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# FINANCIAL DEVELOPMENT, BANK SAVINGS MOBILISATION AND ECONOMIC PERFORMANCE IN GHANA: EVIDENCE FROM A MULTIVARIATE STRUCTURAL VAR

**Deodat E. Adenutsi**

Business School, University of Stellenbosch, Cape Town, Republic of South Africa  
E-mail: deo.adenutsi@gmail.com

**Abstract:** This paper examines the implications of financial development for commercial bank savings mobilisation and economic performance in Ghana since the pursuit of financial reforms programme in September 1987. To achieve this objective a Structural Vector Autoregressive (SVAR) model on quarterly time series data spanning from 1987(3) to 2009(4) was employed. The methodological approach of the analysis hinged on the verification of the theoretical stance that financial development promotes improved financial intermediation, efficient resource mobilisation and allocation for higher economic performance. The empirical results suggest that, in Ghana, financial development has enhanced the performance of commercial banks by way of savings mobilisation but adversely impacted on long-run economic performance directly. Thus, financial development can only enhance long-run economic performance indirectly through increased savings mobilised by banks. The success of Ghana's financial reform programme is largely contingent on the depth of the financial market, which should be considered as the starting point in the sequencing of policy implementation. It is concluded that prudent and rigorous policy measures that will further enhance financial deepening are critically required and this should be seen by policymakers in Ghana as the necessary condition for resource mobilisation and long-run economic performance.

## INTRODUCTION

The role of the financial system in economic growth has been at the centre of intense policy debate since the beginning of financial history. Financial development should, at least in principle, imply that financial resources are made available for the growth and development of the real sector of the economy. In developing countries like those in Sub-Saharan Africa (SSA), however, financial systems have not been well-developed to play this vital role of intermediation. In SSA, the financial markets are often extremely fragmented with the various segments serving distinct groups of clients with similar features and needs, without functional direct and indirect linkages and interaction among the market segments (Nissanke and Aryeetey, 1999). As a solution to this financial market fragmentation, McKinnon (1973) and Shaw (1973) suggest abolishing government interference in the credit market while stabilising the price level through prudent macroeconomic policies. This, they argue should enable the formal financial sector to expand, leading to higher financial deepening (McKinnon, 1988).

In response to the McKinnon-Shaw hypothesis, many developing countries have since the mid-1980s, embarked on far-reaching reforms of their financial systems via liberalization towards market-orientation. Such development represents a policy response made up of a package of measures designed to remove undesirable state-imposed constraints on the efficient functioning of the financial system. These measures include the removal of interest rate ceilings, and the loosening of deposit and credit controls. In addition some countries established and/or actively promoted the development of their stock markets. These programmes of financial reforms and development in developing countries have been predicted on the presumption that a market-based financial system can most effectively mobilise savings, making them available for credit allocation in financing businesses and investment projects.

The emergence of what has become known as new theories of endogenous economic growth has given a new impetus to the relationship between growth and financial development as these models postulate that savings behaviour directly influences not only equilibrium income levels

but also growth rates (Romer, 1986, 1990; Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991). On that account, the performance of financial markets are said to have a strong impact on real economic activity. Indeed, Hermes (1994) asserts that financial liberalization theory and the new growth theories basically assume that financial development, which is the outcome of financial liberalization, leads to economic growth. On the other hand, Murinde and Eng (1994) and Luintel and Khan (1999) argue that a number of endogenous growth models show a two-way relationship between financial development and economic growth.

In Ghana, financial sector development and reform programmes were broadly initiated in September 1987 with the overall objective of improving efficiency within the financial system and broadening the scope of financial services for higher resource mobilisation, improved intermediation, and thus ultimately promoting rapid economic growth. Since then, a number of financial and macroeconomic policies have been implemented in order to achieve this objective. Meanwhile, as at now, bank savings are low with limited access to credit by the private sector. It is also evident that the financial market remains shallow in spite of the fact that competition among banks has now become keener than during the pre-reforms era. It is, therefore, imperative to verify the extent to which the implementation of financial reforms and development programmes has improved savings mobilisation by commercial banks and subsequently promoted long-run economic performance in Ghana.

The remaining part of this paper is organised as follows. In Section 2 the theoretical underpinnings and policy practice on the role of the financial sector in resource mobilisation and advancing higher economic performance is provided. The theoretical framework upon which the empirical models rest constitutes section 3. In section 4 the empirical model and the methodological approach to the analyses are presented together with issues relating to data. The empirical results and analysis are presented in Section 5. Policy guidelines for action can be found in Section 6, which concludes the paper.

## **THEORETICAL CONSIDERATIONS AND POLICY PRACTICE**

### **The Finance-Growth Nexus in Theory**

Theoretically, the relationship between finance and economic growth appears quite complex as this relationship has the potential of passing through various transmission mechanisms. The channel of the linkage between financial development and economic performance is the functions that the financial sector performs. Basically, there are two fundamental considerations with regard to the role of a financial system. First, in an unstable macroeconomic environment of high risk and uncertainty, the onus lies on the financial system to provide the facilities for efficient risk-sharing and diversification. In an uncertain macroeconomic environment, the critical functions of modern financial markets go beyond the traditional mobilisation and allocation of financial resources to include risk-sharing and allocation, which has consequently motivated the pursuit of financial reform programmes with the emphasis on the development of the banking sector. In effect, both the quantum and quality of financial resources are highly essential and hence must be taken into account in determining the efficient functioning of a contemporary financial market.

Second, there is the need to examine the role of financial markets in an asymmetrically-informed environment characterized by moral hazards and other agency problems commonly found in developing countries. The strategic linkage of financial institutions with imperfect information and agency costs gives the financial system a more vital role to play in realizing the efficient allocation of scarce financial resources in underdeveloped economies. In this regard it is

imperative that a well-performing and liquid financial system must be capable of providing the mechanism for efficient intermediation among the various competing participants. It is in line with this premise that economic growth theories are generally formulated to take into account the role of interest rate in equilibrating savings and investment in an economy. From the neoclassical perspective, the optimal growth path is equal to the real interest rate, for which reason the transmission channel from finance to economic performance is of critical importance.

The McKinnon-Shaw financial liberalization hypothesis provides the fundamental theoretical framework for examining the implications of financial sector reforms on an economy (Reinhart and Tokatlidis, 2003; Agca *et al.*, 2007). This hypothesis postulates that the pursuit of financial repressive policies impairs economic growth through a mechanism of low savings rate. As real interest rates are regulated at abysmally low levels, public disincentive for saving increases vis-à-vis increasing demand for financial resources for investment purposes, which results in capital scarcity and inefficient allocation. In effect, under financial repression, financial institutions are impeded from achieving optimal allocation of resources to the productive sectors of the economy. In the course of implementing interest rate liberalization policy, because the equilibrium interest rate is determined under a more competitive condition, interest rates rise in real terms to levels that stimulate higher savings, thereby reducing disintermediation, and enhancing quality productive investment to promote improved economic performance. Consequently, the simplified versions of most popularly known economic growth models seem to suggest some important linkages between the financial system and the level of economic activity. For instance, as the financial sector develops, the potential loss associated with resource allocation is reduced; increases in the savings ratio are stimulated; and the productivity of financial resources is enhanced.

Yet still, as expected, there is lack of consensus on the theoretical role of financial liberalization in inducing domestic resource mobilisation. For example, recently Kelly and Movrotas (2008) contend that, in principle, financial development enhances the savings mobilisation process and channels financial resources towards sustainable economic development. Nevertheless, Bayoumi (1993), Bandiera *et al.* (2000) and Aghion *et al.* (2004) note that financial deregulation minimizes borrowing constraints, which could trigger instability in financial systems thereby reducing the incentives to save. Indeed, Liu and Woo (1994) postulate that a low level of financial development could serve as an incentive to households to save more towards initiating self-finance projects. In various empirical studies, Page (1994), Cardenas and Escobar (1998), Adegunsi (2002) and Kriekhaus (2002) find that financial savings positively impact on economic growth, although some endogenous theorists like Barro and Sala-i-Martin (1999) do not predict any significant long-run impact of savings on growth. Chaturvedi *et al.* (2009) find that a positive bi-directional causal relationship exists between savings rate and economic growth but inflation adversely impacts on growth, albeit with a positive effect on saving rate.

### **Financial Reforms and Development, Financial Savings and Economic Performance**

Keynes (1930) identifies the importance of the banking sector for improved economic performance. In the words of Keynes (1930: 220) bank credit is the pavement along which production travels, and the bankers, if they knew their duty, would provide the transport facilities to just the extent that is required in order that the productive powers of the community can be employed at their full capacity. Robinson (1952) similarly argue that financial development follows economic growth, and articulates this causality contention by suggesting that 'where enterprise leads, finance follows'.

Patrick (1966) distinguishes two possible causal relationships between financial development and economic growth. The first relationship described as 'demand following' views the demand

for financial services as contingent on the growth of real income and on the commercialization and modernization of agriculture and other subsistence sectors. According to this assertion, the creation of modern financial institutions, their financial assets and liabilities and related financial services are a response to the demand for these services by investors and savers in the real economy (Patrick, 1966). According to this viewpoint the more rapid the average growth of real national output, the greater will be the demand by enterprises for external funds (the saving of others) and hence financial intermediation, since under most circumstances firms will be less capable of financing expansion from internally generated depreciation allowance and retained profits. For this same reason, with a given aggregate growth rate, the greater the variance in the growth rates among different sectors or industries, the greater will be the need for financial intermediation to transfer savings to fast-growing industries from slow-growing industries and from individuals. The financial system can thus support and sustain the leading sectors in the process of growth. In this case an expansion of the financial system is induced as a consequence of real economic growth.

The second causal relationship between financial development and economic growth is termed 'supply leading' by Patrick (1966: 75). 'Supply leading' has two basic functions: to transfer resources from the traditional, low-growth sectors to the modern high-growth sectors and to promote and stimulate an entrepreneurial response in these modern sectors (Patrick, 1966). This implies that the creation of financial institutions and their services occurs in advance of demand for these services. Consequently, the availability of financial services stimulates the demand for these services by the entrepreneurs in the modern growth-inducing sectors.

It is believed that economic performance may be constrained by credit creation in underdeveloped economies where the financial systems are less developed, whereas in a more sophisticated financial environment, finance is viewed as endogenous responding to demand requirements. Obviously, this line of argument suggests that the more developed a financial system, the higher the likelihood of growth causing finance. In the view of Robinson (1952), therefore, financial development follows growth or, perhaps, the causation may be bi-directional. However, McKinnon (1973) and Shaw (1973), contributing to the earlier work of Schumpeter (1911), propounded the financial liberalization doctrine, arguing that state restrictions on the banking system restrain the quantity of investment. More recently, the endogenous growth literature has suggested that financial intermediation, a key measure of financial development, has a positive effect on steady-state growth and that government intervention in the financial system has a negative effect on the equilibrium growth rate (King and Levine, 1993).

Notwithstanding the above, the empirical support for the financial reforms and development hypothesis with respect to financial savings remains inconclusive. Whereas Fry (1978), Leite and Makonnen (1986) and Adenutsi (2002) find that improved financial development promotes financial savings; Gupta (1984), Giovannini (1985), Stiglitz (1994), Levine and Zervos (1998), Bandiera *et al.* (2000) and Reinhart and Tokatlidis (2001) conclude that generally financial reforms and development indicators either have no significant statistical impact or a significant negative impact on financial savings especially for developing countries. For instance, for 50 sampled countries consisting of 14 advanced and 36 developing countries, Reinhart and Tokatlidis (2001) find that the impact of financial liberalization on savings is mixed but largely negative or approximately zero. Similarly, Bandiera, *et al.* (2000) analyzing time series data from 1970 to 1994 on Chile, Ghana, Indonesia, Korea, Malaysia, Mexico, Turkey and Zimbabwe conclude that broadly, interest rate does not significantly and positively impact on savings, but for Ghana and Indonesia, in particular, the impact has been significantly negative. The reasons

assigned to the non-positive impact of financial development on savings are low incomes and the existence of imperfect financial markets. There are related empirical studies such as the study by Hellmann *et al.* (2000) that show that an increase in bank competition resulted in a weaker banking system.

On the impact of financial development on economic growth, Goldsmith (1969) in a study comprising 35 countries for the period 1860-1963 and Gupta (1984) for 12 sampled Asian less developed countries, conclude that on the whole the impact is significantly positive. In King and Levine (1993), and Rousseau and Wachtel (1998) find that financial development leads to economic growth. Levine *et al.* (2000) also find a significant impact of financial intermediation indices on economic growth and productivity but an ambiguous impact on saving and investment. Other empirical studies in which it is concluded that financial development is a stimulant for higher economic growth and productivity growth, include the studies by Moore *et al.* (2006), Das and Gosh (2006), Iimi (2004), Spiegel and Yamori (2003), and Honda (2003). In contrast, with reference to the Ghanaian economy, Adenutsi (2002) finds deleterious direct effects of financial liberalization on economic performance, but a positive indirect effect through improved mobilisation of savings by commercial banks. Again, in the case of the Ghanaian economy, Adenutsi (2011) reports that financial development in itself is detrimental to economic growth unless it succeeds in mobilising risk-free external resources such as remittances. Similarly, African Development Bank (1994) and Seek and El-Nil (1993) find no significant impact of financial reforms on economic growth for selected SSA countries.

#### **Evidence of Financial Reforms and Development in Ghana**

In September 1987, a comprehensive programme of financial reforms was introduced in Ghana. The main goals of the programme were:

- to enhance the soundness of the banking institutions by improving the regulatory framework and strengthening banking supervision by the Central Bank;
- to restructure the financially distressed banks following the formulation of specific restructuring plans; and
- to improve the mobilisation of resources and the efficiency of the allocation of credit by the domestic banking system.

Under the financial reforms and development programme interest rates were liberalized. The aim was to encourage competition in the domestic banking system. The move towards interest rate development was gradual. Interest rates were partially liberalized in 1987 with the removal of maximum lending rates and minimum time deposit rates. This was followed by the removal of minimum savings deposit rates and sectoral credit allocation in the following year. Controls on bank charges and fees were abolished in 1990. The bank specific credit ceilings, which had been the main instrument of monetary control during the adjustment programme, were replaced with an indirect method of monetary control involving the weekly auctioning of treasury bills and other government and Bank of Ghana securities, backed up with statutory cash reserve and liquid asset requirements.

A major step in the financial reforms programme was the enactment of an amended banking law in 1989. This new law provided a sound prudential and regulatory base for the banking system by requiring banks to maintain a minimum capital base equivalent to 6 percent of their risk adjusted net assets, by setting uniform accounting and auditing standards, and by introducing limits on risk exposure to single borrowers and sectors. Further, reporting requirements were strengthened, therefore, enabling the Bank of Ghana to improve its ability to regulate the banking systems effectively.

A restructuring plan for the banking sector was designed and approved by the government of Ghana in July 1989. The exposition behind this restructuring plan was the removal of all the nonperforming loans and other claims on both public enterprises and the private sector from the portfolios of the banks. The Bank of Ghana issued promissory notes to temporarily replace non-performing loans or other government guaranteed obligations to public enterprises for example at the end of 1988. After the validation of these non-performing assets, the promissory notes were either replaced by Bank of Ghana bonds, or offset against debts to the Bank of Ghana and the government. Largely as a result of the offset or replacement of non-performing assets, banks were able to meet the new capital adequacy requirements by the end of 1990. All of the more than 1300 non-performing bank assets were passed on to a newly created and wholly government-owned agency called the Non-Performing Assets Recovery Trust (NPART). The NPART was mandated to try to recover as many of these assets as possible by the end of 1995.

African Development Bank (1994) in its review of financial development in Ghana including the Financial Sector Adjustment Programme (FINSAP) reveals that although real interest rates turned positive in 1991 and 1992, largely through a fall in the rate of inflation, there is very little evidence that private or total savings are responsive to real interest rate changes. It was thus concluded that in Ghana the savings rate has still not recovered to the level of the 1970s. Sowa and Acquaye (1998) with quarterly data from 1972 to 1994, find that Ghana's financial reforms have not attracted banks to mobilise savings or intermediate finance in the formal financial sector because of the wide spread between lending and deposit rates. Besides, the development of the exchange rate and interest rates in nominal and real terms failed to have a significant impact on real imports, exports and inflation.

