water resource endowments. The complimentary nature of water and other inputs has boosted public investment in surface irrigation in these regions in order to achieve food security. However, in the absence of public investment due to the lack of surface irrigation sources, individual households have been compelled to take initiatives to invest in groundwater irrigation to produce foodgrains to sustain rural livelihoods (Dhawan, 1995). Of late, investment in groundwater development has picked due to available institutional credit and the supply of electricity remaining steady despite priced fluctuations. However, on the other hand, pressure from the growing population and the effects of economic development, including urbanization, industrialization and mechanization of agricultural activities, have reduced the supply of available water (Kumar and others, 2008). This has resulted in resource scarcity, and has pushed farming into marginal areas, especially in the hard rock areas where there is no assured source of perennial irrigation. Several experiences have already shown that increasing groundwater scarcity in these areas has undermined the agriculture activities (Janakarajan, 1993; Nagaraj, 1994; Nagaraj and others, 1999; Nagaraj and Chandrakanth, 1995; Nagaraj and others, 1994; Chandrkanth and Arun, 1997).

The purpose of this paper is to assess the impact of groundwater depletion on rural livelihoods in the hard rock areas of southern peninsular India. By analysing the size and pattern of the groundwater economy, the paper examines the potential

threats from groundwater depletion and coping strategies to withstand short-term shocks.

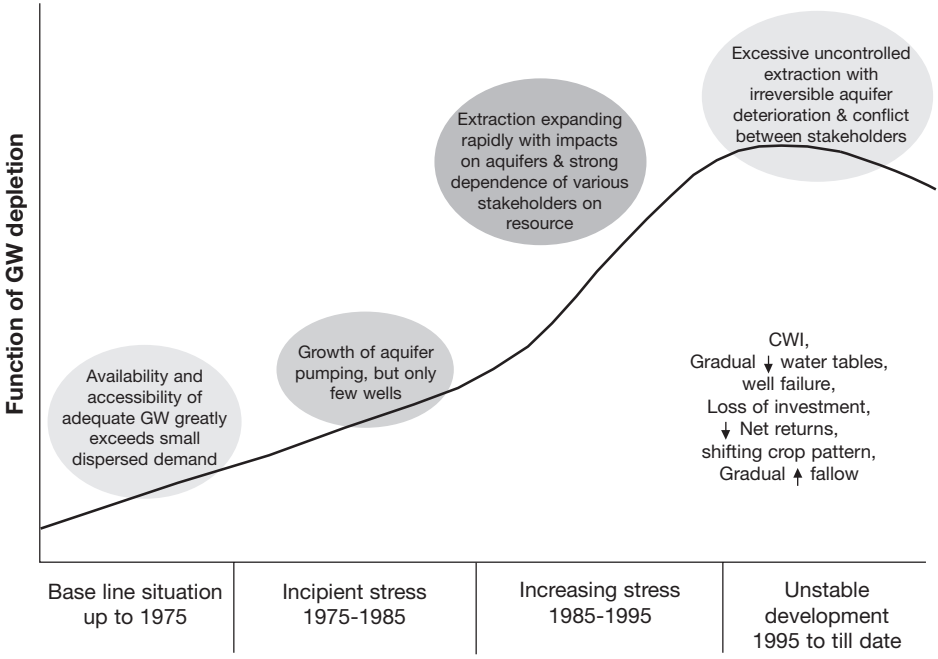
II. CONCEPTUAL FRAMEWORK

During the past few decades, great strides were made in agricultural technologies aimed at enhancing productivity. This, in turn, ensured food security. However, in regions where essential inputs, such as irrigation were harder to implement, public investment in these technologies were not forthcoming, limiting the ability to achieve sustainable agriculture. The hard rock areas fell into this category. The spread of groundwater irrigation, which began in the 1950s, went through four distinct phases of groundwater development, mainly due to institutional and technological changes. Later, due to aquifer development, the groundwater scenario changed drastically, leading to the over-exploitation of groundwater. Figure 1, which presents the four phases of groundwater development, provides a clearer picture of the extent of groundwater exploitation in the hard rock areas. In the baseline situation, commercial crops were not cultivated and demand for water was relatively low. Consequently, there was an overall balance between the extraction and recharge of groundwater (Nagaraj and others, 1999). Demand for water increased in line with the Green Revolution,[1] which put greater focus on agriculture in order to increase food production. Initially, surface irrigation was highlighted, with more public funds being allocated to irrigation projects to meet increased demand for irrigation water. However, ecologically fragile regions that lack surface water sources needed to rely on private investment to augment irrigated areas through groundwater development. As a result, groundwater exploitation was prevalent in these areas (see figure 1). In the fourth phase, groundwater-based agriculture shifted to commercial crops and induced higher demand for reliable water sources. Groundwater from deep surface bore wells paved the way for reliable and equitable exploitation of water to sustain these crops. In this process, the yield of dug wells and dug-cum-bore wells (DCBWs) declined drastically while investments in deep bore wells increased manifold. The depth of the wells also increased the cost of operation and maintenance of pump sets. Rapid changes have occurred during the past four decades in the groundwater irrigation economy of the hard rock areas. Some of the more significant ones include: the increased number of wells; the greater depth of the wells; failure of wells; the disappearance of traditional lifts; higher cost per unit of water extracted; high density of wells per unit of area without considering spacing criteria; a greater area devoted to commercial crops; increased costs associated with improvements of wells; and a shift

[1] The Green revolution refers to a series of initiatives, occurring between the 1940s and 1970s, that increased agriculture production around the world.

to dry land agriculture in some cases (Janakarajan, 1993; Nagaraj, 1994; Chandrakanth and Arun, 1997; Shivakumaraswamy and Chandrakanth, 1997; Nagaraj and others, 2003; Janakarajan and Moench, 2006). In addition, the changes raised tensions among stakeholders over who had customary rights to the groundwater (see Rao, 2006). As a consequence of these factors, groundwater sustainability in the hard rock areas was put in a precarious condition.

Figure 1. Stages of groundwater development in hard rock areas



Source: Author's compilation.

Many experts argue that no single factor provides the solution for most of these problems. However, current literature owes much to Boserup (1965, 1990), who believed that population pressure was the driving force behind the adoption of more advanced forms of agricultural technology, beginning with the abandonment of shifting cultivation and fallowing. While Boserup focused on increases in labour-land ratios, subsequent writers have considered the role of fertilizer, irrigation and other inputs. (Kanhert and Levine, 1989). Dhawan (1995) believed that the most predominate fact was groundwater irrigation, which he said improved productivity by more than 2.5 per cent compared to dry land agriculture. In addition, two other noted basic advantages

of groundwater irrigation over surface water irrigation are that it is relatively less sensitive to rainfall variability and enables users to obtain water more or less on demand. These advantages have led to more secure agricultural planning and lower levels of risk, which have consequently encouraged investment in the inputs necessary to utilize new agricultural technologies. Several studies have argued the importance of groundwater with regard to irrigation has helped encourage complementary investments in inputs such as fertilizers, pesticides, high yielding varieties (HYVs), which, in turn, has increased crop yields. (Kanhert and Levine, 1989).

However, there are diverging views among researchers on the pathways of agricultural change in response to increasing scarcity of productive resources, such as land and water. According to Boserup (1965), increased subsistence demand encouraged land-saving and labour-intensive technical change, which raised production per unit of land, in which resource scarcity was a major driving force for intensification of agriculture. The theory of induced technical and institutional innovation formulated by Hayami and Ruttan (1985) supported this view. The diminishing returns to labour would be offset and degrade the resource base as efforts to boost earnings would entail exploiting more resources. On the other hand, neo-Malthusians rejected the positive autonomous role of population growth in the process of agricultural change and strongly argued that population growth, far from being a positive driving force, was a principal agent leading to a spiral of negative consequences, such as environmental degradation and lack of food security, in developing countries (Meadows and others, 1972, 1992; Hardin, 1995; Cleaver and Schreiber, 1994).