During the implementation of the financial reforms programme in 1988, 1989 and between 1991 and 1994, however, real interest rate gained positive values. The real deposit rate, for instance, turned positive in 1991 for the first time (Adenutsi, 2002). It was expected that these improvements would directly promote the mobilisation of savings and efficient credit allocation by commercial banks. This, however, did not happen as private savings with commercial banks have remained abysmally low and somehow inconsistent.

As a result of the financial reforms programme, lending and discount rates have been very high compared to very low deposit rates. According to Dordunoo (1995), whilst in 1993 lending rates were between 39 percent and 41 percent on overdraft loans at compound interest, deposit rates ranged between 6 percent and 12 percent on savings deposits. The high interest rate spread can be attributed mainly to lack of keen competition among the banks and partly to the high transaction cost of granting loans. Consequently, even though the share of banks' credit to the private sector increased from 13.6 percent in 1986 to 35.8 percent in 1993 private investment remained very low during the Economic Recovery Programme (ERP). Between 1983 and 1991, private investment to GDP ratio was 3.8 percent on the average, whilst the ratio increased slightly to 4.1 percent during the post-ERP period of 1992-97.

## **THEORETICAL FRAMEWORK**

In line with the Keynesian macroeconomic framework, an equilibrium national income is a composite of household consumption expenditure (C), investment (I) representing expenditure on capital goods by firms, government spending on social infrastructure and other welfare services (G), and net income from the external sector, which is measured as export earnings less spending on imports (NX). Mathematically, this can be expressed as:

$$Y = C + I + G + NX, \text{ which implies that } Y = C + S + T + NX \quad (1)$$

when  $I \equiv S$  and  $T \equiv G$  in equilibrium and when the government is running a balanced budget, and where  $S$  and  $T$  denote savings and tax revenue respectively. It follows that, in an economy with net transfer incomes equal to zero at equilibrium (as expected in the assumed ideal case), if  $Y_d$  is the disposable income, then from (1):

$$Y - T \equiv Y_d = C + S \equiv C + I, \text{ which follows that } Y_d = f(S) \text{ and } S = f(Y_d) \quad (2)$$

Therefore, changes in  $Y_d$  should be considered as representing the general economic performance of a country. For a more specific representation, changes in actual *per capita* income are a measure of economic performance from both the theoretical and empirical viewpoints.

From (1) and (2) above, it should be clear that, more generally:

$$Y_d = f(S, G, NX) \text{ just as } S = f(Y_d, G, NX) \text{ so long as } S = f\{Y_d = f(G, NX)\} \quad (3)$$

The implication is that disposable income and savings depend on each other, with government spending and the external trade sector being potential determinants of both. However, the external sector performance of a typical developing economy is largely influenced by government policies on trade and exchange rate since the Ghanaian economy is small-open and, hence a price-taker in the global market. Accordingly, openness to external trade which is also widely used as an index for economic globalisation, and exchange rate can be seen as a potential factor affecting economic performance in a typical import-dependent developing country such as Ghana. Besides, from endogenous growth models and the total factor productivity theory of economic growth, human capital is an essential determinant of long-run economic performance as it is critically required for higher technological advancement and entrepreneurship through research and development.

As noted in the previous section, the motivation for the pursuit of financial reforms and liberalization programmes in Ghana, and indeed, in any economy, is principally to enhance resource mobilisation and efficient resource allocation to finance pro-growth and development projects. This suggests that if the pursuit of financial liberalization programmes is truly successful, this should be reflected in various aspects of financial sector development such as improved financial deepening (an indication of higher public confidence in the banking system), improved financial widening (a measure of financial efficiency in credit allocation), and an “attractive” nominal savings rate<sup>1</sup> (an indication of improved financial competitiveness). Thus, financial development which embodies the improvement in quantity, quality and efficiency of financial intermediary services is expected to enhance financial resource mobilisation and credit allocation towards improved general economic performance with a reduced rate of inflation.

Theoretically, one important factor which adversely affect savings mobilisation by banks is higher inflation in a low-income country where the propensities to save are already low and close to zero. Again, as higher inflation is likely to (negatively) affect financial savings and hence private investment negatively due to credit constraints confronting financial institutions, a typical developing economy may (as well) suffer from lower performance as well due to low investment incentives<sup>2</sup> and the risks associated with rising prices and higher volatility. In this regard, inflation can be seen as a key factor that can obstruct savings mobilisation and economic growth in an economy. Moreover, it is believed that as commercial banks succeed in mobilising more finan-

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<sup>1</sup> This also measures the degree of money illusion and money neutrality hysteresis which are expected to be minimal under a competitive financial environment associated with reduced information asymmetry.

<sup>2</sup> For instance, effective demand for non-essential commodities and services may fall, demand for higher wages may increase, entrepreneurial profit margins may fall, and strategic business planning may become more complicated with low accuracy in forecasting.

cial resources within the domestic economy, excess liquidity will reduce, and given that government expenditure is essentially directed at the productive sectors of the economy (which is expected to be the case especially under multi-party democratic governance), the rate of inflation is expected to fall whilst prices become more stable. Consequently, whereas inflation can be seen as a determinant of savings mobilisation and economic growth, bank savings, economic performance and government expenditure also have the potential of affecting the rate of inflation in Ghana.

From the foregoing, bank savings mobilisation, economic performance and inflation are the endogenous variables within the analytical framework under consideration. The matrix of the key exogenous variables includes the financial development indicators aforementioned. The other matrix of the remaining exogenous variables comprises exchange rate, openness to international trade, government expenditure, and human capital development.

## **EMPIRICAL MODEL, METHODOLOGY AND DATA**

### **The Empirical Model**

In consistency with the theoretical framework espoused in 2.4 above, the explicit simultaneous system of which financial savings, economic performance and inflation are endogenous variables takes a general Structural Vector Autoregressive (SVAR) model of the form:

$$BSM_t = f(EPF_{t-1}, INF_{t-1}, \Pi_{t-1}, \Omega_t) \quad (4)$$

$$EPF_t = f(BSM_{t-1}, INF_{t-1}, \Pi_{t-1}, \Omega_t) \quad (5)$$

$$INF_t = f(BSM_{t-1}, EPF_{t-1}, \Pi_{t-1}, \Omega_t) \quad (6)$$

where

*EPF* is economic performance proxied by GDP per capita in US dollars.

*INF* is the rate of inflation in the domestic economy computed as quarterly changes in consumer price index.

*BSM* denotes bank savings mobilisation measured as the quarterly variation in the ratio of total bank deposits as a ratio of nominal GDP.

$\Pi$  represents the set of exogenous financial development variables notably the average nominal savings deposit rate (NSR) paid by commercial banks on credit balances of savings accounts of customers; financial deepening ( $M_2 / GDP$ ) denoted (FND); and financial widening measured as private sector credit as a ratio of total credit allocated by commercial banks (FNW). These variables measure the most fundamental aspects of financial development.

$\Omega$  is the matrix of other exogenous variables comprising government spending (GSP) which is a proxy for fiscal policy; *HCD* represents human capital development proxied by the enrolment in second cycle institutions; *EXR* is the average nominal exchange rate of the Ghanaian cedi to the US Dollar; and economic openness (OPN) proxied by exports plus imports as a ratio of GDP.

The subscripts  $t$  and  $l$  represent a particular time period and the maximum lag structure of the variables.

From (4-6), given the obvious element of simultaneity and hence endogeneity; and given that a functional relationship exists among the set of dependent variables (BSM, EPF, INF) and with the set of exogenous variables, three equations of simultaneity from (4-6) respectively are, thus, specified as follows:

$$BSM_t = \alpha_1 EPF_{t-1} + \alpha_2 INF_{t-1} + \alpha_3 \Pi_{t-1} + \alpha_4 \Omega_t + \alpha_0 + \mu_{1t} \quad (7)$$

$$EPF_t = \gamma_1 BSM_{t-1} + \gamma_2 INF_{t-1} + \gamma_3 \Pi_{t-1} + \gamma_4 \Omega_t + \gamma_0 + \mu_{2t} \quad (8)$$

$$INF_t = \phi_1 BSM_{t-1} + \phi_2 EPF_{t-1} + \phi_3 \Pi_{t-1} + \phi_4 \Omega_t + \phi_0 + \mu_{3t} \quad (9)$$

where  $\alpha_0, \gamma_0$  and  $\phi_0$  are intercepts of the three endogenous variables;  $\alpha_1, \dots, \alpha_4; \gamma_1, \dots, \gamma_4$  and  $\phi_1, \dots, \phi_4$  are the coefficients of the explanatory variables;  $\mu_{1t}, \mu_{2t}$  and  $\mu_{3t}$  are the disturbance terms in (7-9) respectively; and  $t$  is the time period. The *a priori* signs of the estimated coefficients are expected to be  $\alpha_1, \gamma_0, \gamma_1, \phi_0 > 0$ ,  $\alpha_0, \alpha_2, \gamma_0, \gamma_2, \phi_1, \phi_2 < 0$  while  $\alpha_3, \alpha_4, \gamma_3, \gamma_4, \phi_3, \phi_4 < / > 0$ . The specific estimated SVAR model, however, followed a systematic estimation procedure, essentially to determine the overall (static and dynamic) long-run implications of financial development for bank savings mobilisation and economic performance in Ghana.

### The Empirical SVAR Methodological Approach and Data

#### The SVAR Methodological Framework

SVAR methodology ameliorates the analysis of various economic issues by eliminating the problems of identification of the contemporaneous and dynamic relationships between a set of macroeconomic variables and the appropriate policy instruments. For any system of simultaneous equations the empirical relationships can be modelled within the SVAR framework as follows:

$$\Gamma_0 Y_t = \Gamma_1 Y_{t-1} + \Gamma_2 Y_{t-2} + \dots + \Gamma_n Y_{t-n} + \varepsilon_t \quad (10)$$

such that  $\Gamma_i$  is an  $N \times N$  matrix of parameters for  $i = 0, 1, 2, \dots, n$ ,  $Y_t$  is an  $N \times 1$  vector of endogenous variables at time  $t$ , and  $\varepsilon_t$  is an  $N \times 1$  multivariate white noise error process with  $E(\varepsilon_t) = 0$  and  $E(\varepsilon_t \varepsilon_j') = \begin{cases} \sum_0 & \text{when } t=j \\ & \text{when } t \neq j \end{cases}$  being its fundamental properties. Within the SVAR analytical framework, the structural innovations  $\varepsilon_t$  are assumed to be orthogonal, such that the structural disturbances are not serially correlated and the variance-covariance matrix  $\sum$  is constant and diagonal (Bernanke, 1986; Asteriou, 2006).

Each equation in the SVAR is unique and has its own dependent variable which emerges after the contemporaneous matrix  $\Gamma_0$  (in Equation 10) has been normalized along the principal diagonal. Similar to when estimating a system of traditional simultaneous equations, SVAR parameters are estimated in two stages, the first being deriving the reduced-form parameters from Equation 10.

$$Y_t = \Gamma_0^{-1} \kappa_1 Y_{t-1} + \Gamma_0^{-1} \kappa_2 Y_{t-2} + \dots + \Gamma_0^{-1} \kappa_n Y_{t-n} + \Gamma_0^{-1} \varepsilon_t \quad (11)$$

$$Y_t = H_1 Y_{t-1} + H_2 Y_{t-2} + \dots + H_n Y_{t-n} + \omega_t \quad (12)$$

such that  $H_i = \Gamma_0^{-1} \kappa_i$ ,  $i = 1, 2, \dots, n$ , with  $\omega_t$  which denotes  $\Gamma_0^{-1} \varepsilon_t$  being the reduced-form system innovation with a normal distribution features of  $\omega_t \sim iid(0, \sigma_\omega^2)$ . When Equation (12), which is essentially a VAR model with N number of system equations, is estimated by Ordinary Least Squares (see Faust, 1998; Asteriou, 2006), and the VAR residuals  $\omega_t$  are obtained, the innovations in the structural models represented by  $E(\varepsilon_t \varepsilon_j') = \begin{cases} \sum_0 & \text{when } t=j \\ & \text{when } t \neq j \end{cases}$  are related to the reduced-form innovations as  $E(\omega_t \omega_t') = \Gamma_0^{-1} (\varepsilon_t \varepsilon_t') \Gamma_0^{-1}$  and  $\sigma^2 = \Gamma_0^{-1} \sum (\Gamma_0^{-1})'$ .

Next, the identification of the contemporaneous matrix  $\Gamma_0$  and the variance-covariance matrix  $\Sigma$  which maximizes the likelihood function conditional on the parameter estimates of VAR derived from stage one (Hamilton, 1994). Therefore, following Hamilton (1994), the full information maximum likelihood of a dynamic SVAR can be specified as:

$$\ln L_t = -\left(\frac{1}{2}\right)\ln(2\pi) - \frac{1}{2}\ln\left|\Gamma_0^{-1}\Sigma\left(\Gamma_0^{-1}\right)'\right| - \frac{1}{2}\hat{\omega}'\Gamma_0^{-1}\Sigma\left(\Gamma_0^{-1}\right)'\hat{\omega} \quad (13)$$

where  $\Sigma$  is restricted to be a diagonal matrix, and  $\omega_t$  being the estimated residuals from the reduced VAR; and within a typical SVAR system,  $\Gamma_0$  contains  $N^2$  parameters, with  $\delta$  having only  $\frac{1}{2}[N(N+1)]$  discrete values. Naturally, a model identification problem arises because  $\frac{1}{2}[N(N-1)]$  number of restrictions must be imposed on the simultaneous system in order to establish the exact identification conditions, for which otherwise, the system is under-identified<sup>3</sup>. The residuals obtained from the reduced-form VAR are then transformed into a system of structural equations by imposing restrictions based on relevant underlying theories and conclusions drawn from empirical studies on policy reaction functions rather than in accordance with the commonly used Choleski's decomposition approach. According to Bernanke (1986), Blanchard and Watson (1986), Sims (1986), and Sims and Zha (1998), this is the approach of orthogonalising the reduced-form residuals to recover from the underlying shocks.

As three endogenous variables were identified from the theoretical framework, three normalization restrictions were imposed such that the coefficients of BSM, EPF and INF take a value of unity in the first, second and third vector respectively, following Persaran and Shin (2002).

#### *Tests for Unit Roots and Granger-Causality / Endogeneity*

To begin with the estimation, a series of unit root tests (Dickey-Fuller GLS, Kwiatkowski-Phillips-Schmidt-Shin (KPSS) and Ng-Perron) was conducted on all the variables in order to determine the order of integration of each variable. Conclusion on the order of integration was based on the coincidence of any two tests in case of a conflicting result among the three alternative tests. The results as presented in Table A1 in the Appendix show that, in general, each of the variables is integrated of order one<sup>4</sup>. Following this, it is the first-differenced version of each variable that was used in the empirical modelling.

After identifying cointegrating vectors, a causality test between financial development, bank savings mobilisation, economic performance and inflation was carried out. In essence, this was also to verify the status endogeneity of variables as Hall and Milne (1994) demonstrate that weak exogeneity in a cointegrated system equals long-run causality. For instance, if the null hypothesis that  $X$  does not Granger-cause  $Y$  is rejected, the  $X$  vector is not weakly exogenous with respect to  $Y$  which also implies that  $X$  does cause  $Y$  in the long run.

<sup>3</sup> However, once the system is cointegrated, endogeneity bias is no longer a serious problem in a simultaneous model as proved by Mukherjee *et al.* (2003). Notwithstanding this, the system is over-identified according to the order condition but the rank condition test cannot be carried out since none of the exogenous variables is excluded from an equation in the SVAR framework.

<sup>4</sup> The most consistent results were obtained from DG-GLS and Ng-Perron suggesting that each variable is I(1) whereas KPSS suggested that the variables are mainly I(0).