Similarly, the lack of efforts towards implementing management responses to groundwater problems reflected a combination of technical, social, behavioural and organizational limitations that were weakening the balanced use of water for development. Such limitations were often compounded by the growth of competing demands and social conflict over access to the resource and the manner in which it was being used. However, this process of development also entailed considerable damage to the physical environment, including degradation and depletion of groundwater resources and unsustainable use of land and water resources. Hence, the issue of groundwater and livelihood consonance today is essentially not technical but managerial. The problems arising from the above process have their roots in economics, sociology, political issues, ecology and the environment. Therefore, the effects, especially those pertaining to groundwater resources, have interrelationships with multiple issues.

III. MATERIALS AND METHODS

The objective of this paper is to analyse the implications of groundwater depletion on rural livelihoods, and to assess the coping strategies to deal with them. For this purpose, we interviewed farmers in the central dry zone of Karnataka, India from the taluks[2] of Madhugiri and Hosadurga. Based on a classification system listed by the Department of Mines and Geology of the government of Karnataka, the status of the groundwater in Madhugiri was classified as over-exploited, while in Hosadurga, it was considered to be safe. The classifications are the following: if the proportion of groundwater extraction from the groundwater recharge is above 100 per cent, the area is over-exploited; between 85 and 100 per cent, it is categorized as critical; between 65 and 85 per cent, it is categorized as semi-critical; and below 65 per cent, it is considered as safe area. The fact that the two regions fell into categories in opposite ends of the spectrum implies that groundwater extraction has multi-dimensional effects on its use level within an agro-climatic zone.

The sample for this paper consists of 225 farmers selected from different categories based on their degree of dependency on groundwater-based agriculture. Using participatory rural appraisal (PRA), wells (both functional and non-functional), well depth, distance between wells, farm size and farmers' names were mapped in each village. From the map, a sample of farmers, who had irrigation wells, which were densely placed, was drawn from nine villages in the two taluks. The information gathered includes, among other things, a socio-economic profile, details of irrigation wells, information on access to groundwater irrigation and information about agricultural inputs and outputs. The outputs were based on harvest figures reported in kilograms or quintals by farmers and converted to weight measures at the nearest market place where the farmers' sold their goods. The primary survey was conducted from August to December 2007.

IV. GROUNDWATER IRRIGATION: BOON OR BANE?

According to Kumar and others, 2008, most of the states in India were largely agrarian, and rural livelihoods were heavily dependent on the degree of agricultural development. This trend held true for the hard rock areas as well. These areas were fairly advanced in terms of the adoption of new crop technologies and mechanization of agriculture, making irrigation the most critical component to sustain rural livelihoods through high-yield crops. Irrigation played an important role in enhancing crop productivity by making multicrop and multiseason cultivation possible. Thus, the livelihood impact of irrigation in the hard rock areas indicated increasing economic

[2] A Taluk is a subdivision of a district; a group of several villages organized for revenue purposes.

resistance to the shocks in the household economy. Groundwater irrigation affected rural livelihoods in many different ways. Access to groundwater enhanced the yields and created demand for associated products and services while reducing the risk of crop failure. For farmers, assured irrigation was the prerequisite for increasing agricultural productivity.

The above condition deteriorated when resource scarcity, as a result of groundwater overdraft, led to crop failures. The losses were, in fact, even more severe than in areas that had not built irrigation systems. This was because economies in irrigated areas had shifted to more intensive production techniques, requiring higher inputs, such as fertilizer, and associated cash, labour and other forms of capital investment. Basically, groundwater overdraft posed a severe threat to agricultural production, and consequently, the overall economic development of a region became uncertain.

Land and water are the most influential factors in maintaining livelihoods in agrarian economies as well as in determining household livelihood strategies. The study villages used in this paper were drought-prone in which climate was a major factor contributing to this regular occurrence and the ongoing desertification process. Invariably, groundwater depletion and quality issues became major problems in these villages, forcing the farmers to change their agricultural practices to adjust to the varying climate and their natural resource endowments (table 1).

Table 1. Key characteristics of the study villages

	Hosadurga			
Particulars	**Adrikatte**	**Heggere**	**Huralihalli**	**Marabagatta**
Caste composition	Lingayat, Ediga	Lingayat, Kurba	Lingayat	Lingayat
Livelihood options	Agriculture, livestock, floor mill, petty business	Agriculture, livestock, petty business	Agriculture, livestock	Agriculture, livestock
Climatic conditions	Semi-arid	Semi-arid	Semi-arid	Semi-arid
Resource condition (water, land and soil)	Moderate soil fertility; high groundwater depletion; groundwater quality problem	Moderate soil fertility; moderate groundwater depletion; groundwater quality problem	Moderate soil fertility; high groundwater depletion; groundwater quality problem	Moderate soil fertility; high groundwater depletion; groundwater quality problem

Table 1. ***(continued)***

Hosadurga				
Particulars	**Adrikatte**	**Heggere**	**Huralihalli**	**Marabagatta**
Others	Sefl-help groups, milk cooperative society	Self-help groups, milk cooperative society	Self-help groups	Self-help groups, milk cooperative society

Madhugiri					
Particulars	**Chandragiri**	**D.V. Halli**	**Garani**	**Kambadahalli**	**Madenahalli**
Caste composition	Vokkaliga, Lingayat, Kuruba	Vokkaliga, Muslims, Ediga, Kuruba	Vokkaliga, Lingayat, Ediga, Kuruba	Vokkaliga	Vokkaliga, Reddy, Nayaka
Livelihood options	Agriculture, livestock	Agriculture, livestock	Agriculture, livestock	Agriculture, livestock	Agriculture, dairy activity
Climatic conditions	Semi-arid	Semi-arid	Semi-arid	Semi-arid	Semi-arid
Resource condition (water, land and soil)	Moderate soil fertility; high groundwater depletion; groundwater quality problem	Moderate soil fertility; high groundwater depletion; groundwater quality problem	Poor to moderate soil fertility; high groundwater depletion; groundwater quality problem	Moderate soil fertility; high groundwater depletion; groundwater quality problem	Poor to moderate soil fertility; high groundwater depletion; groundwater quality problem
Others	Self-help groups, milk cooperative society	Self-help groups, milk cooperative society	Self-help groups, milk cooperative society	Self-help groups	Self-help groups, milk cooperative society

Source: Primary survey.

Size of groundwater economy

An estimate of the size of the groundwater economy in each region was made based on a primary survey of gross private returns from crops grown in the study villages. The total value of agricultural output generated through well irrigation was estimated to be 4,071,885 Indian rupees (₹s) in Hosadurga and ₹s 3,693,844 in Madhugiri during 2006-2007. Table 2 shows that coconut accounted for a major share of the groundwater economy in Hosadurga, where it had become a profitable crop because of the effective market demand and other agronomic factors. The table

indicates that the share of coconut in the overall size of the farm economy was 87.14 per cent in Hosadurga, while in Madhugiri, it was only 9.60 per cent. In Madhugiri, paddy comprised the largest share of total crops grown in the region at 31.5 per cent, followed by areca nut (17 per cent) and groundnut (15.5 per cent). Paddy is also a staple food crop in Madhugiri and farmers there tend to allot a small portion of their plot to cultivate it for their household needs. Importantly, areca nut, was the number two crop in the region as cultivation of it began during the early stages of the groundwater economy.[3] But in Hosadurga, because of late planting resulting in less production than their potential, the returns had been low compared to Madhugiri. During the field study, we learned that groundnut was a profitable crop, given the conditions of water scarcity. A majority of the farmers interviewed complained about crop failure during 2006-2007 due to bad rainfall and climatic conditions. However,

Table 2. Annual size of groundwater economy in study areas (in Rs.)

Crops	HOSADURGA		MADHUGIRI	
	Value (Rs.)	Share (%)	Value (Rs.)	Share (%)
Areca nut	8 933	0.22	629 415	17.04
Coconut	3 548 073	87.14	354 602	9.60
Groundnut	107 133	2.63	573 041	15.51
Paddy	165 131	4.06	1 164 762	31.53
Ragi	16 365	0.40	238 890	6.47
Vegetables	196 212	4.82	59 386	1.61
Flower	NC	–	37 822	1.02
Jowar	NC	–	174 009	4.71
Mulbury	NC	–	65 254	1.77
Onion	NC	–	31 717	0.86
Others	30 038	0.74	364 946	9.88
Total	**4 071 885**		**3 693 844**	

Source: Primary survey.

Note: NC stands for no cultivation.

[3] Chandragiri – a village in Madhugiri taluk – had been bearing the brunt of well failure since 2003. The village was once an areca nut and paddy granary, but had become a dry area due to water scarcity. Nearly 25 acres of areca plantations became dry in the village. Farmers, who realized the problem, adopted water-saving methods, such as drip irrigation. However, by the time these methods were adopted, the entire crop area became dry. This resulted in heavy debate among farmers themselves about interlinking rivers to preserve water bodies such as tanks and facilitate aquifer recharge in the area. Unfortunately, nothing happened.

table 2 indicates that there were significant variations in the size of the groundwater economy across the study villages.

Table 3 shows that the annual size of the groundwater economy varied across villages in both the areas. In Hosadurga, Adrikatte topped the table at Rs 1,171,496 followed by Marabagatta (Rs 1,052,409), Huralihalli (Rs 688,792) and Heggere (Rs 124,036). In Adrikatte, coconut and vegetables were the major crops that accounted for a major share of income. In Madhugiri, the size of the groundwater economy varied from Rs 1,065,306 in Garani where a variety of crops were grown to Rs 340,418 in Madenahalli, which was vulnerable to agricultural activities due to water scarcity. In general, based on our findings, it can be concluded that the size of the groundwater economy in the hard rock areas depended on cropping patterns, availability of water and climatic conditions.

Dealing with water scarcity

Groundwater irrigation had affected livelihood sources by cutting into income generated from farm and non-farm activities as a whole. This study focused on areas where long-term groundwater overdraft was compounded by cumulative well interference. In these areas, people tended to adopt new techniques as water became less available. However, the over-exploitation of the groundwater led to the deterioration of the living standards of the rural farm households in many different ways. The more visible impact of groundwater depletion was on the income status of households and food security. To counteract this, the following steps were taken 1) farmers attempted to diversify income sources away from water-dependent, agricultural livelihood; 2) increased access to water was sought by drilling deeper bore wells; and 3) households borrowed from informal sources to cover the increasing cost of irrigation such as bore wells and other accessories.

Table 4 shows the proportion of income generated from irrigated agriculture to the income generated from all sources. It also indicates that well irrigation contributed a major share to the total income of all the farmers across all the villages, with a greater proportion going to the medium and large farmers. In the case of marginal and small farmers, the proportion varied from village to village. As the area under irrigation was limited, small and marginal farmers had to depend on some non-farm activities, such as construction, driving and security work in urban areas to supplement their income.

The contribution of irrigated agriculture to livelihood security was significant in both the areas. However, the degree of the contribution varied from village to village and across size classes, depending on resource availability and the opportunity to utilize the resources. Small and marginal farmers were not in a position to experiment

Table 3. Annual size of the groundwater economy in study villages (in Rs)

Crops	Adrikatte	Heggere	Huralihalli	Marabagatta	Chandragiri	D.V. Halli	Garani	Kambadahalli	Madenahalli
Areca nut	368	8 565	NC	NC	494 513	93 345	50	6 385	35 122
Coconut	933 256	NC	688 792	890 873	72 485	71 720	182 137	28 260	NC
Groundnut	51 135	NC	NC	55 998	NC	247 842	95 779	153 635	75 785
Floriculture	NC	NC	NC	NC	NC	35 722	NC	2 100	NC
Jowar	NC	NC	NC	NC	NC	3 482	105 659	15 228	49 640
Mulberry	NC	NC	NC	NC	NC	3 507	5 030	56 717	NC
Onion	NC	NC	NC	NC	NC	19 685	NC	NC	12 032
Paddy	37 175	78 218	NC	49 738	125 898	386 567	310 777	267 011	74 509
Ragi	NC	NC	NC	9 150	5 368	62 642	73 420	85 146	12 314
Vegetables	149 562	7 215	NC	46 650	NC	22 159	12 303	5 076	19 849
Others	NC	30 038	NC	NC	NC	23 628	280 151	NC	61 167
Total	**1 171 496**	**124 036**	**688 792**	**1 052 409**	**698 264**	**970 299**	**1 065 306**	**619 558**	**340 418**

Source: Primary survey.

Note: NC stands for no crop cultivation.

Table 4. Proportion of income based on well irrigation to other income

Villages	Marginal	Small	Medium	Large	Overall
			HOSADURGA		
Adrikatte (N = 24)	–	0.93	0.70	0.87	0.80
Heggere (N = 35)	0.98	0.37	0.90	0.87	0.67
Huralihalli (N = 12)	–	0.97	0.98	0.94	0.94
Marabagatta (N = 31)	–	0.92	0.81	0.88	0.86
All Villages [N = 102]	0.98	0.65	0.79	0.90	0.80
			MADHUGIRI		
Chandragiri (N = 29)	0.61	0.68	–	0.93	0.73
D.V. Halli (N = 21)	0.54	0.36	0.47	–	0.39
Garani (N = 38)	–	0.42	0.50	0.59	0.45
Kambadahalli (N = 15)	0.95	0.67	0.64	0.38	0.48
Madenahalli (N = 20)	–	0.51	0.55	–	0.53
All Villages [N = 123]	0.61	0.45	0.53	0.54	0.49

Source: Primary survey.

with new technology or improved agricultural practices due to their small land holding and poor capital base. In spite of having access to agricultural credit, subsidized electricity, seeds and fertilizer, small and marginal farmers were still living in poor conditions. In some areas, where wells had dried up, the inhabitants migrated to nearby urban centres and cities. The sustainability of communities in rural areas are in doubt if the conditions mentioned above persist for an extended period of time.

Table 5. Livelihood index of irrigated agriculture

Area	Farm income	Livestock income	Other income	Total income	Livelihood index
HOSADURGA	1 222 435	183 024	126 550	1 532 009	0.91
MADHUGIRI	602 443	154 196	479 100	1 235 739	0.61

Source: Author compilation from primary data.

It is clear from table 5 that the average household income from crop production and livestock was much higher in Hosadurga. However, other sources of income, either directly or indirectly, dependent on irrigation were higher in Madhugiri because of the above mentioned reasons. The major reason supporting irrigation's

greater impact in Hosadurga was the availability of more land for cultivation. This gave farmers leeway in managing their crops with less water intensive and high water efficient crops such as coconut and areca nut. It is important to mention that while the average land area under cultivation was much higher, the net returns were also higher. This was also due to less variability in resource availability, such as land and water. In contrast, in Madhugiri, due to high variability in water resource availability, agriculture production was hampered. It was also adversely affected by small landholdings and changing cropping patterns.

Since agriculture plays a major role in enhancing rural livelihood, the livelihood index[4] suggests that there was greater scope for increasing the capacity of the farm households to withstand shocks. This not only helps us understand the composition of income in the livelihood system but also indicates how much impact irrigation has on the farm households. Meanwhile, on a regional basis, Hosadurga benefited more from irrigated agriculture.