**Table 1: Results of Granger-Causality and Endogeneity Test**

Null Hypothesis	F-Statistics				
	Lag 2 <sup>+</sup>	Lag 3	Lag 4	Lag 8	Lag 12
BSM does not Granger cause FND	0.33864	0.30384	2.19578*	2.19521**	1.59775
FND does not Granger cause BSM	6.53082***	5.56541***	6.45519***	5.78450***	4.98218
INF does not Granger cause FND	0.36691	0.39555	0.65850	1.64795	2.70168
FND does not Granger cause INF	0.59105	0.49226	0.46315	0.42977	0.38983
EPF does not Granger cause FND	7.69093***	3.60977**	4.21835***	1.95588*	2.30509
FND does not Granger cause EPF	6.29015***	4.32474***	7.41437***	2.75719***	4.52959
INF does not Granger cause BSM	0.45125	0.09836	0.25824	0.44116	0.34227
BSM does not Granger cause INF	0.30784	0.07168	0.02849	1.76982*	1.67942
EPF does not Granger cause BSM	0.24034	5.86117***	8.87776***	7.28306***	2.92585
BSM does not Granger cause EPF	3.76010**	4.65621***	1.44058	2.17433**	3.58303
EPF does not Granger cause INF	1.83983	1.12070	0.83249	0.56374	0.77520
INF does not Granger cause EPF	0.28157	0.08423	0.45928	0.54925	0.41974

Source: Author's estimation <sup>+</sup> optimal lag selected according to SIC  
 \*/\*\*/\*\* indicate 10%, 5%, 1% level of statistical significance respectively

Quarterly data ranging 1987(3)-2009(4) was used in this study. The choice of the study period was based on the desire to investigate how financial development following the implementation of the financial reforms programme in September 1987 has influenced bank savings mobilisation and economic performance in Ghana. Real GDP *per capita* in US dollars as reported by the World Bank in *World Development Indicators* (WDI) was used to measure economic performance. Essential aspects of financial development were captured in the estimation. Thus, the indicators of financial development included the ratio of credit to the private sector out of the total which measures the financial widening aspect of financial development (FNW), broad money as a ratio of nominal GDP measuring financing deepening (FND) and nominal savings deposit rate (NSR) measuring financial competitiveness and efficiency which were obtained entirely on a quarterly basis from the Central Bank of Ghana (BoG). The rate of inflation was computed using Consumer Price Index (CPI) as reported by BoG on a quarterly basis. Enrolment to second-cycle schools as obtained from WDI was used as a proxy for human capital development (HCD). Like nominal exchange rate (EXR), government spending (GSP) was obtained entirely from various editions of *BoG Quarterly Statistical Bulletin*. The generation of quarterly data of GDP and human capital development (HCD) followed the universally adopted repetitive procedure.

*The Cointegration Test*

To determine whether or not the system variables move towards long-run steady state, a cointegration test was performed following Johansen and Juselius's (1990) maximum likelihood procedure. With this test, it was possible to identify the maximum likelihood estimators of the unconstrained cointegrating vectors and also to determine empirically the number of cointegrating vectors without relying upon arbitrary normalization. The results of the cointegration test reported in Table A2 in the Appendix show that the series individually exhibit a random walk with strong evidence of an equilibrium long-run relationship among the system variables having three cointegrating equations by both the trace and the maximum eigenvalue criteria.

*Derivation of Impulse Response Functions and Test for Variance Decompositions*

An empirical SVAR model is imperative in analyzing the dynamic characteristics of the model by deriving the impulse response functions and estimating the forecast variance decompositions. To analyse the dynamic responses of the endogenous variables to independent one-standard deviation shocks emanating from the variables within the empirical SVAR system, it was necessary to draw on impulse response functions. The forecast error variance decomposition was also estimated from the empirical SVAR system in order to explain the proportion of a shock to a specific endogenous variable.

**THE EMPIRICAL RESULTS AND ANALYSES**

**Results of the Estimated Static and Dynamic SVAR Models**

The results of the estimated static SVAR model are presented in Table 2 below. The results show that, in the static long run, financial deepening as a component of financial development is the only positive factor that enhances bank savings mobilisation in Ghana. Nominal savings rate and human capital development are factors that undermine higher savings mobilisation by commercial banks whilst factors such as economic performance, inflation, financial widening, exchange rate, government spending and openness to international trade do not affect banks' savings mobilisation. This could imply that, in the long run, the key macroeconomic determinants of bank savings mobilisation are not static but dynamic in nature.

**Table 2: Results of the Estimated Static SVAR Model**

Variable	BSM	EPF	INF
BSM	1.00000	2.78545 [0.9337]	8.11729 [0.9292]
EPF	0.00887 [0.9337]	1.00000	-0.20494 [-0.6276]
INF	0.00732 [0.9229]	-0.02390 [-0.6276]	1.00000
FND	0.17031 [1.6516]*	31.9006 [3.0638]***	-19.6307 [-1.6706]*
FNW	0.00160 [0.0197]	5.18089 [2.4598]**	19.2928 [3.2040]***
NSR	-0.00759 [-1.8931]*	0.25004 [2.3519]**	1.53040 [5.6134]***
EXR	-9.69E-05 [-0.5228]	0.00374 [13.7987]***	0.00294 [2.0702]**
GSP	-0.00879 [-0.7954]	-0.98635 [-3.5664]***	1.14530 [1.3282]
HCD	-0.01594 [-2.1620]**	0.62575 [3.2745]***	-0.68264 [-1.6852]*
OPN	0.00017 [0.0808]	0.39387 [11.7606]***	0.11581 [0.7172]
CONSTANT	-0.15067 [-0.2142]	165.557 [4.4889]***	29.1967 [2.2294]**
R-squared	0.306606	0.992818	0.56314
Adjusted R-squared	0.217349	0.992010	0.50725

*Source: Author's estimation*      *\*/\*\*/\*\* denote 10%, 5% and 1% significance level*  
*90 observations included;      [ ] = t-statistics*

The static long run results again reveal that financial development is the most important propeller of higher economic performance as financial deepening, financial widening and nominal savings rate have individual positive effects on economic performance. Whereas increases in

government spending as well as depreciation of the local currency (the Ghanaian cedi) are detrimental to higher economic performance, openness to external trade and human capital development positively impact on economic performance in Ghana. The estimated result from the static inflation model shows that, overall, improvements in financial development by way of increases in the depth of the financial sector and improved human capital development are significant in reducing the rate of inflation in Ghana. Furthermore, in the static long run, increases in the nominal savings rate, financial widening and exchange rate depreciation directly contribute to higher rates of inflation in Ghana, whilst variations in openness to international trade and government spending have no impact on the rate of inflation in Ghana.

The results of the dynamic SVAR model are presented in Table 3. The empirical results show that the financial widening component of financial development and openness to international trade does not have any long-run dynamic effects on variations in bank savings mobilisation, economic performance or inflation.

The results show that, although, the dynamic impact of financial deepening on bank savings mobilisation vary overtime (from negative to positive over the first and second lag values), the overall impact of financial deepening on bank savings mobilisation in Ghana is positive for the period under investigation (Table 3). Increases in the first and second lag values of inflation, and nominal savings rate have inconsistent impacts on the rate of inflation, moving from positive to negative, whilst increases in the immediate initial values of government spending and human capital development increase the rate of inflation in the long run. The overall long-run dynamic impact of initial economic performance on current economic performance is positive just as the second lag of government spending whereas those of banks savings mobilisation, human capital development and financial deepening significantly inhibits economic performance.

From the combined static and dynamic results, it is apparent that, in the long run, improved financial development by way of financial deepening, financial widening, and financial efficiency is the foremost macroeconomic factor that positively impact on bank savings mobilisation in Ghana. Besides financial development, only higher economic performance proxied by increased per capita income has a positive marginal impact on bank savings mobilisation; and although the exchange rate depreciation promotes increased savings mobilisation by banks, the estimated coefficient is insignificant or approximately zero. Improved human capital development proxied by secondary school enrolment is the only factor which, in the long run, impedes bank savings mobilisation probably. A probable explanation of this result is that, given the low income level of Ghanaians, households might dissave to pay for education especially during secondary school admission. Another possible explanation is that the educated might be more sophisticated and hence could diversify their saving and investment portfolios away from bank deposits. Openness to international trade, government spending, inflation and financial widening have no long-run impact on bank savings mobilisation in Ghana.

**Table 3: Estimated Results of Dynamic Long-Run SVAR Model**

	Estimated SVAR System Equations		
	BSM	EPF	INF
BSM(-1)	0.510607 [ 4.26807]***	-8.746051 [ -2.29036]**	0.285699 [ 1.05843]
BSM(-2)	0.162376 [ 1.28306]	9.191571 [2.27543]**	3.063629 [ 1.59227]
EPF(-1)	0.085609 [ 1.10846]	0.672528 [ 4.16401]***	-0.032467 [-0.15698]
EPF(-2)	0.090933 [1.87075]**	0.315424 [ 1.86105]**	-0.119482 [-0.55052]
INF(-1)	0.111008 [ 0.43316]	-0.104807 [-1.41054]	1.306487 [ 13.7311]***
INF(-2)	-0.002577 [-1.10224]	0.091449 [ 1.22529]	-0.506681 [-5.30152]***
FND(-1)	-0.931069 [-2.09097]**	-30.65578 [-2.15687]**	3.119484 [ 1.51396]
FND(-2)	1.136636 [ 2.23717]**	-51.67280 [-3.18630]***	16.75322 [ 0.80673]
FNW(-1)	0.020356 [ 0.25474]	-1.487566 [-1.58322]	2.668737 [ 1.81708]*
FNW(-2)	0.005388 [ 0.06777]	1.487259 [ 1.58599]	0.031342 [ 0.10964]
NSR(-1)	0.011536 [ 1.68651]*	-0.264341 [-1.13891]	0.637311 [ 2.14429]**
NSR(-2)	-0.006820 [-1.00987]	0.212205 [ 0.98440]	-0.490151 [-1.77564]*
EXR(-1)	-6.07E-05 [-1.09578]	0.000651 [ 0.36829]	0.004388 [ 1.93794]**
EXR(-2)	8.89E-05 [ 1.73937]*	-0.000698 [-0.42802]	0.040142 [1.98832]**
GSP(-1)	-0.000412 [-0.03742]	0.367889 [ 1.04803]	0.123765 [1.77534]*
GSP(-2)	-0.004152 [-0.35891]	0.893981 [ 2.42110]**	-0.359744 [-0.76083]
HCD(-1)	-0.023884 [-1.69863]*	-0.663313 [-1.99094]**	0.890279 [ 1.75789]*
HCD(-2)	0.016245 [ 1.02035]	0.494504 [ 1.97308]**	-0.364144 [-0.55957]
OPN(-1)	-0.000275 [-1.10250]	0.043445 [ 0.50708]	-0.086601 [-0.78934]
OPN(-2)	0.003001 [ 1.12050]	-0.069029 [-0.80759]	0.034109 [ 1.31163]
CONSTANT	0.920059 [ 1.82081]*	3.050044 [ 2.18718]**	20.56631 [ 1.22233]
R-squared	0.667917	0.884427	0.926543
Adj. R-squared	0.538937	0.847264	0.904616

**Source:** Author's estimation \* / \*\* / \*\*\* denote 10%, 5% and 1% significance level  
[ ] = t-statistics; n=88(included after adjustments)

### Results of Variance Decomposition

The forecast error variance decomposition mechanism was pursued to explore the interactions among endogenous variables over a 5-year or a 20-quarter response horizon. Table A3 in the Appendix reports the proportion of the variations of the three endogenous variables as explained by each other and other system variables. The empirical results show that over the forecast horizon, the main variations in each endogenous variable are strongly explained by its own shock followed by minimal shocks emanating from financial development variables, with financial deepening leading the pack. In particular, apart from being largely affected by its own shock (averaging 70% over the initial five years), bank savings mobilisation is also influenced by marginal

shocks originating nominal savings rate, financial deepening and human capital development throughout the forecast period in a descending order of importance respectively. The three most important variables from which bank savings mobilisation responds to shocks within the short term (i.e. within the 1<sup>st</sup> year) are financial deepening, nominal savings rate and exchange rate. During the medium term (i.e. between the 2<sup>nd</sup> and 3<sup>rd</sup> years), nominal savings rate, financial deepening, and human capital development are the leading variables that emit shocks to bank savings mobilisation. Human capital development, nominal savings rate, financial deepening and financial widening are the leading variables that shock bank savings mobilisation in the long term. In Table 4 below, a summary of the results of the variance decomposition of the endogenous variables is presented.

**Table 4: Summary of Variance Decomposition Results**

	Other System Variables Emitting Shocks (average % in parenthesis)			
	Short-Term Horizon (Year 1 / Quarter 0-4)	Medium-Term Horizon (Year 2-3 / Quarter 5-12)	Long-Term Horizon (Year 3-5 / Quarter 13-20)	Forecast Horizon (Year 1-5)
BSM	FND (3.8), NSR (3.6), EXR (2.1), HCD (2.0)	NSR (5.7), FND (4.8), HCD (4.2), EXR (2.3), GSP (1.3)	HCD (7.6), NSR (5.7), FND (4.5), FNW (4.4), EXR (2.3), GSP (1.5)	NSR(4.0), HCD (3.5), FND (3.4), EXR (1.7), FNW (1.3)
EPF	FND (5.8), GSP (5.6), INF (1.8), BSM (1.5), HCD (1.4)	FND (15.4), GSP (8.6), FNW (6.0), BSM (2.6), HCD (1.7), INF (1.3)	FND (14.8), FNW (9.8), GSP (6.1), HCD (2.8), BSM (2.6)	FND (9.5), GSP (5.8), FNW (4.8), BSM (1.9), HCD (1.5)
INF	FND (2.9), EXR (2.7), NSR (1.7), OPN (1.2), BSM (1.2)	OPN (8.9), FND (8.8), EXR (4.4), NSR (2.5), BSM (1.7), HCD (1.4), FNW (1.0)	OPN (9.8), FND (8.6), EXR (6.0), NSR (3.2), HCD (2.2), BSM (2.0), FNW (1.4)	FND (5.8), OPN (5.8), NSR (2.0), BSM (1.3), HCD (1.1)

*Source: Author's compilation*

*Note: For detailed decompositions including those less than 1% see Table A4*

It is clear from Table 4 that, bank savings mobilisation, economic performance and inflation are largely self-driven and hence not significantly driven by the other variables within the SVAR system, since over the initial 5 years, the proportion of variation in any of these endogenous variables to itself averaged about 70 percent.

### **Results of Impulse Response Functions**

Impulse response functions were analysed to enable us examine the dynamic responses of the endogenous variables to one standard deviation shocks originating from the variables within the empirical SVAR system over the initial five years. The magnitudes of the shocks are measured by the independent shocks of the corresponding orthogonal errors obtained from the estimated SVAR model. The derived impulse response functions reported in Figure A1 in the Appendix reaffirm the fact that each of the endogenous variables responds mainly to its own shock rather than to shocks stemming from the remaining system variables. For instance, a one-standard deviation positive shock to innovation of bank savings mobilisation causes it to spring instantaneously above its equilibrium level, followed by a sharp initial drop during the first two quarters, and a stagnation between the 2<sup>nd</sup> and the 3<sup>rd</sup> quarters before continuing to decline gently until the 6<sup>th</sup> quarter beyond which it dissipates. Bank savings mobilisation does not significantly respond to shocks emanating from other variables within the system.

A positive one standard deviation shock to economic performance due to innovations of economic performance causes economic performance to rise instantaneously on impact. This is fol-

lowed by an immediate decline over the first year (i.e. between the 1<sup>st</sup> and 4<sup>th</sup> quarters) before resurgence in a continuous upward deviation from its equilibrium throughout the 5-year forecast period. In response to a one-standard deviation positive shock to innovations from financial deepening, economic performance will initially drop slightly over the first-two quarters; disappear between the 2<sup>nd</sup> and the 4<sup>th</sup> quarters, and re-surface with a marginal rise between the 4<sup>th</sup> and the 7<sup>th</sup> quarters, after which its significance fades away completely. A marginal latent rise between the 2<sup>nd</sup> and the 3<sup>rd</sup> quarter followed by a drop between the 3<sup>rd</sup> and the 6<sup>th</sup> quarter constitutes the response of economic performance to an independent shock originating from fiscal policy represented by government spending. None of the remaining variables within the SVAR system significantly elicit a response from economic performance as a result of a one-standard deviation shock over the 20-period forecast horizon.

Apart from reacting to its own one standard deviation shock, only innovations of exchange rate and financial deepening appear to force a slight temporary upward response from inflation over the initial three quarters. There were no impulse responses from inflation due to individual one-standard shocks emanating from remaining system variables for the 5-year forecast horizon.