In Hosadurga, farmers had access to water without much problem as this area faced comparatively less scarcity. Reliability of groundwater was high and water was used to maximize areas under irrigated production with wealth-creating water efficient crops. In addition, larger holdings and land consolidation made mechanized farming easy. For instance, drip irrigation was feasible in areas where perennial as well as plantation crops were grown, and tractors could be used for cultivation in the larger areas.

In contrast, climatic conditions and land characteristics enabled Madhugiri farmers to intensify land use by cultivating water-intensive vegetables and paddy, staple crops, which were consumed by farmers themselves on a daily basis. In addition, due to water scarcity, multiseason cultivation and multicropping declined in this region. Of note, the level of mechanization of farming was low in Madhugiri compared to Hosadurga due to the lack of land consolidation, which inhibited the use of new technology, such as tractors and drip and sprinkler irrigation. This obviously was a constraint in achieving higher farm productivity as well as water use efficiency.

[4] The livelihood index is a technique for assessing the role of agriculture in enhancing livelihood.

V. INCREASING COST: A REAL BANE OF GROUNDWATER IRRIGATION

Cost and returns

The rise in annual irrigation costs could be partly attributed to the scarcity of groundwater. A comparison of the annual cost and returns from groundwater irrigation between the two regions indicated that the irrigation cost contributed to the major difference in the cost of cultivation, which was higher by 35 per cent in Madhugiri (table 6). Higher repair and maintenance costs comprised a major portion of the irrigation cost. As water levels declined, the capacity of pump sets to lift water from deeper depth needed to be increased. However, due to voltage fluctuations, the frequent burning of pumps occurred, inflicting heavy losses on farmers. As a result, there was a variation in terms of net returns; the net income was negative in both the regions, but Hosadurga was marginally better off compared to Madhugiri. Of note, the impact of irregular electricity supply on the cost of groundwater irrigation was severe in the hard rock areas.[5] The irregular supply was not only the result of scarcity of electricity but also due to groundwater extraction. Due to irregular electricity supply, a majority of farmers used automatic pumping systems to reduce labour costs. The use of an automatic pumping system not only results in wastage of electricity but affects the groundwater supply. Consequently, the use of this system increased environmental costs as well as economic costs to the society in general and to individual farmers, in particular. Although gross income per well and per acre in Madhugiri and Hosadurga were comparable, considerable differences between the two regions existed in terms of net income (table 6).

The cost of groundwater per acre-inch corresponded with the water used in both the areas. The average cost per acre-inch of water was nearly one-and-a-half times higher for small farmers in Hosadurga, while in Madhugiri, this amount was in the reverse order. For large farmers, their higher gross irrigated areas (GIA) tended to require more water, resulting in a high cost per acre-inch of water. The results were statistically significant except for net return per farm and per acre of GIA, signifying the need to improve resource use efficiency in irrigated agriculture.

An evaluation of the costs associated with irrigated agriculture against the returns revealed that groundwater irrigation was not impressive, particularly for small farmers, because of the serious overdraft problem. The net return in both the areas

[5] In all the study villages, electricity supply was irregular and varied between 5-6 hours/day. The fluctuation of electricity supply lead to burning of motors, hence, more cost to replace motors. On the other hand, the full supply (three-phase) was during night time due to which they have to experience many difficulties such as snake bites leading to heavy expenditure on health measures.

Table 6. Annual cost and returns from well irrigation per farm

Particulars	HOSADURGA		MADHUGIRI	
	Per well	Per acre	Per well	Per acre
Volume of water extracted from well (M^3)	5 992	1 919	7 039	2 231
Volume of water extracted from well (acre-inch)[a]	58	19	68	21
Human+bullock labour (Rs)	6 691 (23)	2 143	8 150 (20)	2 584
Fertilizer cost (Rs)	7 028 (24)	2 251	7 462 (18)	2 365
Other variable cost (Rs)	521 (2)	167	2 699 (7)	855
Opportunity cost of capital @ 9 per cent[b]	1 282 (4)	410	1 648 (4)	522
Irrigation cost (Rs)	13 851 (47)	901	21 410 (52)	1 784
Total cost (Rs)	29 373 (100)	5 872	41 369 (100)	8 110
Gross income (Rs)	29 331	9 394	33 037	10 474
Net income (Rs)	-42	3 522	-8 332	2 364

Source: Primary survey.

Notes: Figures in parentheses indicate percentage to the total cost.

[a] One acre-inch = 102.79 M^3.

[b] Interest rate during the fourth quarter of 2007 was considered to indicate the realistic opportunity cost of capital as field work was carried out during this time.

showed that the small farmers were in a precarious situation while the large farmers benefited from groundwater irrigation because of their large holdings and rich resource base that could withstand short-term shocks. However, any positive changes in resource use efficiency could have improved the benefit-cost ratio.

Debt-asset ratio (DAR)

The decline in private returns from groundwater-based agriculture was the best indicator of how groundwater was being exploited in the hard rock areas. As groundwater resources declined, farmers tended to invest in well irrigation by borrowing funds. However, for the most part, they did not get the expected returns from the investment due to the high rate of well failure and low yield rate, and in the process were saddled with high interest rate payments and accumulated debts. In order to understand the vulnerability and pressure on households resulting from groundwater overdraft, the magnitude of the household debt was examined. The burden of debt on a household was assessed by comparing debt-asset ratios.[6] The

[6] Debt-asset ratio is defined as the ratio between total debt outstanding of a household and the fixed and durable assets the household owns.

major sources of finance for acquiring irrigation assets in the study area were informal money lenders, friends and relatives. The farmers in Madhugiri tended to resort to these informal sources of finance due to restrictions placed by the National Bank for Agricultural and Rural Development (NABARD),[7] on farmers in getting access to institutional credit due to groundwater overexploitation. As a result, over a period of time, debt had become an integral part of the rural peasant household in these areas. In fact, borrowing had not been a recent phenomenon but had crossed the acceptable limits a few years prior due to the start of declining water levels and frequent well failures caused by cumulative well interference. These debt woes had been driving long-term migration in the peasant community. Seasonal migration, meanwhile, had also been occurring, especially in Madhugiri due to the area's limited livelihood opportunities.

The extent of a household's indebtedness explained the real financial implications of resource depletion in the study area. The proportion of households reporting outstanding debt ranged between 38.2 per cent in Hosadurga to nearly 49 per cent in Madhugiri (table 7). Among the different landholding groups, marginal and small farmers were the worst affected based on the debt ratio in both the areas. But, the magnitude was high in Madhugiri where groundwater reached a critical level and investment was needed to restore resources. One reason for the high incidence of debt was that cumulative well interference resulted in a high incidence of well failures, prompting farmers to take advantage of institutional crop loans that were made available through primary agricultural co-operatives to finance work to deepen the well and purchase pump sets and storage tanks.

The average debt per household was reported to be highest in Madhugiri (₹s 60,475) compared to Hosadurga (₹s 44,974). A different pattern in average debt per household existed among the different classes of farmers. This, in a way, explained the financial needs of the households to restore resource endowments and maintain intergenerational equity.

The debt-asset ratio (DAR) indicates the ability of a household to tackle the indebtedness problem. That is, the higher the debt-asset ratio, the lower the repayment capacity and vice versa. In other words, a high DAR reflects low creditworthiness because household income must be diverted to cover interest payments to keep capital debt unchanged. Given the high rate of interest, (between 24 per cent and 36 per cent per annum) for informal borrowing during the time of the study, there was an inverse relationship between DAR and creditworthiness. Due to

[7] NABARD facilitates natural resource management based livelihoods by integrating technology and credit. Its objectives are to enhance livelihoods and quality of life of the rural community through improved resource conditions.

Table 7. Extent of household indebtedness in the study area

Size class	Percentage of indebted households	Loan outstanding (Rs/household)	Loan-repayment ratio (LAR)	Total asset value (Rs/household)	Debt-asset ratio (DAR)
HOSADURGA	38.2	44 974	0.5	137 439	0.32
Marginal	50.0	31 000	0.6	98 880	0.31
Small	32.4	23 500	0.6	100 229	0.23
Medium	38.5	37 200	0.5	138 288	0.27
Large	41.4	78 750	0.3	197 448	0.39
MADHUGIRI	48.8	60 475	0.6	154 613	0.39
Marginal	73.3	54 818	0.5	70 466	0.77
Small	50.7	61 040	0.5	130 637	0.47
Medium	36.4	83 875	0.5	202 000	0.42
Large	30.8	24 000	0.8	306 153	0.08

Source: Primary survey.

the high DAR, the farm households in the regions were not able to make productive investments that would have ultimately helped repay the loans. Instead, funds had to be used to repay the interest on the loan and not the loan amount. The farm households, consequently, got stuck in a deep trap, which made them vulnerable to an increasing debt ratio.

The difference in the average DAR between Madhugiri and Hosadurga was marginal (table 7). However, this ratio varied greatly among size classes between the two areas. The debt-asset ratio was low among different size classes in Hosadurga compared to Madhugiri. This clearly reflected the disadvantage of the problem of resource scarcity. Though farmers in Hosadurga also reported a high incidence of debts, their position was comfortable when compared to farmers in Madhugiri, who had to deal with the brunt of cumulative well interference. In Madhugiri, the DARs were inversely related to farm size, indicating that the debt burden fell more on smaller farmers compared to medium and large farmers, while the picture was diverse in Hosadurga. The increasing intensity of groundwater over-exploitation posed several challenges to farming communities in these areas. Therefore, several strategies were adopted to mitigate groundwater overdraft.

VI. THREE PILLARS OF LIVELIHOOD STRATEGIES

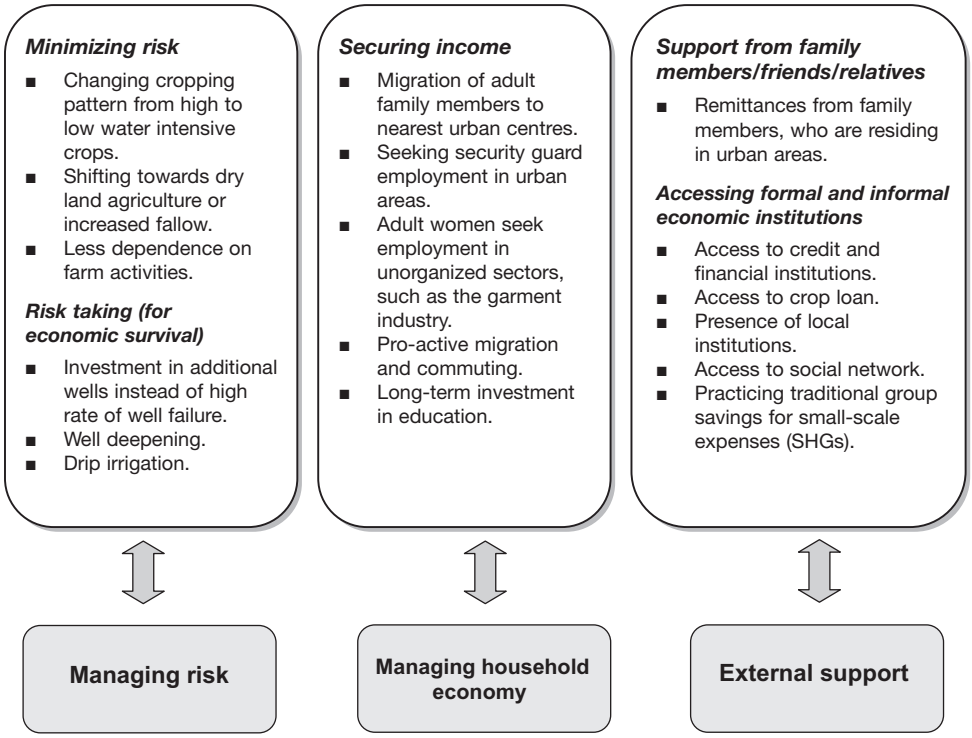
What does the above problem imply for responses to the emerging groundwater problems? While exploration of all the implications is well beyond the scope of this paper, a few problems stand out: (1) the emerging phenomenon indicates that interference, change and adaptation are inherently interlinked processes, and that periods of interference should be recognized as opportunities as well as times of crises. The most natural time of change in an agricultural economy based on intensive groundwater use is during the crisis of water scarcity. During this time, creative destruction is likely to occur and livelihood, economic and political systems will be forced to adapt; (2) the shift away from the rain-fed system of agriculture to groundwater irrigation in this region increased productivity, reduced vulnerability and encouraged the development of systems that depend on secure water supplies when water supply reliability declines. Therefore, appropriate mechanisms need to be put in place over time to maintain the system; and (3) the situation suggests that a livelihood founded primarily on groundwater irrigation is likely to be much less resilient when the resource fails than one based on diverse agricultural and non-agricultural activities. Similarly, the diversification within agricultural livelihood systems' resilience in terms of crop varieties and allied agricultural activities are important.

Several strategies to mitigate groundwater overdraft problems have evolved, including some that have developed over an extended period of time. To be more specific, a combination of factors have enabled most of the villages to diversify their livelihood activities into ones that are less water-dependent. The livelihood strategies involved three pillars in mitigating the groundwater depletion problems. The three pillar model includes managing risk, managing household economy and external support (Korf and others, 2001). Livelihood strategies of households in the hard rock areas comprise a portfolio of short-term coping and long-term adapting strategies. The study shows that changing a pattern of mobility and successful diversification into less water dependent activities are a key response of people to adjust to a risk-prone environment (figure 3).

Minimizing risk

Our study shows that among the different strategies households utilized to minimize their personal risks, changing the cropping pattern from high to low water intensive crops was high on the list. Nearly one third of the respondents adopted a changing cropping pattern as a coping strategy in Madhugiri while in Hosadurga, the number comprised one fourth of the respondents. This strategy, which involved shifting to low water intensive crops such as coconut, ragi, groundnut and sunflower, was mainly implemented in response to insufficient water supply. Small farmers, as

Figure 3. Three pillars of livelihood strategies



Source: Adopted from Korf and others, 2001.

a group, were the most prone to shift crop patterns due to their inability to cope with the progressive lowering of water tables. Importantly, there were noticeable differences between farmers in Hosadurga and Madhugiri on how they carried out the strategy. For instance, initially, paddy was the major water intensive crop in both regions. However, as a result of the unabated water scarcity problem, the cropping pattern shifted from paddy to low water intensive crops, such as coconut, in Hosadurga, while ragi and groundnut were the dominant dry land crops adopted by farmers in Madhugiri. Also of note, the study found that fallow land was increasing at high rate in Madhugiri.

The reasons behind the shifting cropping pattern varied between the two regions but the dominant factors in both areas were inadequate water supply and well failure. Of the farmers who shifted their cropping pattern, nearly 80 per cent in Hosadurga and about 58 per cent in Madhugiri indicated that inadequate water supply was the main reason behind the shift (table 8). Interestingly, well failure, was second

Table 8. Details of changing cropping pattern in the study area

HOSADURGA		MADHUGIRI	
Total no. of farmers			
102		123	
No. of farmers with shifting cropping pattern as coping mechanism			
30 (29.4)		40 (32.5)	
Major shift from			
Paddy = 28		Paddy = 21	
Others = 02		Mulberry = 19	
Major shift to			
Coconut = 16		Groundnut = 05	
Ragi = 04		Ragi = 18	
Vegetables = 03		Sunflower = 05	
		Others = 04	
Fallow = 07		Fallow = 08	
Reasons for shifting cropping pattern (%)			
Cope with reduced yield	3.3	2.5	
Due to electricity short supply	10.0	0.0	
Well failure	3.3	20.0	
Inadequate well water	80.0	57.5	
Crops use less water	3.3	2.5	
Others	0.0	15.0	
Year-wise shift			
HOSADURGA		**MADHUGIRI**	
Prior to 2000	**2001 onwards**	**Prior to 2000**	**2001 onwards**
11 (36.7)	19 (63.3)	19 (47.5)	21 (52.5)

Source: Primary survey.