From the observed impulse response functions derived over the initial 5-year horizon, the sizes of the one standard deviation shocks from the financial development variables, fiscal policy proxied by government spending, and indeed, the remaining explanatory variables within the SVAR system can be described as generally marginal, temporary and insignificant. Only financial deepening as a component of financial development has been reasonably consistent in eliciting a temporary marginal response from the endogenous variables within the system, )

## **CONCLUSION**

The conclusions that can be drawn from the key findings of this paper are:

a) In the long run, improved financial deepening is the only component of financial development that significantly promotes bank savings mobilisation in Ghana. Specifically, an increase in deepening the Ghanaian financial sector by 100 percent will lead to at least a 21 percent increase in the amount of deposits mobilised by commercial banks as a ratio of GDP. The overall positive impact on nominal interest paid by commercial banks on deposits is negligible in increasing savings mobilisation in the long run. Financial widening by way of increasing the proportion of bank credits allocated to the private sector does not, in the long run, influence savings mobilisation of commercial banks in Ghana.

b) Economic performance has a positive long-run impact on savings mobilisation in Ghana although the impact is not robust as a 100 percent rise in income per capita has a mere 9 percent positive impact on bank savings mobilisation. In turn, bank savings mobilisation impacts significantly on economic performance to the tune of 45 percent for an upward 100 percent variation in deposits as a ratio of GDP mobilised by commercial banks in Ghana.

c) In the long-run, improved financial widening and financial efficiency components of financial development are more important than financial deepening as far as higher economic performance is concerned when the impact analysis is considered directly.

d) The total impact of improved financial development on the rate of inflation is negative but negligible taking into account the estimated coefficients of financial deepening, financial widening and nominal interest rate paid on bank deposits from the estimated static and dynamic models.

d) A bi-directional causality exists between financial deepening and economic performance, while a uni-directional causal relation runs from financial deepening to bank savings mobilisation, and also from bank savings mobilisation to economic performance.

e) The direct overall impact of financial development on long-run economic performance is negative; suggesting that, in Ghana, the mechanism of transforming savings mobilised into investible funds might still be weak due to information asymmetry. It could also imply that the vital entrepreneurial class to bear the risks of accessing capital from banks to initiate productive ventures is absent. All the same, in view of the fact that financial development significantly promotes higher bank savings mobilisation but impacts negatively on economic performance directly; it can be concluded that, in Ghana, in the long run, financial development promotes higher economic performance indirectly through increased prior savings with commercial banks, so long as bank savings mobilisation impacts positively on economic performance.

Based on the above findings, the following policy implications and recommendations are advanced:

a) For commercial banks in Ghana to improve upon domestic resource mobilisation there is a need for policy makers to boost public confidence in the banking sector. This is because with higher public confidence in the financial system, the amount of currency circulating outside the banking system is likely to reduce, resulting in excess liquidity. Apart from this, improved financial efficiency resulting in the payment of more attractive returns on bank deposits could serve as an important means by which commercial banks in Ghana can mobilise higher domestic resources in the long run. More specifically, it is suggested that commercial banks and indeed other formal sector deposit mobilisation institutions should spread to the rural centres with specialized services aimed at mobilising deposits from this large segment of the Ghanaian population who are currently either non-banked or under-banked.

b) Although, generally, improved financial development has a significant negative impact on long-run economic performance arising from the dynamic effects of higher financial deepening, there is the need for policy reorientation towards improved financial sector development that lays emphasis on increased credit allocation to the private sector and attracting the saving public with higher interest payable on bank deposits. With consistent improvement in financial widening and efficiency through higher private sector credit allocation and attractive interest rates on savings, the overall impact of financial development on economic performance could turn positive, if the anticipated positive impact out if the Ghanaian banking industry becomes more competitive and efficient with diversified risks.

c) Further development of the Ghanaian financial system, though necessary and desirable for its positive and significant influence on bank savings mobilisation, should not be considered as an end in itself. Efforts are also required in order to erect proper structures like the expansion and the development of the capital market to absorb the likely increase in demand for funds that can be invested. Together with the implementation of other policies, this measure will help promote the efficiency of equity markets, raise corporate savings or even encourage foreign inflows, needed as complements to financial development in a developing country like Ghana. In this regard, all supporting or associated reforms must help to integrate the financial markets fully as a necessary condition to synchronize the revealed benefits of financial development in totality.

d) Given the direction of the observed causal effects, policymakers should consider the sequencing and focus of financial sector development towards improved savings mobilisation and economic performance as essentially important. For instance, in order to ensure long-run growth through domestic resource mobilisation, the financial deepening component of financial devel-

opment cannot be ignored or downplayed. In fact, as the evidence shows, financial deepening is the only element of financial development that can cause higher savings mobilisation by banks, which in turn positively impacts on long-run economic performance in Ghana. Therefore, there is the need to put premium on financial deepening to create the necessary platform for improved economic performance through higher resource mobilisation in Ghana in the long run. It can, thus, be concluded that, in the long run, programmes of financial reforms and development are central to higher resource mobilisation and economic performance in Ghana, with financial deepening being the necessary condition for its success.

e) It is imperative for financial institutions in Ghana to selectively allocate more credit to the investing private sector to boost the financing pro-growth and development projects rather than over-concentrating on employee loans and pre-financing generally non-productive personal assets such as the purchase of private cars under bank auto-loans for customers who are salaried workers. Without this, higher private sector credit allocation will not have the desired impact on long-run growth, and the economy could even suffer from overheating, culminating in higher inflation in the long-run. This appears to be the situation for Ghana for the period studied.

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### Appendix

Table A1: Results of Unit Root Tests											
DF-GLS		BSM	EPF	CPI	EXR	FND	FNW	GSP	HCD	NSR	OPN
Level	I	<i>-1.866</i>	2.859	-1.047	0.998	1.436	-1.353	-0.676	1.837	-0.881	0.843
	II	<i>-4.512</i>	-0.939	-2.761	-1.501	-0.734	-2.361	-5.828	-2.579	-1.735	-1.418
First Dif-ference	I	<i>-3.924</i>	2.027	-1.571	-2.494	-1.087	<i>-14.399</i>	<i>-8.886</i>	<i>-9.903</i>	<i>-8.503</i>	<i>-2.808</i>
	II	-3.627	-0.113	-2.880	-3.264	-0.053	<i>-15.417</i>	<i>-9.127</i>	<i>-10.331</i>	<i>-8.519</i>	<i>-3.398</i>
KPSS											
Level	I	0.131	1.186	<i>0.416</i>	<i>1.171</i>	<i>1.060</i>	<i>0.793</i>	<i>1.181</i>	<i>1.172</i>	0.712	<i>1.036</i>
	II	<i>0.127</i>	<i>0.279</i>	0.073	<i>0.231</i>	<i>0.331</i>	0.114	0.111	<i>0.137</i>	0.201	<i>0.219</i>
First Dif-ference	I	0.053	0.371	0.043	<i>0.386</i>	<i>0.454</i>	0.134	0.188	0.106	0.077	<i>0.364</i>
	II	0.053	0.155	0.035	0.058	0.180	0.078	0.185	0.106	0.079	0.068
Ng-Perron											
Level	I	<i>-6.641</i>	3.003	-2.914	2.308	11.672	-4.674	-1.272	1.826	-1.962	1.878
	II	<i>-4.778</i>	-1.089	-20.106	-7.873	-0.588	-9.630	<i>-35.714</i>	-11.896	-5.714	-8.999
First Dif-ference	I	<i>-14.669</i>	<i>-6.248</i>	<i>-175.051</i>	<i>-18.704</i>	6.578	<i>-36.825</i>	<i>-49.511</i>	<i>-61.879</i>	-	<i>-6.270</i>
	II	-19.733	-8.208	<i>-416.776</i>	<i>-43.369</i>	6.200	<i>-33.483</i>	<i>-242.733</i>	<i>-52.498</i>	<i>51.496</i>	-18.520
Asymptotic Critical Values:											
with trend only											
with trend and constant											
1%      5%      10%      1%      5%      10%											
DF-GLS (average)			-2.5928	-1.9447	-1.6142			-3.6408	-3.0812	-2.7880	
KPSS			0.7390	0.4630	0.3470			0.2160	0.1460	0.1190	
NG-PERRON			-13.8000	-8.1000	-5.7000			-23.8000	-17.3000	14.2000	

Source: Author's estimation

Notes: Italics, bold, and bold-italics imply significant at 10%; 5% and 1% respectively.  
 I and II denote trend only; trend & intercept respectively and Optimal lag length was selected based on SIC

**Table A2: Results of Johansen Maximum Likelihood Cointegration Test**

Series: BSM EPF EXR FND FNW GSP HCD INF NSR OPN						
Lags interval (in first differences): 1 to 2						
<b>Unrestricted Cointegration Rank Test</b>						
Hypothesized		Trace			Maximum Eigenvalue	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Statistic	Critical Value	

None *	0.588786	287.0780	197.3709	77.31177	58.43354
At most 1 *	0.555099	209.7663	159.5297	70.46169	52.36261
At most 2 *	0.429574	139.3046	125.6154	48.83934	46.23142
At most 3	0.325345	90.46523	95.75366	34.23913	40.07757
At most 4	0.243466	56.22610	69.81889	24.27370	33.87687
At most 5	0.157211	31.95240	47.85613	14.88040	27.58434

Both trace and maximum eigenvalue tests indicate 3 cointegrating eqn(s) at the 0.05 level  
 \* denotes rejection of the hypothesis at the 0.05 level  
 Critical values for significant trace statistics: 197.3709;159.5297; 125.6254 respectively  
 Critical values for significant max-eigenvalue statistics: 58.43354, 52.36261, 46.23142 respectively

Source: Author's estimation

Table A3: Variance Decompositions of the Dynamic Long-Run Unrestricted SVAR Model

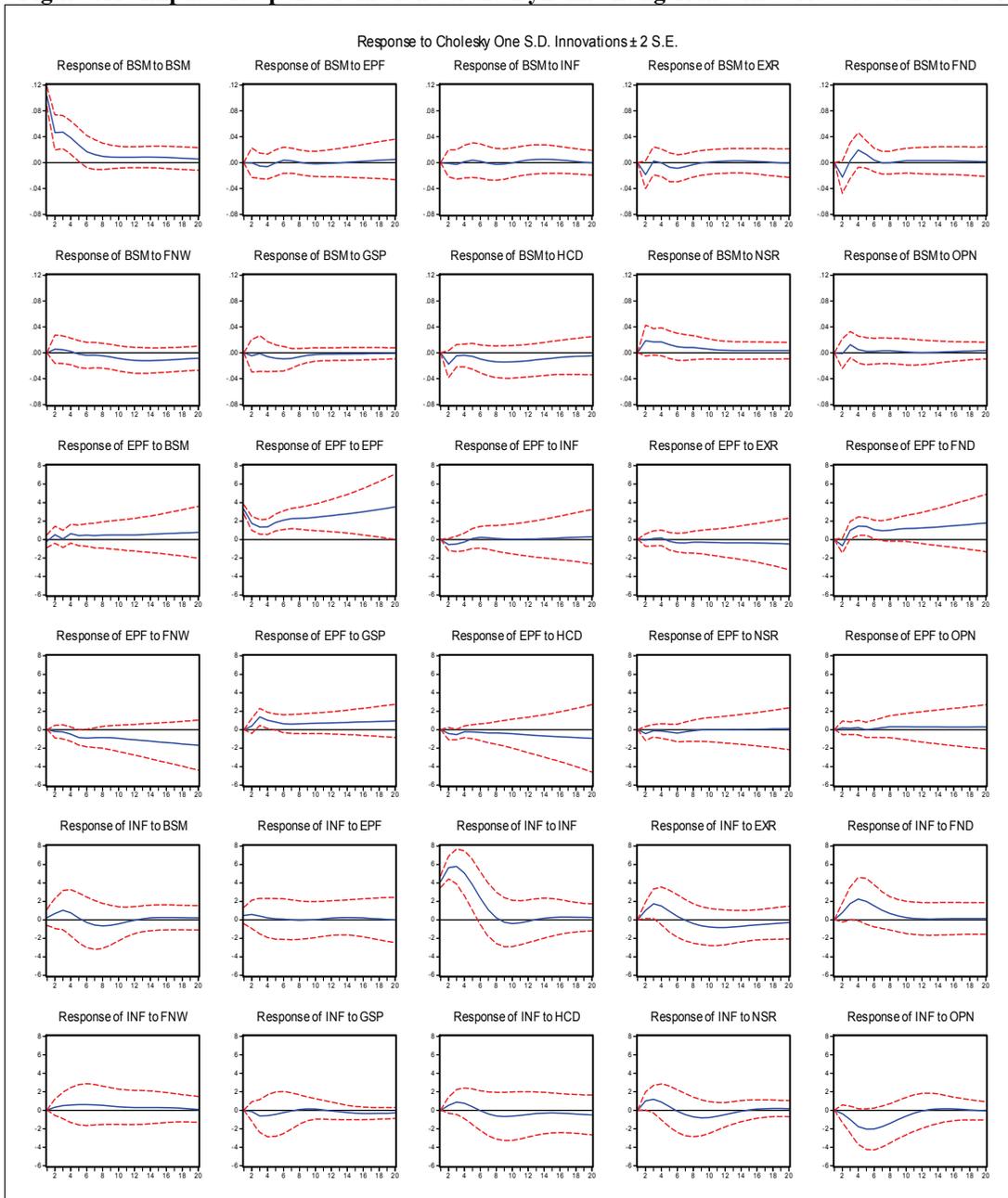
Variance Decomposition of BSM:										
Period	BSM	EPF	INF	EXR	FND	FNW	GSP	HCD	NSR	OPN
1	100.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	88.930	0.0003	0.0121	2.4615	3.5648	0.2173	0.1558	2.1907	2.4575	0.0098
3	87.588	0.1591	0.0586	2.0971	3.0413	0.3074	0.1386	1.9622	3.7130	0.9351
4	84.950	0.3384	0.0615	1.8502	4.6635	0.2920	0.3141	1.8232	4.7574	0.9491
5	83.452	0.3194	0.1247	1.9986	5.1448	0.2991	0.6424	1.8666	5.2350	0.9171
6	82.101	0.3737	0.1429	2.3080	5.0464	0.3664	1.0379	2.2485	5.4626	0.9122
7	80.821	0.4035	0.1446	2.4314	4.9249	0.4226	1.3647	2.9203	5.6313	0.9362
8	79.643	0.3970	0.1771	2.4261	4.8273	0.5105	1.5077	3.7506	5.8037	0.9568
9	78.553	0.3990	0.1975	2.3837	4.7530	0.6893	1.5504	4.6003	5.9128	0.9614
10	77.480	0.4095	0.1944	2.3461	4.7084	1.0144	1.5560	5.3908	5.9497	0.9504
11	76.418	0.4137	0.2100	2.3194	4.6704	1.4829	1.5516	6.0671	5.9315	0.9350
12	75.387	0.4100	0.2738	2.3044	4.6307	2.0390	1.5438	6.6031	5.8882	0.9196
14	73.589	0.3983	0.4886	2.2992	4.5646	3.1763	1.5246	7.2644	5.7979	0.8967
16	72.270	0.4127	0.6425	2.2831	4.5235	4.1540	1.5074	7.5663	5.7432	0.8976
18	71.336	0.4893	0.6762	2.2476	4.4830	4.9012	1.4931	7.7152	5.7249	0.9334
20	70.587	0.6408	0.6683	2.2184	4.4406	5.4375	1.4778	7.7981	5.7305	1.0006
Variance Decomposition of EPF:										
Period	BSM	EPF	INF	EXR	FND	FNW	GSP	HCD	NSR	OPN
1	0.3303	99.670	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.8689	89.277	2.0006	0.0408	3.0192	0.2843	0.9392	1.1822	1.1609	0.2271
3	1.4074	75.074	2.6734	0.0865	6.9278	0.5133	9.8638	2.2701	0.9226	0.2615
4	2.5629	65.562	2.3799	0.1780	13.288	1.3462	11.509	1.9819	0.8269	0.3657
5	2.5773	61.720	1.9050	0.2630	16.353	3.2724	11.010	1.7399	0.8679	0.2909
6	2.6515	61.312	1.6877	0.5241	16.181	4.7314	9.9580	1.6395	1.0537	0.2608
7	2.5845	62.086	1.4984	0.7301	15.444	5.5799	9.1334	1.6368	0.9982	0.3083
8	2.6232	62.701	1.3099	0.7887	15.001	6.0844	8.5212	1.6436	0.8844	0.4422
9	2.6399	62.883	1.1447	0.8123	14.947	6.5023	8.0809	1.6737	0.7715	0.5445
10	2.6414	62.856	1.0053	0.8388	14.991	6.9290	7.7143	1.7387	0.6766	0.6086
11	2.6098	62.796	0.8878	0.8751	14.977	7.3822	7.3899	1.8503	0.5966	0.6388
12	2.5758	62.710	0.7888	0.9069	14.897	7.8406	7.0995	1.9986	0.5288	0.6536
14	2.5359	62.365	0.6371	0.9358	14.756	8.7288	6.6261	2.3383	0.4207	0.6559
16	2.5458	61.829	0.5428	0.9381	14.730	9.5511	6.2358	2.6538	0.3402	0.6337
18	2.5806	61.299	0.4940	0.9444	14.739	10.258	5.8822	2.9218	0.2800	0.6005
20	2.6202	60.858	0.4678	0.9679	14.752	10.818	5.5628	3.1519	0.2353	0.5669
Variance Decomposition of INF:										
Period	BSM	EPF	INF	EXR	FND	FNW	GSP	HCD	NSR	OPN
1	0.3890	1.2696	98.342	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	1.0020	1.0451	91.827	1.9902	1.1861	0.1784	0.0354	0.5357	1.9421	0.2581
3	1.6445	0.7304	84.044	4.1468	3.8825	0.3504	0.4172	1.0820	2.4821	1.2203
4	1.5864	0.5524	79.038	4.5983	6.4713	0.4785	0.5679	1.1830	2.3550	3.1694
5	1.3709	0.4763	76.026	4.4386	7.9563	0.6226	0.6021	1.0868	2.0879	5.3331
6	1.3231	0.4446	73.682	4.2057	8.6916	0.7857	0.5969	1.0106	1.9448	7.3147