Note: Figures in parentheses indicate percentages.

most common reason for the shift among farmers in Madhugiri, comprising 20 per cent of the total. The shift in the cropping pattern as noted on an annual basis reveals that the severity of water scarcity increased after 2000. During this time, well interference problems emerged as a serious issue because of variability in rainfall and heavy demand for water. Consequently, a high rate of well failure as well as crop failure due to water scarcity occurred. This was one of the main reasons for the shift in the cropping pattern during this period in both the regions.

Risk taking for economic survival

Investment in additional wells to address the high rate of well failure had been increasing at an alarming rate among study villages. Most of the large farmers opted to construct additional wells when the previous ones failed while more than 75 per cent of the small and marginal farmers invested in additional wells in Madhugiri. This clearly indicates that small farmers were in a precarious position due to the declining water tables. The large farmers in Madhugiri also adopted a strategy to transfer water from distant places to the areca nut garden.[8] Therefore, in addition to drilling additional wells, water transfer from distant places had become a burden on the household economy. This involved monetary risks, physical labour and dependence on access to tractors to transfer the water. The field observation during data collection confirmed that most of the small farmers who had pursued the additional well strategy, mobilized capital from their friends and relatives.[9] However, it must be noted that, in general, even though drilling additional wells helps farmers recover from the immediate shocks of water scarcity, it is not an effective coping mechanism as it puts pressure on the resource base in the long run.

Securing income

Migration is one of the core strategies of farm households to gain access to outside labour markets and sources of non-farm income. However, in the study area, this occurred due to severe overdraft of groundwater. Migration, in a true sense, had become a core strategy to secure income lost as a result of groundwater overdraft. Household that invested in efforts to find non-agricultural work for at least one key member in an urban area, were doing well in terms of coping with the problems. The strategy involved a long-term investment in education. In most of the cases, when crop failure occurred, the income generated by household members working in urban areas became a critical buffer for livelihood or the source of capital for recovery or investment for those still living in the rural areas. However, in a few instances, migration was on a short-term seasonal basis in order to take advantage of specific local work opportunities. Most of the participants in this type of work were rural

[8] A few farmers in Chandragiri village had been transferring water from the neighbouring villages since 2002 to protect areca nut plantations. Initially, a group of households pooled resources and hired a tractor to transfer water on a daily basis. They installed a pipeline to obtain water. This coping mechanism was adopted by large farmers who could afford to do so. However, it could not be sustained due to several reasons, including that it was not economical.

[9] The other sources of capital investment on well irrigation with a consequence were sale of assets such as livestock, trees, such as eucalyptus and teak, and land. Gold was also mortgaged. Of note, several small and marginal farmers used the crop loan for the repayment of old loans.

illiterate unskilled labourers. They were mainly employed to do short-term seasonal daily wage construction work, or by security firms. The core point here is that mobility is a key factor enabling diversification and in many cases, it serves as a short-term response to the problems caused by groundwater overdraft. From the survey, we learned that members of the younger generation from rural areas, who are uneducated/semi-skilled, tended to migrate to urban centres to support their families.

Credit requirements is one of the critical components of adaptation. The progressive lowering of the water table resulted in a high rate of well failure. Farmers, consequently, opted to construct additional wells, an action that requires a huge investment. To finance the investment, many farmers relied on informal sources as funding from institutional sources were not forthcoming for several reasons. This was particularly the case in Madhugiri where, as mentioned earlier, NABARD had imposed restrictions on institutional finance to restrict groundwater over-exploitation. However, in Hosadurga, the proportion of households who obtained loans from institutional sources was high. This was clearly a reflection of the inequity that exists in access to credit facilities.

Local financial institutions, such as self-help groups (SHGs), had operations in almost all the study villages, and played an important role in helping farmers access short-term loans. In fact, based on the results of the survey, SHGs were one of the major sources of finance for investments by farmers in irrigation assets. One of the main advantages of borrowing from SHGs, despite their high interest rates, was that it enabled borrowers to avoid the time-consuming procedures entailed from obtaining loans from institutional lenders.

The occupational structure is one of the key strategies for diversification. Although the groundwater overdraft problem had been severe, agriculture remained the major occupation for all respondents, irrespective of landholdings. This clearly points out the importance of agriculture in the rural livelihood system. However, other non-farm occupations had been pursued by respondents to the survey, an indication that diversification through occupational structure already existed. Children from families that had invested in their education succeeded in getting appropriate jobs. But, nevertheless, agriculture remained the primary source of income for the entire family because they could not find salaried jobs for all members of the family. Access to the market and transport facilities is another essential factor for diversification. All of the surveyed villages had good infrastructure facilities, such as road and transport. Therefore, most of the rural households had easy access to an outlet for selling their goods.

In summary, a majority of the farmers in the study areas adopted coping strategies to mitigate the problem of groundwater overdraft, many of which had been developed over an extensive period of time. Among them, migration was a short-term strategy the majority of unskilled persons used to cope with seasonal agricultural distress due to groundwater scarcity. In the spring harvest and summer seasons when groundwater was not plentiful enough to carry out agricultural activities, many of the inhabitants migrated to the nearest urban centres to take unskilled jobs on construction sites. Since agriculture activities were limited to one or two periods instead of three full periods, access to wage work also was a grave problem in these areas. Another coping strategy, of note, was to borrow money from informal and formal sources to restore groundwater yield by deepening existing wells or drilling additional wells. In general, it should be noted that small farmers tended to adopt less capital intensive coping mechanisms as compared to larger farmer who were more inclined to implement more capital intensive measures.

VII. STRATEGIC IMPLICATIONS

Groundwater scarcity affects the livelihoods of rural communities in many different ways. It is, therefore, essential that communities implement measures that enable them to cope with the adverse effects of groundwater depletion. Policies and institutional innovations that are directed at strengthening the resource base of the rural agrarian economy must be developed. Specific measures that are relevant to the hard rock areas in coping with the problem of groundwater scarcity also need to be adopted.

First of all, farm households, in order to secure their livelihoods, need to adopt strategies at the household level. These strategies may include investments that will provide long-term benefits such as in education or other non-farm activities. This not only helps reduce pressure on the already degraded resource but builds strong resilience for the communities to take up future challenges.

Secondly, response strategies must entail activities that are less water focused, and are not directly related to groundwater where groundwater resources are under severe threat and conventional management strategies do not appear to be feasible. One alternative to consider, is low cost natural resource-based microenterprises that do not require high technology nor are closely linked to groundwater.

Third, from a hydrological perspective, identifying regions that are mostly likely to need support in putting in place livelihood and economic systems should be relatively straightforward. Timely information regarding the status of groundwater

resource availability must be made available to the groundwater users and concerned authorities should then suggest a suitable cropping pattern. This not only avoids putting stress on the resource base but also reduces the burden on farmers from crop losses.

Fourth, to effectively implement institutional reforms, a groundwater authority should be set up to oversee the process and make sure it does not stray from the overall objectives of resource management. The authority should carry out control and monitoring functions. Attention needs to be paid to the linkages between long-term groundwater management issues and short-term coping mechanisms. In this context, governments should promote the managed aquifer recharge (MAR) strategy developed by Andhra Pradesh Farmer Managed Groundwater Systems Project (2006). Under this strategy, institutions involving farmers play a key role in aquifer recharge as well as in reversing the trend of declining water levels. Thus, community participation must be encouraged in restoring aquifers and sustainable use of groundwater.