7	1.4533	0.4286	71.669	4.0555	8.9827	0.9467	0.5792	1.0637	2.0135	8.8074
8	1.6544	0.4198	70.012	4.0472	9.0292	1.0744	0.5684	1.2406	2.2594	9.6947
9	1.8121	0.4130	68.771	4.1913	8.9645	1.1607	0.5690	1.4657	2.5826	10.070
10	1.8864	0.4075	67.901	4.4541	8.8755	1.2162	0.5692	1.6686	2.8766	10.145
11	1.8974	0.4092	67.297	4.7769	8.8011	1.2568	0.5646	1.8176	3.0791	10.101
12	1.8859	0.4235	66.857	5.1013	8.7468	1.2933	0.5630	1.9139	3.1792	10.036
14	1.8928	0.4791	66.206	5.6175	8.6678	1.3696	0.6077	2.0137	3.1957	9.9504
16	1.9419	0.5240	65.693	5.9258	8.6057	1.4415	0.7170	2.0912	3.1749	9.8846
18	1.9858	0.5349	65.283	6.0886	8.5618	1.4822	0.8368	2.2295	3.1834	9.8144
20	2.0188	0.5322	64.935	6.1608	8.5297	1.4863	0.9311	2.4576	3.1945	9.7539

Source: Author's estimation

Note: Period is the same as quarter, therefore, 4 quarters equal one year

Figure A1: Impulse Response Functions of the Dynamic Long-Run Unrestricted SVAR Model



Source: Author's estimation

# ENGENDERING TRAFFICKING AND HUMAN SECURITY: A COMPARATIVE STUDY OF INDIA AND HUNGARY

**Siddhartha Sarkar**

Assistant Professor, A.C.College of Commerce, Jalpaiguri, West Bengal, India  
Professorial Fellow, Central European University and Corvinus University, Hungary  
E-mail: drsarkar.s@gmail.com

**Abstract:** This study analyzes the determinants of human trafficking on a micro level. The results strongly underline our main argument: migration pressure is the key driver of human trafficking. Moreover, the determinants of migration do not differ much from the determinants of trafficking. Our estimation results for India and Hungary suggest that it is difficult to identify other socioeconomic drivers of human trafficking other than migration prevalence. Victims of human trafficking appear to be a relatively heterogeneous group coming from both urban and rural areas that can be rich or poor. We find that poverty on the household level; regional crime levels and several other regional development and remoteness indicators do not play a significant role. What appears to matter, however, are risk perceptions and the relative role of illegal migration.

## INTRODUCTION

Trafficking of human beings, especially of women and children, is an organized crime that violates basic human rights. As per the UN Protocol to prevent, suppress and punish trafficking in persons, especially women and children, supplementing the UN Convention against Transnational Organized Crime, trafficking is defined as any activity leading to recruitment, transportation, harbouring or receipt of persons, by means of threat or use of force or a position of vulnerability. Human trafficking has been identified as the third largest source of profit for organized crime, following arms and drug trafficking, generating billions of dollars annually at the global level. Trafficking takes places for various purposes such as labour, prostitution, organ trade, drug couriers, arms smuggling etc. However, these cannot be seen in isolation as they have a crosscutting nexus and linkage, which compounds the constraints faced in tackling the problem. It is also seen that while the methods used for trafficking such as coercion, duping, luring, abducting, kidnapping etc. are commonly cited, it is the social and economic constraints of the victims that make them most vulnerable.

With growing globalization and liberalization, the possibilities and potential for trafficking have also grown. People tend to migrate in search of better opportunities. Though this is a positive trend, it has also led to the emergence of other complex issues such as smuggling of people across borders and unsafe migration by unscrupulous touts and agents. While trafficking has severe implications on the psycho-social and economic well-being of the victim, highly adverse ramifications are also seen on the society and the nation. By denying the victims their basic rights to good health, nutrition, education and economic independence, the country loses a large number of women and children as victims to this crime, who otherwise would have contributed productively to its growth. A growing concern is that trafficking has an adverse impact on the problem of HIV/AIDS too. Some studies have revealed that the longer the confinement in brothels, the greater is the probability of the victims contracting HIV/AIDS due to poor negotiation for safe sex methods. The country has to incur huge costs for health and rehabilitation as well as for law enforcement.

Being a complex phenomenon, problem of trafficking is profoundly entrenched in the socio-economic, political and cultural reality of the context in which it occurs, although this may not be its immediate cause. The perpetrators are the traffickers about whom relatively little is known. This gap has to be urgently addressed, along with the demand factors, which drive trafficking. It

is a fundamental violation of the rights of human beings and shows a blatant disregard for the dignity of a person (Sarkar, 2011).

The scale of the phenomenon is difficult to judge. It is very difficult to collect data on trafficking because of the clandestine nature of the operations. The trade is secretive, the women are silenced, the traffickers are dangerous and not many agencies are counting (Hughes, 2000).

Among the most quoted figures are the United Nations estimates that 4 million people in a year are traded against their will to work in some form of slavery, many of them are children and believes that in the last 30 years, trafficking in women and children for sexual exploitation in Asia alone has victimized more than 30 million people. Asia is mainly an origin region as well as a destination for trafficking in persons. Asian victims are reported to be trafficked from Asia to Asian countries, in particular to Thailand, Japan, India, Taiwan and Pakistan (United Nations, 2006). The US Department of State estimates that 600,000 to 800,000 (of which around 250,000 in Europe) women and children are trafficked for sexual purposes across international borders each year, of which approximately 80% are women and 50 per cent are minors. This does not include the International Labour Organization (ILO) estimated 12.3 million people trafficked worldwide for labour annually (US Department of State, 2006a).

India is located in golden triangle, which is most vulnerable region for the trafficking of women and children for flesh trade (Westwood, n.d.). Literature on trafficking in India is completely dominated by the issue of commercial sexual exploitation, so much so that trafficking, as a distinct separate crime does not get highlighted. At times is almost reduced to insignificance in comparison to commercial sexual exploitation. Even though there seems to be considerable information available, one is unable to form a picture, which reflects the reality of trafficking in women and children in India (Sen and Nair, 2004).

Calculations of trafficked people are generally made with reference to commercial sex exploitation. In India, the stigma attached to prostitution and the clandestine nature of operations makes it doubly difficult to arrive at authentic numbers (Gupta, 2003). Increasing incidence of trafficking has threatened the social fabric of the country. Girls under 18 are being lured from Nepal, Bangladesh to Indian metropolitan cities. In India traffickers also lure girls and young women from Assam, West Bengal, Bihar, Rajasthan, Jharkhand, Madhya Pradesh, Chhattisgarh and Uttar Pradesh. The counterfeit promises of jobs and better living standards push these girls and young women into prostitution.

There are many reasons of human trafficking. But the traffickers look for most lucrative purpose through which they can be more benefited. Because of this, most of the women and children from rural Nepal and Bangladesh are more innocent and attractive and they become the target of traffickers in this sense. Sexual trafficking is highly profitable and low penalty nature business than others in India. There is a huge demand for women and female children in the sex industries in India, Pakistan and Middle East. The demand for women and female children is undoubtedly more compared to males in sex industries in South Asian countries. A special target of traders are female children because, among customers of commercial sex establishment, there is a perception that female children are virgins and are less likely to be infected with HIV. Moreover, there is a common myth that sex with a virgin, specially a child, cures a person of STDs. There is no scientific explanation to this belief, but it exists and adds to child prostitution. According to the information received from different GOs and NGOs in India the traffickers prefer Bangladeshi and Nepalese women and children, as they are more easily accessible and also easy to take to India.

Moreover, women and female children are generally less productive than males, they are easier to abuse, easily forced, less assertive, and less able to claim their rights- and accordingly, can be made to work longer hours with little food, poor accommodation and no benefits, which also attracts the traffickers to traffic women and female children more rather than males.

The most important reason behind trafficking women and female children massively from Bangladesh and Nepal is as the Bangladeshi and Nepalese girls are relatively free from the deadly disease AIDS and HIV virus that is why they have high demand to the customers of the brothels. And this is the reason, which compels the traffickers to traffic women and female children massively from Bangladesh and Nepal to India.

At present, Hungary is both a transit and a destination country for migration trafficking. Not only are citizens of the neighbouring countries trafficking, but there are growing numbers originating from more distant countries. The future of Hungary as a destination or a transit country for them will depend mainly on the further European policy developments. Western countries have introduced more and more restrictions on the flow of trafficking. Arrival in Hungary, whether it is legal or not, does not provide for the legal possibility of progressing further into Europe in the majority of cases. As a consequence, many of them will try to cross the borders illegally, often with the help of human traffickers.

Located along a corridor between Eastern and Western Europe, Hungary has become a key transit country for various intra-regional transactions, both legitimate and illicit. In particular, it has become a gateway to Western Europe for persons trafficked from Eurasia. With its accession to the European Union (EU), Hungary now forms the eastern edge of the EU; its importance in this area will increase as it assumes responsibility for monitoring those who enter and exit the EU. In 2007, Hungary will officially become subject to the Schengen Agreement, which applies to countries within the European Union and enables citizens of participating states to cross-shared borders without checks. With fewer border checks between EU states, those along the perimeter will be tasked with controlling entry into the EU. Consequently, Hungary will serve as a first line of defence against trafficking for the EU.

According to US Department of State (2006) report Hungary is a source, transit, and destination country for women and girls trafficked from Ukraine, Moldova, Poland, the Balkans, and the PRC to Austria, Germany, Spain, the Netherlands, Italy, France, Switzerland, Japan, the United States, the UK, and several countries in Scandinavia and Central America for the purpose of sexual exploitation (US Department of State, 2006b).

Limited employment opportunities for women and discrimination against women in the labour market in Hungary, specifically young women and women with young children make Hungary a country of origin. Unemployment is a greater problem in Eastern parts of the country, and therefore women here are more vulnerable to becoming victims of trafficking.

Hungary currently lacks reliable estimates of the number of people who are trafficked to, from and through the country annually. This is partly due to the fact that no agency has been charged with compiling national data on victims of trafficking. At present, statistics are maintained at the local level. Recent estimates have suggested that "as many as 1,50,000 victims transit through Hungary each year" ( US Department of State, 2004). However, this figure is believed to be too high, as it conflates smuggling and trafficking (Srivastava and Choudhury, 2005).

Prosecution statistics are available, but fail to capture the scope and gravity of Hungary's trafficking problem. Only 22 individuals were prosecuted under Hungary's trafficking law in 2004 (United States of America State Department, 2004). This low rate of prosecution is due to a number of factors: trafficking victims are often too intimidated to testify against their traffickers;

police systematically fail to recognize trafficking victims; border guards lack jurisdiction to investigate suspected trafficking cases; and perverse incentives discourage the police from investigating trafficking cases. In short, prosecution statistics do not reflect the fact that a large number of trafficking cases are never detected, and those that are detected are rarely prosecuted.

It is also difficult to gauge what forms of trafficking are most prevalent in Hungary. The prosecution data provided by the National Police was not disaggregated to distinguish between sex, labour and other forms of trafficking. Moreover, any effort to extrapolate based on such a small sample would be inconclusive. The division leader of the Criminal Investigation and Intelligence Department of the Hungarian Border Guards reported that 60 percent of Hungarian trafficking cases were related to forced labour while the other 40 percent were related to other forms of trafficking, such as forced sex labour (Choudhury and Zureick, 2005).

The lack of reliable data on trafficking in Hungary poses a serious challenge to the police's anti-trafficking efforts. Many officers said that they could not gauge the gravity of Hungary's trafficking problem because of the absence of data. One officer responded, "I don't have an answer because I don't have any data. You need to ask someone with data who knows about this. I have only heard lectures about it (Srivastava and Tressa Johnson, 2005). The victims trafficked through and to Hungary come primarily from the CIS, the Balkans, Poland and China. The Hungarian victims of trafficking are to a great extent recruited in the eastern part of the country, where the social and economic situation is presently the most difficult. The target area for women trafficked from and through Hungary is the European Union (Austria), and to some extent also the United States. Presently, Hungary is estimated to have 10,000 prostitutes, of whom 500 are minors. One-third of the prostitutes are foreigners, mainly Ukrainians, Russians and Romanians. Trafficking from Hungary has decreased considerably over the last few years, but unfortunately a corresponding positive trend is not seen in trafficking through and to the country (Lehti, 2003)). The scarcity and inconsistency of statistics, and the fact that prosecution statistics tend to seriously downplay the prevalence of trafficking, give the impression that trafficking is not a major problem in Hungary. This creates a vicious cycle – law enforcement officials fail to investigate trafficking because they perceive it to be a minor problem; yet, their failure to investigate further exacerbates the deficiency of data on the crime.

### **TRAFFICKING PATTERNS AND TRENDS IN ASIA AND EUROPE**

Traffickers lure victims from their homes with false promises of economic opportunities and better lives. Naturally, less-developed countries with high rates of poverty, violence, and corruption constitute their best recruiting bases. South and South East Asia, South East Europe, and Latin America are the largest source of trafficking victims.

In East and Southeast Asia the main countries of origin for trafficking are Thailand, China, the Philippines, Myanmar, Vietnam and Cambodia, while the major countries of transit and destination are assumed to be Thailand, Malaysia and Japan. Myanmar is regarded as both a country from which persons are trafficked into Thailand and as a transit country for the trafficking of Chinese women and girls from Yunnan province into Thailand (Caouette, 1998).

In Cambodia, trafficking has become an issue since the early 1990s. In response to the growing sex industry in the country most trafficking of girls and young women within Cambodia is for the purpose of commercial sexual services. Cambodia is known as a destination for trafficked persons from Vietnam. It is also regarded as a country of origin and transit for Cambodians and Vietnamese sent to Thailand and elsewhere in Asia (IOM Project Outline, 2000-2002).

Trafficking in Indonesia is generally assumed to take place in the context of labour migration to the Middle East and East and Southeast Asian countries, though the issue has so far not received much attention. Due to the economic crisis, Indonesian women have reportedly become more exposed to illegal forms of migration.

The eight Lao provinces bordering on Thailand are known to be areas from where large numbers of people go to Thailand to work, the majority illegally. Little is known about how they cross the border and their whereabouts in Thailand.

More than two decades of labour shortage in Malaysia have resulted in a high level of immigration of professionals as well as unskilled labour, which in the case of women mostly means domestic work. For this reason women from countries like Indonesia, the Philippines, Thailand, China, and also from India and Sri Lanka, go to Malaysia. According to the IOM some of them have been trafficked. Malaysian women are also victims of trafficking for prostitution and other purposes within as well as outside the region. However, since the issue has mainly been addressed within the context of illegal migration there are no reliable estimates of the number of persons trafficked to and from Malaysia (IOM, 2000).

Japan is regarded to have the largest sex industry in Asia, recruiting women and girls mainly from Thailand and the Philippines but also from for instance Russia and Ukraine but most trafficking in China occurs within the country especially from poor rural areas of Yunnan, Sichuan and Guizhou.