Finally, policy responses should focus on developing physical and social infrastructures that are relevant to the diversification of livelihoods. These infrastructures, which include, among others, roads, transport, financial institutions and, dairy development are important in helping members of farm households diversify their occupations and connect to the outside market.

REFERENCES

Andhra Pradesh Farmer Managed Groundwater Systems Project (2006). *Rebuilding Groundwater Dependent Economy through Managed Aquifer Recharge (MAR)*. (Hydearabad, Grama Vikas Samsthan), accessed from www.apfamgs.org.

Boserup, Ester (1965). *The conditions of agricultural growth: The economics of Agrarian change under population pressure* (London, George Allen & Unwin) accessed from www.biw.kuleuven.be/aee/clo/idessa_files/Boserup1965.pdf.

Boserup, Ester (1990). *Economic and Demographic Relationships in Development: Essays Selected and Introduced by T. Paul Schultz,* The Johns Hopkins Studies in Development. (Baltimore, Johns Hopkins University Press).

Chandrakanth, M.G., and V. Arun (1997). "Externalities in groundwater irrigation in hard rock areas", *Indian Journal of Agricultural Economics*, vol 52, No. 4 (Oct.-Dec.), pp. 761-771.

Cleaver, K.M., and G.A. Schreiber (1994). *Reversing the spiral: the population, agriculture and environment nexus in sub-saharan Africa*. (Washington, D.C., World Bank).

Dhawan, B.D. (1995). *Groundwater Depletion Land Degradation and Irrigated Agriculture in India*. (New Delhi, Commonwealth Publishers).

Hardin, Garrett James (1995). *Living within limits: ecology, economics, and population taboos*. (New York: Oxford University Press).

Hayami, Yujiro, and Vernon W. Ruttan (1985). *Agricultural development: An international perspective*. (Baltimore, MD, Johns Hopkins University Press).

Janakarajan, S. (1993). "Economic and social implications of groundwater irrigation: some evidence from South India", *Indian Journal of Agricultural Economics*, vol. 48, No. 1, pp. 65-75.

Kahnert, Friedrich, and Gilbert Levine, eds. (1989). *Groundwater irrigation and the rural poor: options for development in the Gangetic Basin*. Key findings, recommendations, and summary. (Washington, D.C., World Bank).

Korf, Benedikt, and others (2001). "Conflict – threat or opportunity? Land use and coping strategies of war-affected communities in Trincomalee, Sri Lanka". Schriftenreihe des Seminars für Ländliche Entwicklung (SLE). (Berlin, Centre for Advanced Training in Rural Development), accessed from edoc.hu-berlin.de/series/sle/195/PDF/195.pdf.

Kumar, M. Dinesh, A.K. Malla, S.K. Tripathy (2008). "Economic value of water in agriculture: comparative analysis of a water-scarce and water-rich region in India", in M. Dinesh Kumar, ed. *Managing water in the face of growing scarcity, inequity and declining returns: exploring fresh approaches*. Proceedings of the 7th Annual Partners Meet, IWMI TATA Water Policy Research Program, ICRISAT, Patancheru, Hyderabad, India, 2-4 April, vol. 2. (Hyderabad, International Water Management Institute (IWMI), South Asia Sub Regional Office), pp. 870-888, accessed from publications.iwmi.org/PDF/H041895.pdf.

Meadows, D.H., D.L., Meadows, and J. Randers (1972). *The Limits to Growth*. (Washington, D.C., Potomac Associates).

Meadows, Donella H., Dennis L. Meadows, and Jorgen Randers (1992). *Beyond the limits: Confronting global collapse, envisioning a sustainable future*. (Post Mills, Vt., Chelsea Green Publishing).

Nagaraj, N. (1994). "Groundwater irrigation from low yielding borewells in hard rock areas of Karnataka – an economic analysis", Ph.D. Thesis, University of Agricultural Sciences, Bangalore (unpublished).

Nagaraj, N., and M.G. Chandrakanth (1995). "Low yielding irrigation wells in peninsular India – an economic analysis", *Indian Journal of Agricultural Economics*, vol. 50, No. 1 (Jan.-Mar.), pp. 48-58.

Nagaraj, N., M.G. Chandrakanth, and Gurumurthy, (1994). "Borewell failure in drought prone areas of southern India: a case study", *Indian Journal of Agricultural Economics*, vol. 49, No.1 (Jan.-Mar.), pp. 102-106.

Nagaraj, N., W. Marshall Frasier, and R.K. Sampath (1999). "Groundwater institutions in US and India: sustainable and equitable resource use", *Economic and Political Weekly*, vol. 34, No. 26 (June 26-July 2), pp. A93-A104.

Rao, M. Chandrasekhara (2006). "Sand mining: groundwater depletion in Papagani Catchment", *Economic and Political Weekly*, vol. 41, No. 7 (February 18), pp. 593-594, accessed from tinyurl.com/48jwf3r.

Rockström, John, Jennie Barron, and Patrick Fox (2003). "Water productivity in rain-fed agriculture: challenges and opportunities for smallholder farmers in drought-prone tropical agroecosystems", in J.W. Kijne, Randolph Barker, and D.J. Molden, eds. *Water productivity in agriculture: Limits and opportunities for improvement*, (Cambridge, MA, CAB International), pp. 145-162, accessed from http://www.iwmi.cgiar.org/publications/CABI_Publications/CA_CABI_Series/Water_Productivity/Unprotected/0851996698ch9.pdf.

Sharma, Bharat R., J.S. Samra, C.A. Scott, and Suhas P. Wani (2005). *Watershed management challenges improving productivity, resources and livelihoods*. (Colombo, International Water Management Institute), accessed from http://www.intranet.icrisat.org/gtaes/downloads/Publication CD Ver 4.0/ECD/ebooks/92-9090.pdf.

Wani, S.P., P. Pathak, H.M. Tam, A. Ramakrishna, P. Singh, and T.K. Sreedevi (2001). "Integrated watershed management for minimizing land degradation and sustaining productivity in Asia", in Zafar Adeel, ed. *Integrated Land Management Productivity in Asia*, Proceedings of Joint UNU-CAS International Workshop, Beijing, China, 8-13 September, pp. 207-230.

SUBSCRIPTION FORM

(Please type or print)

NAME: _____

POSITION: _____

ORGANIZATION: _____

ADDRESS: _____

_____

_____

_____

COUNTRY: _____ POSTCODE: _____

TELEPHONE: _____ FACSIMILE: _____ E-MAIL: _____

SUBSCRIPTION RATES FOR ASIA-PACIFIC DEVELOPMENT JOURNAL (2 ISSUES PER YEAR)

❑	1 year	US$ 66.00
❑	3 years	US$ 198.00

Please mail this form together with your subscription fee in US dollars in the form of a bank draft/cheque drawn in a bank in the United States, issued in the name of UN-ESCAP, crossed and marked "Account Payee Only". The draft/cheque may be mailed to the following address:

Chief, Conference Management Unit
Administrative Services Division
Economic and Social Commission for Asia and the Pacific (ESCAP)
United Nations Building, Rajadamnern Nok Avenue
Bangkok 10200, Thailand

✂ ---

This publication may be obtained from bookstores and distributors throughout the world.
Please consult your bookstore or write to any of the following:

Sales Section
Room DC2-0853
United Nations Secretariat
New York, NY 10017
United States of America

Tel.: (212) 963-8302
Fax: (212) 963-4116
Telex: 422311 UN UI

Sales Section
United Nations Office at Geneva
Palais des Nations
CH-1211 Geneva 10
Switzerland