In the 1990s female Filipino migrants outnumbered Filipino male migrants, especially with respect to domestic work, entertainment and commercial sex service, but also more qualified work. Within the context of large-scale labour migration, trafficking processes have developed through specialized agencies or informal networks. The victims include girls who are promised high-paying jobs, but end up as prostitutes; girls who leave as tourists, but end up as maids, dancers or bar girls; and girls forced into the mail-order bride trade. The trafficking of young children is arranged mainly through adoption, which subsequently leads to commercial or other exploitation, abduction or purchase and sale for the purposes of exploitation in prostitution or pornography. Women and girls from the Philippines who are victims of trafficking are found in Japan, Singapore, Brunei, Malaysia and the Middle East (ARIAT, 2000).

In the 1980s women and girls were recruited from the poorer provinces in the north and north-east of Thailand for commercial sex services in the urban areas. This traffic consisted mostly of 12-16 year old girls from the hill tribes of the north and northeast. This pattern was to some extent replaced in the 1990s by the trafficking of women and children, primarily from Myanmar, but also from Lao PDR, Cambodia and Yunnan province in China. Today, Thailand is considered a major transit and destination country for trafficked women and children from countries in the Greater Mekong sub-region. Thailand receives from neighbouring countries considerable number of children trafficked for different forms of labour and begging. Many of them subsequently end up in the sex industry. Sometimes women from Russia, Yugoslavia, Poland and the Czech and Slovak Republics end up in Thailand (ILO, 2000). Thai women and girls are trafficked out of the country by advanced networks, in particular to Japan, Australia, India, Malaysia and the Middle East, as well as to Europe.

Vietnamese women and girls are trafficked from northern Vietnam to China, mainly for marriage, but also for labour and household work or to be sold as prostitutes. Women and girls from Ho Chi Minh City are lured to Hong Kong, Macao and Taiwan under the guise of marriages between Vietnamese and foreigners. Women and girls from the southern provinces of Vietnam are trafficked into Cambodia and further abroad.

In South Asia, Bangladesh and Nepal are the main countries of origin for trafficking, while India and Pakistan are considered countries of destination, and Kolkata in India is regarded as a major transit point for other destinations.

Extensive internal trafficking of minors seems to occur in Bangladesh. Bangladesh is also a supplier of young women and girls, and some boys, to the sex industry in India and Pakistan. In addition several thousands of young Bangladeshi women and girls are taken across the border to India each year for marriage. Many of these girls, who mainly originate from western Bangladesh close to the Indian border, end up in brothels in Kolkata, Mumbai and Goa or are sold several times.

India is not only the main country of destination for traffickers, but also a country of origin for women and girls trafficked in the region. Most of the trafficking in India occurs within its borders, from rural to urban areas and from poorer states like Bihar to wealthier states like Maharashtra.

Thousands of children in Nepal live apart from their families. Some of them have migrated voluntarily, for example to Kathmandu, to work in manufacturing, sweatshops, hotels, or as domestic workers. Many of these children then become victims of the cross-border trafficking to India.

Pakistan is regarded a major destination for trafficked women and children in South Asia. Every year, thousands women and children are trafficked from Bangladesh across India into Pakistan. They are forced into prostitution, sold or auctioned for marriage, or employed as bonded labour. The typical trafficking scenario in Pakistan is one of women who arrive in the country as migrant labourers and then end up sexually abused.

Reports indicate that tribal children from the hills are trafficked to the big cities, or to the coast in the south and southwest of the country. Sri Lanka is one of the favoured destinations of paedophile sex tourists from Europe and the United States. In Sri Lanka, unlike other countries in South Asia, the majority of the child prostitutes are boys. These boys are often referred to as "beach boys" since they live and work on the beach. Other prospects that trafficked children from Sri Lanka may face are domestic work and illegal adoption. A large number of adult women go to the Middle East, primarily with the intention of working as maids.

Information from across the region suggests that a growing number of women and girls are being trafficked for the purpose of sexual exploitation within and into Europe. The data and information are unpredictable and there are few reports on the trafficking situation. However, the focal destinations in Europe are the countries in Western Europe, while the countries in Central, Eastern and Southeastern Europe provide the women and girls. Women are also coming into Europe from Southeast Asia, mainly the Philippines and Thailand, from Africa, mainly Ghana, Nigeria and Morocco and from Latin America, mainly Brazil, Colombia and the Dominican Republic.

The former Soviet Union and Central and Eastern Europe have replaced Asia as the main source of trafficked women to Western Europe. Victims come from Russia, Ukraine, and other Eastern European countries. After the breakup of the Soviet Union, trafficking from the region has escalated from a minor problem before 1991 into a major issue. As criminal organizations have grown, especially in Russia, they have gravitated to this lucrative business. Russian organizations now play a dominant role not just in the trafficking of Russian women but also women from throughout Eastern Europe. Russian organized crime groups and others including Albanian, Estonian, Czech, Serb, and Italian groups are involved in human trafficking in Europe. Further-

more, Russian organized crime is starting to take over the sex industry in a number of European countries.

In the countries of Central and Eastern Europe, including the Balkans and in Central Asia, the increase in demand and supply for trafficking has led to the growth of the trafficking in women and girls for sexual exploitation. Many of the Central and Eastern European countries have particular difficulty in dealing with the problem, because of their weakened social control system and the high degree of ineffectiveness of their formal criminal justice systems.

In the region, the rise of small, middle-size and complex organized criminal networks whose main interests are in human trafficking coincides with the growth of the shadow economy and the high levels of unemployment among the female population. According to official estimates, in the last decade alone at least 400,000 women have been trafficked from the Ukraine (UNICRI, 1999). In 1995, it was estimated that the money generated by the informal (and illegal) economy accounted for 50 per cent the gross national product, furthermore unemployment mostly affects women, constituting 64 per cent of the total unemployed (Hughes, 2001). The huge availability of illegal services greatly facilitates trafficking, for example, there is evidence that traffickers can obtain a forged passport for young girls under 18, for about \$800 (OSCE, 1999).

Recent estimates on trafficking show that a quarter of trafficking flows worldwide originates from Central and Eastern Europe, region which presents the most impressive increase in trafficking activities on a global level. Despite the increasing magnitude of the internal sex markets, the main flows of the traffic are still directed outside of the region. The region now rivals “traditional” trafficking source regions such as Asia, Africa and the Caribbean. Generally women and girls are normally younger than those trafficked from developing countries. In Germany, where 9 out of 10 victims of trafficking are from Central and Eastern European countries, the percentage of girls aged between 15 and 18 is estimated to be as high as 20 per cent. However, few data have been collected, within Europe, on the percentage of girls among the trafficked population.

As regards figures, according to OSCE calculations, in 1997, some 175,000 women and girls were trafficked from the eastern countries of the OSCE region to Central and Western Europe. The transfer of trafficked women and girls flows from the Eastern countries to the Western countries and to a less visible extent from the Southern countries (Romania, Bulgaria, and Albania) to the Northern countries (Poland, Hungary, Czech Republic, Lithuania). Cities such as Budapest, Prague, and even Belgrade, as well as major towns and cities situated along border areas are used as transit points. The geography of trafficking is changing fast. At the beginning of the 90s, Central European countries like Poland, the Czech Republic, Hungary and Lithuania were mainly origin countries for trafficking of women and girls to the Western countries. Nowadays they are important *origin, transit and even destination* countries. Most of the women trafficked into Czech Republic and Poland – a country where 15,000 arrivals are estimated each year – are nationals of the former Soviet Republics. In fact, although new origin areas emerge, trafficking of nationals from Russia and Ukraine persists. Eastern countries such as the Ukraine, Belarus, Moldova, Romania and Bulgaria are now origin and transit areas for the trafficking of women. Even Belarus has become a strategic *origin and transit* state, used on the way to the Western European countries through the Ukraine and Poland, and to Scandinavia through the Baltic States.

Former Soviet Republics of Central Asia are now booming as *recruitment areas*. Even if information on the scope or extent of the phenomenon is still very limited, local NGOs report a growing number of trafficking cases from Armenia, Georgia, Azerbaijan, and Kazakhstan. According to IOM about 4,000 women have been trafficked in 1999 from Kyrgyzstan, with different destinations: one third of them were travelling to or through Central Europe, two thirds were

travelling to China, the Middle East and the West European countries. The major push factors for trafficking in Central Asia are the presence of strong organized criminal groups, a high rate of female unemployment (80%), along with high levels of poverty, weak institutions, and open borders (Redo, 2000). The Balkan region is acquiring increasing importance not only as a ground for recruitment practices, but even for the transit and final exploitation of trafficked women and girls. In Macedonia in 1998 local authorities recorded (UNICRI, 1999) a sharp rise in the number of trafficked women and girls (but mainly young girls), citizens of Russia, Ukraine, Belarus, Moldova, Bulgaria, Romania and Albania. In Macedonia traffickers are said to be well organized, with regional connections and a good level of technology. The same is true of Bosnia-Herzegovina, where the problem has reached alarming proportions. Bosnia has become a final destination for hundreds of women as the presence of 20,000 foreign peacekeepers has provided a ready market for brothel-keepers. According to IOM survey (IOM, 1997), one-third of the women working as prostitutes declared to have been lured, and trafficked into the country. They come mostly from Moldova, Romania and the Ukraine, or other parts of the former Soviet Union and 5 per cent of them are minors. Often recruited by acquaintances or friends, they have been transported to Belgrade, where they have been sold to traffickers and provided with false documents, before being introduced in Bosnia-Herzegovina.

The business of trafficking from and within Central and Eastern Europe is increasingly controlled by Russian and Ukrainian middle-size and trans-national criminal organizations. Ukrainian and Russian networks especially provide call girl or escort system services worldwide. Some of them, at any given time, can control over 100 girls and women, mainly nationals of Russia and the Ukraine, as well as other CIS countries. Equipped with modern means of communication, and well introduced in the sex market structures abroad, they often run all the phases - recruitment, travel, and exploitation - of the business. Sometimes they are involved only in the recruitment and transport phases of trafficking, "selling" women on the foreign sex markets. The reputation of Russian and Ukrainian traffickers is widespread and, depending on their area of action, they are able cooperate with the main organized criminal groups involved in human trafficking worldwide, such as Turkish and ex Yugoslavian networks, as well as Chinese triads or yakuza.

It is worth noting the huge extension of the routes of such traffic: women are circulated among different countries, by air and land. Important flows controlled by Russian and Ukrainian groups end up in the United States, where it seems that 4,000 women from Eastern and Central Europe arrive each year to work on prostitution. They also end-up in some Asian megalopolis, including Bangkok, Hong Kong, Beijing and Singapore, as well as in Japan, the Middle East, Israel and Turkey. In some parts of the world, such as Turkey and Israel, the presence of women from Russia and other former Soviet republics is so prevalent that prostitutes are called *Natashas* (Hugues, 2001). Generally, routes directed to the neighbouring countries are less demanding from the organizational point of view. For that reason too, in Finland, Russian criminal organizations closely control the "carousel" system (ECPAT, 2001), while in Greece over half of the trafficked women are estimated to be from Russia and Ukraine. Ukrainian and Russian organized crime groups also control the main part of street prostitution and clandestine brothels in localities in Poland and the Czech Republic situated close to the border area with Germany and Austria. In this border area since 90% of clients come from the Western countries, high profits are assured. The most attractive women and girls, once trained, are selected and moved on to other Western European countries. Otherwise in the Baltic States, especially in the strategic border areas, trafficked women working on the streets are mainly nationals of Russia, Ukraine and Belarus, which have been "exported" mainly by Russian and Ukrainian groups.

Similarly to what happens in the Czech Republic and Poland, two recent trends have been noted in the border areas: first, the arrival of trafficked women from the Eastern countries: second, the arrival of sexual tourists from richer countries visiting the local sex markets, because of the low prices. The main trafficking flows out of the Baltic States go from Lithuania, a country of origin of strong criminal groups which are able to coordinate their activities with Russian and Ukrainian groups.

With respect to their victims, the methods used by Russian and Ukrainian groups, as well as Lithuanians, Polish, and other criminal networks from Central European countries, are the same. Even those women who voluntarily engage in prostitution are blackmailed and become prey to their exploiters. There is evidence that organizers of trafficking sexually abuse the newcomers and then collect pornographic materials of this abuse. They threaten them, saying that they will show videos of them to their families if they attempt to report to the police or escape. Other menaces usually concern the eventual killing or torture of family members. Their passports are confiscated, and in some cases women are locked up, beaten and even tortured. Patterns of sexual exploitation may vary depending on local sex-work structures, however a strict and permanent control of the organized crime emissaries on the victims is held. Even if the women are compelled to work for “external” exploiters, they have enormous debts to pay back to the organization, generally on a weekly rate.

Organized criminal groups from Albania are also involved in trafficking in women and girls all over Europe. They are different from the Russian and Ukrainian groups in the routes they use, the kind of markets they supply, and the type of girls they exploit. As regards routes, they operate exclusively within Europe. Albanian gangs initially began to traffic girls from their country into Italy. Recently, Albania has also become a transit country for trafficking originating in the former Soviet Republics. Women entering Albania are “bought” before being transported to Bosnia, Macedonia and Kosovo. Italy is still one of the main countries of transit and destination, for trafficked girls and women of Albania and the Eastern countries. Traffickers also pass through Italy, or through the eastern countries, such as Slovenia, to enter the Schengen area and reach the North-Western European countries, especially the Netherlands, Belgium and France. In Western European countries the Albanian organized criminal groups supply the lowest level of prostitution markets. While women from the former Soviet Republics who are exploited by Russian and Ukrainian groups are often well educated, and better trained, it seems that women exploited by the Albanians rings are mostly uneducated.

### **MIGRATION, SEX EXPLOITATION AND SECURITIZATION**

The scholarly literature on trafficking can be broadly divided into two approaches: firstly, the ‘sexual violence’ approaches linking trafficking to sexual exploitation (Barry 1995; Hughes, 2003, Raymond, 1998), and secondly, the ‘migration’ approaches linking trafficking to the widespread occurrence of irregular migration (Skeldon, 2000). The first approach can be further subdivided into two ‘camps’ representing fundamentally opposing views of the legitimacy of the sex industry. This is a somewhat broader (and older) debate. In view of much migration-taking place under irregular conditions, the second approach in theory also includes men as potential victims of trafficking. These two strands – trafficking for sexual exploitation and irregular migration, however, rarely engages with each other. In this sense, the conceptual debate on trafficking has reached an impasse.

Keeping with the sex trafficking approach, within the geographical context of India as well as Hungary has undergone unprecedented scrutiny of its sex industry and hence the trafficking of

women into it. Indian and Hungarian prostitutions cannot be discussed without recognition that certain US pressure groups (anti-prostitution feminist coalition and the Christian right) have joined forces with the US Government to argue that any country that does not aggressively deal with its own sex industry, are promoting sex trafficking thereby, a security threat. Moreover, the trafficking issue cannot be divorced from the practice of migration – domestically as well as trans-nationally. Illegal migration, which also includes trafficking, is historically not new to India and Hungary. It was only after the introduction of compulsory passports did, migration therefore, become a form of controlling peoples' movements by governments to protect their national sovereignty, security and identity. Migration discourse, in all its forms, focuses on issues such as poverty, violence and push-pull factors; the exploitation and victimization of the migrants is often central to the analysis. Inevitably exploitation exists but when the issues of trafficking and migration are brought together, conditions that make up the many reasons for which women migrate are given very little attention and the concept that women do make decisions based on choice (albeit constrained) is typically ignored. It needs to be further investigated as to whether all women, trafficked or prostituted, are incapable of choice and, therefore, are never able to exercise agency – which is not to deny the structural changes that are part of the push/pull factor (Agustin, 2003).

Hence, it is with these points in mind, that make questions such as whether or not the sex industry in India and Hungary is being securitized, and if so, by whom, why, and how. The analytical framework that we will take as a preparatory point is the security and securitization, and more specifically the societal sector. By showing that securitization is occurring we will suggest that an alternative perspective could be a valid option: human security. This approach could then advance the debate on trafficking for sexual exploitation versus irregular migration and yield important policy recommendations that address the root causes of trafficking – a crucial aspect previously neglected. Linked to addressing root causes are issues to do with socio-economic development. Our contribution to this debate is by taking a sociological perspective, i.e. to look at this subject as a “bottom up” process in which non-governmental actors/agents try to achieve social change. We shall discuss certain civil society groups and their approaches to various security aspects of trafficking such as sex work and human rights issue. We approach human security as socially driven, therefore highlighting the importance of social action and activism in the efforts to find countermeasures to trafficking.

### **DATA, APPROACH AND METHOD**

This study on engendering trafficking and human security in India and Hungary is pioneering and exploratory. It is not surprising that reliability and authenticity of existing data is a matter of concern. The aim of this research is to gain an overview of human trafficking on migration patterns in India and Hungary. It will attempt to identify the main types of trafficking and their dimensions through the experience of different governmental agencies, other institutional actors, NGOs dealing with migrants, as well as the people directly involved in trafficking. This last group consists primarily of migrants but includes some traffickers. We carried out the pilot project in India and first and subsequent analysis of data before visiting Hungary and also continued to expand the network of interested parties and disseminate results from review and expert consultations to NGOs networks. There are some basic prerequisites to achieving results from the study. These comprise: a) the cooperation of all parties involved including collaborating institutions, government ministries, local authorities, and participating communities in India as well as Hungary in project implementation and in monitoring and evaluation; b) useful documents should be

prepared so the activity can be replicated by relevant grassroots NGOs and extension agencies working with women's groups. The research team engaging in field survey found useful a wide variety of data-gathering tools and methods, with the most important being policy and institutional analysis, the use of both qualitative and quantitative data.

Trafficking is a complex, multidimensional phenomenon, with a variety of – often inter-related – aspects covering large geographic spaces. It is not possible to address all the areas simultaneously. Broadly, the study focuses on: the crime of trafficking and the responses engaged in preventing and countering it. The role played by the demand factor in trafficking for different purposes, which has received scant attention earlier, may also be studied explicitly. This may be primarily examined from the 'client' angle of the commercial sexual exploitation 'sector'. The sources and scale of profitability from this 'sector' are also examined to find out the motivations behind the demand – the causal mechanism that reproduces the system.

The lack of reliable information is characteristic on all aspects of human trafficking. Not only are information and practices scarce concerning such issues as the effects of trafficking on migration patterns, the scale and extent of operations, structure and working principles of the trafficking organizations, but even information on the trafficked migrants, their personal characteristics, reasons for using the services of the traffickers, remains incomplete. Although there are some indicators connecting human trafficking with other criminal activities, the real scale and depth of this relationship are unclear. Typologies of how the migrant trafficking business is organized, and the functions performed thereby, are quite simplistic and heuristic. The elaboration of effective strategies and potential actions against trafficking is not possible without a detailed knowledge of the different aspects of the phenomenon.

The analysis of the study is based on household survey from India and Hungary carried out during October and November 2011. The survey comprises total of 534 individuals from India and Hungary. At least 200 individuals per country were interviewed, with 327 from three-districts of West Bengal, India and 207 from three-districts of Budapest, Hungary. A standardized questionnaire was used in both the countries. The multi-stage stratified sampling technique was undertaken. The survey covers both urban and rural areas and sampled households in all regions in the sample countries. In each region, interviews were proportionally distributed according to the size of settlement. Within each group, settlements were randomly selected applying probabilities proportional to size.

Interviews were structured in order to acquire information on the structure and functioning of trafficking networks, financial arrangements, specific methods in use, and how these relate to each type of migrant. Through the findings of individual cases, we aim to understand the process from mobilization through transition to destination. This includes recruitment in the place of origin, methods of border crossing, etc. Most of the interviews with migrants were conducted in detention or holding centers and in refugee camps. Others were conducted in railway stations, restaurants, places where trafficking is organized, police cars and through personal contacts. Some other interviews were done in a "panel" format involving small groups of migrants familiar with the smuggling experience. The number of migrants interviewed varied between 1 and 10 at one time in one location. The length of the interview varied between couples of minutes to 2 hours, depending on the circumstances, the willingness to cooperate and on the value of information the migrant could provide. Most interviews were - at least partly - taped. Some interviews were carried out with people who acted as human smugglers or assisted in the smuggling process. We arranged site visits at five different detention centers and various refugee camps in India and Hungary. We also managed to visit border communities and relevant interior sites in both

the countries where smuggling is organized and experienced. In certain cases we were able to follow some parts of the trafficking process. Field observations took place in India around the Indo-Nepal and Indo-Bangladesh boarder areas and in Budapest around the central railway station. Further observations in Budapest took place in a town near the Austrian border known as a major "transit-waiting" centre for migrants mainly from Kosovo. More interviews were conducted with NGOs and migrants who planned to cross the border, some of whom had been readmitted several times. During the research we enjoyed the support of governmental agencies, especially the Border Security Force or Guard. Most officials were not only willing to share official statements, but were helpful and open about their personal experiences. Meetings with migrants were arranged and upon our insistence, provisions were made to speak with them without surveillance. The project team was selected on the basis of their previous experience; language knowledge and communication skills. Some had to deal with virtually all types of respondents; others contacted just very specific categories. Besides language knowledge familiarity with the circumstances in the place of origin of the migrants, the sex or the citizenship of the interviewer played an important role in establishing contact and receiving relevant and reliable information from migrants.

To estimate the determinants of human trafficking on the household level, we use binary response models. A potential problem in this regard is that human trafficking, although affecting millions of people, is a relatively rare event on the household level, so that standard procedures such as probit and logit models might yield inaccurate estimates. As baseline method, we therefore rely on the rare events logit model suggested by King and Zeng (2001). Our dependent variable is a dummy denoting whether the interviewed person reported a victim of human trafficking among close family members. Given the relatively small number of individuals with trafficking in their close family, we combine sexual exploitation and other forms of exploitation. More specifically, the dummy takes the value of one if a close friends and relatives had travelled abroad and experienced one of the following situations: (i) "was offered a domestic or nursing job, but was locked and forced to work for no pay", (ii) "was offered a job at an enterprise, on a construction site, or in agriculture, but was locked and forced to work for no or little pay" (iii) "was offered employment, but the passport was taken away upon arrival to the destination country and was forced to work in the sex industry".

It is to be noted that the data are likely to suffer from some degree of reporting bias. Victims of human trafficking and their friends and relatives might be unwilling to share their experiences, being anxious of stigmatisation or problems with authorities at home or abroad. Overall, 78 individuals indicated a victim of human trafficking in their close friends and relatives. Out of these, there are 56 reported cases of members being forced to work in the commercial sex market, while 22 cases were associated with non-sexual forms of exploitation. This is especially true for the case of sexual exploitation, which is a highly sensitive and husky issue (Laczko, 2005). The survey did look into on marginal social groups, among whom trafficking predominance rates could be higher. Despite these concerns, we believe that the potential reporting bias will not nullify our results. The main problem here is that the number of victims may actually be too low, i.e., a problem of under-reporting. To minimize the degree of underreporting, the survey instrument used various ways of reducing the stigma associated with human trafficking. First, instead of asking directly whether a family member had been "trafficked", the survey instrument rather referred to typical situations of coerced labour. Second, the respondent did not have to reveal the identity of a trafficked family member. Third, if there was a case of sexual exploitation in the family, the interviewed person could still "bury" this experience in a more general answer cate-

gory of exploitation. However, there is no reason to assume that there are systematic regional differences in reporting behaviour. Moreover, we would certainly have a more serious problem if the bias were upwards, i.e., if there was a potential problem of over-reporting. Taken together, and despite the unavoidable drawbacks, we suppose that the dataset at hand is well suitable for the purpose of our analysis.

Looking at the explanatory variables used in our analysis, we consider a set of household and regional characteristics. We also include age, gender, marital status, and educational level of the respondents, which should manage for systematic reporting biases along these dimensions.

On the household level, we use household size, the number of children aged 14 or below, a dummy for households living in rural areas and another dummy indicating whether households live in urban or semi-urban areas around their respective city or town. In addition, a household's living standard is surrogated by subjective measures of its perceived financial status. To capture access to public information and news, we also code a dummy for households that use the television, as opposed to other media and social contacts, to get informed about social and political issues. With a view to the empirical literature on the determinants of migration in South Asia and Central Europe, we suppose household size, the number of children and poverty to enhance the likelihood of human trafficking. In contrast, television use can be seen as a source of relatively objective and high-quality information and is anticipated to raise awareness of trafficking risks, thus lowering the trafficking likelihood.

Our main proxy of migration pressure, the key variable of interest, is the migration prevalence ratio on the regional level. This variable allows us to identify "hot spots" of migration, where individuals had a significantly higher propensity to migrate compared to other regions. Areas with high out-migration are also likely to witness strong herd and network effects, which have been shown to be a main driver of migration in South Asia and Central Europe. To strengthen our argument, we use a second proxy for migration pressure, namely the share of individuals in the region who stated that they could not imagine to ever working abroad.

To proxy the degree of information asymmetries, we include a risk awareness measure, which corresponds to the regional share of respondents who assured that they had heard of the phenomenon of human trafficking before. We try to most closely resemble a migrant's knowledge status before departure and reduce potential endogeneity by excluding respondents who knew a victim of human trafficking or lived in a migrant household in computing this share. We suppose that a person who is aware of the risk of being trafficked would be more alert in dealing with people during the migration process and perhaps even disregard the possibility of migration. Hence, we expect the regional risk awareness to reduce the likelihood of having a trafficked family member.

We also use a regional measure for the prevalence of illegal migration. It is defined as the share of households in each region that reported to have had a member working abroad illegally. On the one hand, this variable aims to capture the fact that their notorious vulnerability makes illegal migrants more prone to be trafficked than legal migrants at any stage of the migration process. On the other hand, shadow migration sectors, which might act as a breeding ground for trafficking networks, are presumably more present in areas with high levels of illegal migration. Consequently, we predict that the risk of being trafficked should rise with the extent of illegal migration.

## **RESULTS**

Before thrashing out the econometric results, it is worthwhile to look at the summary statistics (Table 1 in the appendix). A simple mean suggests that overall, 14.7 per cent is of a victim of

human trafficking in their close surroundings while human trafficking in household is 1.8 per cent. The average regional prevalence of migration is about 20.1 per cent. The internet user in the region is 11 per cent while cell phone user is 75.6 per cent. Regional wage gap to capital is 30.1 per cent while regional crime rate is about 174.7 per 12000 inhabitants. The table also shows that regional prevalence of migration is 20.1 per cent where as regional awareness of human trafficking is 67.4 per cent. The share of families which uses the television to get informed about socio-economic issues and knows about the phenomenon of human trafficking is noticeably higher as 95.4 per cent. Amongst the dwellers prevalence of poor financial condition is significant (51.4 per cent). Regional prevalence of legal migration is 20.7 per cent and illegal migration is 12.9 per cent but share of illegal migrants among all migrants is significantly higher (44.3 per cent).

Table 2 in the appendix shows key estimation results. Migration pressure, as measured by migration prevalence, turns out to be a vigorous and highly significant predictor of human trafficking both within the household and among close friends and relatives. This is true for different specifications and subsamples. The migration prevalence ratio also has a sizable marginal effect compared to other explanatory factors. Interestingly, we find a (weakly) significant link between risk perception and trafficking. In regions where more people are aware of the phenomenon of human trafficking, the likelihood of human trafficking is lower. This finding, although not fully robust, underlines the potential benefit of awareness campaigns to combat human trafficking. A further interesting finding is that the role of illegal migration plays a significant role. In areas where a larger share among the emigrants worked abroad illegally, trafficking risks are higher. This is very much in line with common belief and confirms the intuition of existing theoretical models that close connections to people acting in the illegal sector increases the risk of exploitation. Converse to what we expected, weak rule of law in the home region (as surrogated by high crime rates) does not emerge to amplify the likelihood of trafficking abroad. The variable of regional crime rates has a negative sign and is only feebly significant for some specifications. A similarly surprising finding is that the dispersion of information technology as measured by the share of internet users in the region does not lower the risk of trafficking. On the contrary, internet use on the regional level appears to significantly increase its likelihood. Use of cell phone also appears to matter much more for trafficking risks. Access to television news, however, seems to lower trafficking risks, although this finding is not very robust.

Generally, remoteness and low socioeconomic development do not appear to matter much for trafficking risks. A lower quality of public services as measured by low density of physicians and high infant mortality rates, the household's locality (rural or urban), and low wages compared to the capital town do not increase the likelihood of trafficking in a certain region. Likewise, the share of the rural population, although positively related to trafficking, is only significant in some cases.

On the household level, the number of children appears to increase the risk of trafficking, while household size does not matter. As we are not able to control for household composition in more detail, the interpretation of this effect warrants caution. It may well be the number of children is a good proxy for the presence of prime-age individuals, who are typically most likely to migrate. Age also appears to be an explanatory factor, which is very much in line with the stylized facts. In households with a young respondent, the risk of trafficking is much higher. While we do not have any information on the age of the trafficked friend or relative, it is reasonable to assume that young respondents know more people of their own age. Hence, one can infer that being young increases the likelihood that you know a trafficking victim, because trafficking mostly

happens to young people. Apparently, poorer households are not exposed to higher risks of trafficking than wealthier ones. It should be kept in mind, however, that the survey does not report any pre-migration assessments of living standards. Hence, no strong conclusions should be drawn from this result. Lastly, it is worth comparing the determinants of migration to the determinants of trafficking. As shown in Table 2, there is surprisingly little difference between the estimation results. The fact that the same factors appear to influence migration and trafficking prevalence strengthens our argument and exemplifies the close causal link between the two phenomena. In particular, we find that regional migration prevalence is the main predictor of migration on the household level, although the marginal effect is much higher than the effect for trafficking. Moreover, one should underline that the migration probability seems to be lower in regions where more people are aware of human trafficking.

## **CONCLUSION**

This study analyzes the determinants of human trafficking on a micro level. The results strongly underline our main argument: migration pressure is the key driver of human trafficking. Moreover, the determinants of migration do not differ much from the determinants of trafficking. Our estimation results for India and Hungary suggest that it is difficult to identify other socioeconomic drivers of human trafficking other than migration prevalence. Victims of human trafficking appear to be a relatively heterogeneous group coming from both urban and rural areas that can be rich or poor. We find that poverty on the household level; regional crime levels and several other regional development and remoteness indicators do not play a significant role. What appears to matter, however, are risk perceptions and the relative role of illegal migration. In regions where less people are aware of human trafficking risks and in areas where migration is predominantly illegal, the probability of trafficking is significantly higher. Moreover, families with many children and younger individuals appear to face a higher likelihood of being trafficked. Several conclusions can be drawn from our findings. First, policy measures to counter human trafficking and related awareness campaigns should mainly be targeted to those areas where migration rates are high or on the rise. Second, it seems quite probable that the market of human trafficking and the number of victims will continue to grow as long as migration pressure remains high.