Tel.: (41) (22) 917-1234
Fax: (41) (22) 917-0123
Telex: 23711 ONU CH

Chief, Conference Management Unit
Administrative Services Division
Economic and Social Commission for Asia and the Pacific (ESCAP)
United Nations Building, Rajadamnern Nok Avenue
Bangkok 10200, Thailand

Tel.: (662) 288-1234
Fax: (662) 288-3022
Telex: 82392 ESCAP TH

READERSHIP SURVEY

The Macroeconomic Policy and Development Division of ESCAP is undertaking an evaluation of the publication *Asia-Pacific Development Journal,* with a view to improving the usefulness of future publications to our readers. We would appreciate it if you could complete this questionnaire and return it, at your earliest convenience, to:

Director
Macroeconomic Policy and Development Division
ESCAP, United Nations Building
Rajadamnern Nok Avenue
Bangkok 10200, THAILAND
E-mail: escap-mpdd@un.org

QUESTIONNAIRE

	Excellent	*Very good*	*Average*	*Poor*
1. Please indicate your assessment of the *quality* of the publication in terms of:				
• presentation/format	4	3	2	1
• readability	4	3	2	1
• timeliness of information	4	3	2	1
• coverage of subject matter	4	3	2	1
• analytical rigour	4	3	2	1
• overall quality	4	3	2	1
2. How *useful* is the publication to your work?				
• provision of information	4	3	2	1
• clarification of issues	4	3	2	1
• its findings	4	3	2	1
• policy suggestions	4	3	2	1
• overall usefulness	4	3	2	1

3. Please give examples of how this publication has contributed to your work:

.....

.....

.....

.....

.....

4. Suggestions for improvement of similar publications:

.....

.....

.....

.....

5. Your background information, please:

Name: .....

Title/position: .....

Institution: .....

Office address: .....

.....

Please use additional sheets of paper, if required, to answer the questions.
Thank you for your kind cooperation in completing this questionnaire.

ASIA-PACIFIC DEVELOPMENT JOURNAL

INSTRUCTIONS TO CONTRIBUTORS

Published by the Macroeconomic Policy and Development Division of the United Nations Economic and Social Commission for Asia and the Pacific, the *Asia-Pacific Development Journal* provides a platform for the exchange of ideas and experiences on development issues and concerns facing the region, and aims to stimulate policy debate and assist policy formulation. Published twice a year, the *Journal* welcomes policy-oriented articles and original pieces of work, focusing on development issues and challenges relevant to the Asian and the Pacific region.

1. MANUSCRIPTS

Authors are requested to provide copies of their manuscripts in English. Contributors should indicate in their covering letter to the Editorial Board that the material has not been previously published or submitted for publication elsewhere. The manuscripts should be typed, double-spaced, on one side of white A4 paper and the length should not exceed 30 pages. Manuscripts are accepted subject to editorial revision.

Since all manuscripts will be refereed by professionals in the field, the name(s) of the author(s), institutional affiliation(s) and other identifying information should be placed on the title page only, in order to preserve anonymity. The title page should contain the following: (a) title; (b) name(s) of the author(s); (c) institutional affiliation(s); and (d) complete mailing address, telephone number, facsimile number and e-mail address of the author, or of the primary author in the case of joint authors, and (e) JEL classification and keywords relevant to the article. The second page should contain the title, the name(s) of the author(s) and an abstract of approximately 150 words. Acknowledgement (if any) should appear after the abstract.

It is preferred that manuscripts be submitted by e-mail to the address below (if hard copies are submitted, kindly provide two copies of the manuscript to the address below). The preferred word-processing software is MSWord. Once a manuscript is accepted for publication, the author(s) may be asked to submit electronic files of their manuscript, figures, tables and charts, as appropriate.

2. FOOTNOTES AND QUOTATIONS

Footnotes, if any, should be numbered consecutively with superscript Arabic numerals. They should be typed single-spaced and placed at the bottom of each page. Footnotes should not be used solely for citing references. Quotations should be double-spaced. A copy of the page(s) of the original source of the quotation, as well as copy of the cover page of that source, should be provided.

3. TABLES AND FIGURES

All tables and figures should be numbered consecutively with Arabic numerals. Each table should be typed double-spaced. Tables and figures should be planned to fit the proportions of the printed page. Full information on the source(s) should appear below the table/figure, followed by notes, if any, in lower-case letters.

4. REFERENCES

Authors should ensure that there is a complete reference for every citation in the text. References in the text should follow the author-date format, followed, if necessary, by page numbers, for example, Becker (1964: 13-24). List only those references that are actually cited in the text or footnotes. References, listed alphabetically, should be typed double-spaced on a separate page in the following style:

Ahmed, E. and N. Stern (1983). "Effective taxes and tax reform in India", Discussion Paper 25, University of Warwick.

Desai, Padma, ed. (1883). *Marxism, Central Planning, and the Soviet Economy* (Cambridge, MA, MIT Press).

Krueger, Alan B. and Lawrence H. Summers (1987). "Reflections on the inter-industry wage structure", in Kevin Lang and Jonathan S. Leonard, eds., *Unemployment and the Structure of Labour Markets* (London, Basis Blackwell).

Sadorsky, P. (1994). "The behaviour of U.S. tariff rates: comment", *American Economic Review*, vol. 84, No. 4, September, pp. 1097-1103.

Terrones, M. (1987). "Macroeconomic policy cycle under alternative electoral structures: a signaling approach", unpublished.

For further details on referencing, please refer to the editorial guidelines at: www.unescap.org/pdd/publications/questionnaire/apdj_editorial_guidelines.pdf. The Editorial Board of the *Asia-Pacific Development Journal* wish to emphasize that papers need to be thoroughly edited in terms of the English language and authors are kindly requested to submit manuscripts that strictly conform to the attached editorial guidelines.

Manuscripts should be sent to:

Chief Editor, *Asia-Pacific Development Journal*
Macroeconomic Policy and Development Division
United Nations Economic and Social Commission for Asia and the Pacific
United Nations Building, Rajadamnern Nok Avenue, Bangkok 10200, Thailand.
Tel: (662) 288 1902; Fax: (662) 288 1000; (662) 288-3007; E-mail: escap-mpdd@un.org
Cable: ESCAP Bangkok

United Nations
Economic and Social Commission for
Asia and the Pacific
Macroeconomic Policy and Development Division
United Nations Building, Rajadamnern Nok Avenue
Bangkok 10200, Thailand
Fax: (662) 288-3007
E-mail: escap-mpdd@un.org
escap-publicationsoffice@un.org
Website: www.unescap.org

United Nations publication
Sales No. E.10.II.F.21

ISBN: 978-92-1-120619-7
ISSN: 1020-1246
ST/ESCAP/2592

The *Asia-Pacific Development Journal* (APDJ) is published twice a year by the Macroeconomic Policy and Development Division of the United Nations Economic and Social Commission for Asia and the Pacific.

The primary objective of the APDJ is to provide a platform for the exchange of knowledge, experience, ideas, information and data on all aspects of economic and social development issues and concerns facing the region and aims to stimulate policy debate and assist policy formulation.

The Asian development experience has stood out as an extraordinary example of what can be achieved when policymakers, experts, scholars and people at large harness their creativity, knowledge and foresight. The APDJ has been a proud partner in this process, providing a scholarly means for bringing together research work by eminent social scientists and development practitioners from the region and beyond for use by a variety of stakeholders. Over the years, the *Journal* has emerged as a key United Nations publication in telling the Asian development story in a concise, coherent and impartial manner to stimulate policy debate and assist policy formulation in the region.

USD $33
ISBN 978-92-1-120619-7

United Nations Publication
Printed in Bangkok
March 2011 – 1,150