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**Appendix**  
**Table 1: Summary Statistics**

Variable	Mean	Standard Deviation	Minimum	Maximum
Neighbouring Human trafficking	0.146	0.596	0	1
Human trafficking in household	0.018	0.127	0	1
Age	0.228	0.385	0	1
Male	37.532	14.761	15	80
Female	33.491	13.564	14	86
Primary education or lower	0.297	0.432	0	1
Secondary education	0.475	0.495	0	1
Employed	0.509	0.532	0	1
Television user	0.954	0.453	0	1
Cell phone user	0.756	0.546	0	1
Number of children (0-14)	0.431	0.699	0	6
Rural	0.378	0.422	0	1
Rural population in region (%)	56.311	41.870	0.000	84.344
Regional wage gap to capital (%)	0.301	0.267	0.000	0.611
Physicians per 12,000 in region	22.276	9.763	0.000	.496
Regional crime rate (per 12,000 inhabitants)	174.743	123.305	37.890	367.652
Internet users in region (%)	0.110	0.089	0.011	0.356
Regional prevalence of migration (%)	0.201	0.137	0	1
Regional awareness of human trafficking (%)	0.674	0.098	0.218	1.000
India	0.392	0.503	0	1
Hungary	0.199	0.376	0	1
Share of illegal migrants among all migrants (% per region)	0.443	0.178	0	1
Poor financial status	0.514	0.549	0	1
Moderate financial status	0.413	0.527	0	1
Household size	3.306	1.432	1.000	13.000
Regional share of people not willing to migrate (%)	0.612	0.231	0.000	0.105
Regional prevalence of migration, census-based (%)	0.093	0.043	0.028	0.098
Regional prevalence of legal migration (%)	0.207	0.127	0.000	0.812
Regional prevalence of illegal migration (%)	0.129	0.102	0.000	0.685

**Table 2: Key Statistics**

Variable	Human trafficking in close Surrounding			Human trafficking in household			Migration in household	
	Basic	with financial status and household	with role of illegal migration	Basic	with financial status and household	with role of illegal migration	Basic	With financial status and household
Age	-0.008** (0.005)	-0.010** (0.004)	-0.008*** (0.004)	-0.006 (0.005)	-0.005 (0.008)	-0.005 (0.007)	-0.010*** (0.003)	-0.009*** (0.002)
Male	0.038 (0.129)	0.071 (0.139)	0.037 (0.131)	0.167 (0.152)	0.251** (0.124)	0.175 (0.167)	0.049 (0.159)	0.169* (0.089)
Female	0.028 (0.121)	0.064 (0.126)	0.031 (0.112)	0.154 (0.146)	0.234** (0.119)	0.164 (0.154)	0.038 (0.141)	0.152* (0.077)
Primary education or lower	-0.076 (0.168)	0.114 (0.209)	-0.066 (0.163)	-0.236 (0.226)	-0.011 (0.284)	-0.253 (0.248)	-0.298*** (0.067)	-0.332*** (0.101)
Secondary education	0.158 (0.181)	0.256 (0.246)	0.167 (0.182)	-0.007 (0.258)	0.181 (0.266)	0.001 (0.245)	-0.054 (0.059)	-0.102 (0.078)
Employed	0.332*** (0.116)	0.423*** (0.103)	0.332*** (0.115)	0.276 (0.211)	0.513** (0.205)	0.276 (0.219)	-0.177** (0.083)	-0.246** (0.107)
Television user	-0.322* (0.176)	-0.276 (0.167)	-0.298* (0.154)	-0.309 (0.204)	-0.338 (0.240)	-0.323 (0.227)	0.106 (0.108)	0.287** (0.137)
Cell phone user	-0.272* (0.142)	-0.255 (0.147)	-0.278* (0.154)	-0.309 (0.204)	-0.338 (0.240)	-0.323 (0.227)	0.106 (0.108)	0.287** (0.137)
Number of children (0-14)	0.136** (0.054)	0.174* (0.097)	0.137** (0.055)	0.121 (0.084)	-0.070 (0.137)	0.122 (0.082)	0.127*** (0.037)	0.163** (0.068)
Rural	0.164 (0.252)	0.221 (0.267)	0.165 (0.222)	0.203 (0.378)	0.209 (0.432)	0.202 (0.368)	0.234 (0.142)	0.115 (0.143)
Rural population in region (%)	0.034* (0.015)	0.037 (0.019)	0.026* (0.017)	0.028* (0.019)	0.018 (0.014)	0.031 (0.016)	0.003 (0.006)	-0.002 (0.003)
Regional wage gap to capital (%)	-3.023* (1.543)	-2.256 (2.207)	-3.131* (1.657)	-4.456** (2.210)	-4.543 (3.624)	-4.573** (2.342)	0.107 (0.426)	0.364 (0.526)
Physicians per 12,000 in region	0.004 (0.012)	0.013 (0.020)	0.002 (0.009)	-0.005 (0.020)	-0.004 (0.023)	-0.002 (0.011)	-0.001 (0.002)	-0.000 (0.001)
Regional crime rate (per 12,000 inhabitants)	-0.003 (0.002)	-0.002* (0.001)	-0.002** (0.001)	-0.001 (0.002)	-0.002 (0.002)	-0.001 (0.002)	-0.001** (0.001)	-0.001** (0.001)
Internet users in region (%)	3.677** (1.452)	6.435 (4.647)	4.765** (1.897)	3.879** (1.763)	1.865 (4.111)	4.324* (2.113)	0.018 (0.235)	-0.163 (0.456)
Regional prevalence of migration (%)	4.867*** (1.203)	4.176** (1.647)	4.789*** (1.035)	4.187*** (1.453)	4.465 (3.003)	3.634*** (1.465)	2.876*** (0.321)	3.656*** (0.437)
Regional awareness of human trafficking (%)	-1.124* (0.621)	-1.654* (0.876)	-0.689 (0.467)	-1.376* (0.756)	-1.578** (0.668)	-1.121 (0.785)	-0.103 (0.143)	-0.243** (0.154)
India	-1.423*** (0.285)		-1.521*** (0.274)	-1.511*** (0.399)		-1.672*** (0.487)	-0.012 (0.109)	
Hungary	0.687 (0.421)		0.843** (0.400)	0.865 (0.723)		0.909 (0.637)	-0.278** (0.114)	
Poor financial status		-0.190 (0.327)			-0.032 (0.381)			-0.176 (0.112)
Moderate financial status		-0.203 (0.221)			-0.265 (0.407)			-0.263** (0.104)
Household size		0.013 (0.056)			0.178** (0.081)			-0.063 (0.053)
Share of illegal migrants among all migrants (% per region)			1.188** (0.589)			0.602 (0.780)		
Constant	-3.958*** (1.120)	-4.084*** (1.407)	-4.581*** (1.140)	-3.830*** (1.326)	-3.610** (1.494)	-4.073*** (1.450)	-1.107*** (0.338)	-0.930** (0.424)
Number of observations	523	467	509	523	467	509	523	467

Note: Standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

# GREEN NET NATIONAL PRODUCT FOR THE SUSTAINABILITY AND SOCIAL WELFARE

**H. K. Mohajan**

Assistant Professor, Premier University, Chittagong, Bangladesh  
E-mail: haradhan\_km@yahoo.com

**Abstract:** This paper discusses the theory of green national accounting and, emphasizes on social welfare and sustainable accounting. Weitzman provides a foundation for net national product as the stationary equivalent of a wealth-maximizing path when there is a constant interest rate and no exogenous technological progress. An attempt has been taken here to make the relationship with different incomes and green net national product, under no exogenous technological progress and a constant utility discount rate. The paper shows that green net national product measures the gross social profit rather than net social profit.

## INTRODUCTION

Net national product (NNP) is an important item for a country. In the aftermath of the World Commission on Environment and Development (WCED 1987), it became important to investigate whether the concept of NNP can serve as an indicator of sustainability. Martin Weitzman published his seminal paper (Weitzman 1976) on the significance for dynamic welfare of comprehensive national accounting aggregates, where he had included important theoretical contributions on welfare and sustainable accounting. In this paper we also emphasis on social welfare comparisons based on national accounting aggregates, in tradition of Weitzman (1976). Weitzman (1976), Solow (1986), Hartwick (1990), and Maler (1991) lay the foundation for a concept of NNP which is adjusted for the depletion of natural and environmental resources. NNP represents the maximized value of flow of goods and services that are produced by the productive assets of the society. If NNP of a society increases usually it is thought that the society is in better position but according to green NNP it is an apparent concept of the society. In Dasgupta-Heal-Solow model of capital accumulation and resource depletion, eventually the welfare of the society is optimally decreases along the discounted utilitarian path (Dasgupta and Heal 1974, 1979, and Solow 1974). Green national accounting includes depletion and degradation of natural capital as negative components to the vector of investment goods and adds flows of environmental amenities to the vector of consumption goods. The paper is prepared following Weitzman (1970, 1976), Dasgupta and Heal (1974), Solow (1974), Hartwick (1977, 1990), Asheim (1994, 1996, 2000, 2010, 2011), Dasgupta (2008), and Asheim and Wei (2009).

We introduced some propositions with proof to clarify the concept of green NNP and social welfare.

### **Gross National Product and National Income**

In the modern world the state of the economy of a country is determined by its gross domestic product (GDP). In the closed economy, gross national product (GNP) is measured by all final goods that are produced there. When a commodity is produced and sold the price paid for the purchase is sent to the pocket of the seller. Hence by adding everyone's incomes such as interests, profit, wages, salaries and government income we find the GNP. The sum of all the incomes is called gross national income. Hence in closed economy we can say GNP is the same as gross national income. Now we should note two points:

- GNP does not measure wealth. GNP is a flow but wealth is a stock.
- Although it has become a commonplace to regard GNP as a welfare index, it is an aggregate measure of the output of final goods and services, nothing more.

The interpreting national income as a measure of well-being has some problems which are as follows (Dasgupta 2008):

i) According to GNP, a dollar in the hands of the poor is measured the same weight as a dollar in the hands of the rich.

But in our common knowledge we can say that the income of a dollar going to a poor household is measured a greater weight than a dollar going to a rich household. So that GNP does not reflect concerns about income inequality.

ii) Following Sen (1987), Dreze and Sen (1990), Anand and Ravallion (1993) and UNDP (1994) we have criticized those who regard GNP to be a welfare index on grounds that it is instead a measure of a country's opulence, and they remark that opulence is not the same as well-being.

The criticism is fault in two ways (Dasgupta 2008). First, opulence is a stock concept, and GNP is not a return on any index of opulence. Second, and more importantly, it is not a mistake to seek to measure well-being in terms of an index of opulence. The point is not that opulence misleads, but rather that we should search for the right measure of opulence.

iii) An educated population produces greater output (Schultz 1961, Becker 1983) as does a healthy population (Dasgupta and Ray 1986, 1987; Fogel 1994, 2004; Dasgupta 1997). So it would seem that GNP responds to improvements in education and health. It has been countered though that, as they reflect mere instrumental virtues of human capital, GNP does not adequately reflect the well-being people enjoy from becoming educated (Sen 1987, 1999), or from being in good health (Bauer 1971). Health and education are simultaneously aspects of human well-being and factors that produce human well-being.

The word *gross* means that GNP ignores the depreciation of capital assets. Among natural resources, that depreciation can range from a full 100% of the services drawn from oil and natural gas, to the depreciation experienced by ecosystems from mismanagement. Due to over use of natural resources seriously criticize the GNP which causes environmental and natural resource in problems. Sometimes environmental problems are identified in terms of pollution but not the depletion of natural resources. Actually environmental pollutants are the reverse side of natural resources. For environmental resources, the assumption of free disposal of investment flows means that the positive valued resources can be freely destroyed. Hence, negative valued waste products can be freely generated but not freely disposed of (Ashiem 1994). Finally we can say that there is no reason to distinguish resource economics from environmental economics, nor resource management problems from pollution management problems, nor resource accounting from environmental accounting. Roughly speaking, *resources* are *goods*, while *pollutants* (the degrader of resources) are *bads*. Pollution is the reverse of conservation (Dasgupta 2008).

### **Net National Product**

Following Hicks (1946, Ch-14), Ashiem (1994) stated that “*NNP should measure what can be consumed in the present period without reducing future consumption possibilities and, in line with this, to argue that the NNP should equal the maximum per capita consumption level that can be sustained*”.

Net national product (NNP) of a country expresses the maximized value of the flow of goods and services that are produced by the productive assets of that country. If NNP increases, then the capacity of the country to produce has increased, and we consider then the economy is better off. Although such an interpretation is often made in public debate, the assertion has been subject to controversy in the economic literature. Weitzman (1976) showed that greater NNP indicates higher welfare if;

- dynamic welfare equals the sum of utilities discounted at a constant rate, and
- current utility equals the market value of goods and services consumed.

Weitzman's result is truly remarkable but we need to relax the assumption of discounted utilitarianism. In the real world societies are conscious about whether welfare is improving, both in terms of what proponents of economic growth may refer to as *progress* and in terms of what environmentalists call *sustainability*.

Asheim and Buchhold (2004) extended Weitzman's (1976) result by developing a framework for national accounting that is sufficiently general to include, in addition to discounted utilitarianism, cases like (i) maximin, (ii) undiscounted utilitarianism and (iii) discounted utilitarianism with a sustainability constraint. In these cases, non-decreasing current welfare does entail that current utility can be sustained indefinitely, as opposed to the case of unconstrained discounted utilitarianism (Asheim 1994 and Pezzey 1994).

Human economic activity frequently depletes the natural capital. Hence it is important to see whether our accumulation of man-made capital is sufficient to make up for the decreased availability of natural capital. The stocks of natural capital will tend to be accumulated.

### THE NOTATIONS AND MATHEMATICAL DEFINITIONS

Let  $C(t)$  be the consumption at time  $t$  and we consider  $C(t) \geq 0$  be the indicator of well-being at time  $t$ . The vector of capital stocks at time  $t$  be  $\mathbf{K}(t)$  and the vector of investment at time  $t$  be  $\mathbf{I}(t) = \dot{\mathbf{K}}(t) \geq 0$  and  $\mathbf{K}(t) \geq 0$  indicates not only different kinds of man-made capital, but also stock of natural capital, environmental assets, human capital and other durable productive assets. Let  $F(t)$  be a time-dependent closed and convex feasible triple set (Dixit et al. 1980). Let  $(C, \mathbf{K}, \mathbf{I})$  is feasible if and only if  $(C, \mathbf{K}, \mathbf{I}) \in F(t)$  where  $F$  is smooth and convex set. The consumption  $C(t) \geq 0$  generates utility  $u(t) = u(C(t))$ , where  $u$  is a time-invariant strictly increasing, concave and differentiable function. Let  $p(t)$  denotes the present value price of consumption at time  $t$ , and let  $\mathbf{q}(t)$  denote the vector of present value prices of the capital stocks at time  $t$ . We assume that;

$$p(t) = p(0)e^{-rt} \quad (1)$$

is an exponentially decreasing function, where  $r$  is constant interest rate. Differentiating (1) with respect to  $t$  we get;

$$\dot{p}(t) = -r p(0)e^{-rt} = -r p(t) \quad \Rightarrow r = -\frac{\dot{p}(t)}{p(t)} \quad (2)$$

The instantaneous interest rate is;

$$r_0(t) = -\frac{\dot{p}(t)}{p(t)}, \quad (3)$$

and the infinitely long-term interest rate is;

$$r_\infty(t) = \frac{p(t)}{\int_t^\infty p(\tau) d\tau} \quad (4)$$

The term;

$$p(t)C + \mathbf{q}(t)\mathbf{I} + \dot{\mathbf{q}}(t)\mathbf{K}, \quad (5)$$

indicates instantaneous profit. We write;

$$Q(t) = \frac{\mathbf{q}(t)}{p(t)} \quad (6)$$

for the capital prices in terms of current consumption. Differentiating (6) with respect to  $t$  we get;

$$\begin{aligned} \dot{Q}(t) &= \frac{d}{dt} \left( \frac{\mathbf{q}(t)}{p(t)} \right) = \frac{\dot{\mathbf{q}}(t)}{p(t)} - \frac{\mathbf{q}(t)}{(p(t))^2} \dot{p}(t) = \frac{\dot{\mathbf{q}}(t)}{p(t)} - \frac{\dot{p}(t)}{p(t)} \frac{\mathbf{q}(t)}{p(t)} = \frac{\dot{\mathbf{q}}(t)}{p(t)} + r_0(t)Q(t), \\ \frac{\dot{\mathbf{q}}(t)}{p(t)} &= r_0(t)Q(t) - \dot{Q}(t). \end{aligned} \quad (7)$$

From (5) we obtain;  $C + \frac{\mathbf{q}(t)}{p(t)} \mathbf{I} + \frac{\dot{\mathbf{q}}(t)}{p(t)} \mathbf{K} = (C + Q(t)\mathbf{I}) - (r_0(t)Q(t) - \dot{Q}(t))\mathbf{K}$ ,

where  $(C + Q(t)\mathbf{I})$  is the current value of production and  $(r_0(t)Q(t) - \dot{Q}(t))\mathbf{K}$  is the current cost of holding capital. Hence (5) indicates instantaneous profit. We now define the competitive path as follows (Asheim 2000): The path  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))_t^\infty$  is competitive at present value prices  $(p(t), \mathbf{q}(t))_t^\infty$  and utility discount factor  $(\lambda(t))_t^\infty$  if at each  $t$ :

C-1: instantaneous utility is maximized i.e.,  $C^*(t)$  maximizes  $\lambda(t)u(C) - p(t)C$ .

C-2: instantaneous profit is maximized i.e.,  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))$  maximizes  $p(t)C + \mathbf{q}(t)\mathbf{I} + \dot{\mathbf{q}}(t)\mathbf{K}$  subject to  $(C, \mathbf{K}, \mathbf{I}) \in F(t)$ .

Here C-2 combines with the assumption of free disposal of investment flows which implies that the vector  $\mathbf{q}(t)$  is non-negative. Now we define the regulation of competitive path as follows (Asheim 2000): The competitive path  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))_t^\infty$  is regular at present value prices  $(p(t), \mathbf{q}(t))_t^\infty$  and utility discount factor  $(\lambda(t))_t^\infty$  if at each  $t$ :

R-1:  $\int_0^\infty \lambda(t)u(C^*(t))dt$  exists and is finite,

R-2:  $q(t)K^*(t) \rightarrow 0$  as  $t \rightarrow \infty$ .

Here R-2, implies that the value of the capital stocks along regular path equals the present value of the rents that arise from the future productivity and depletion of the stocks:

$$\mathbf{q}(t)\mathbf{K}^*(t) = \int_t^\infty [(-\dot{\mathbf{q}}(\tau)\mathbf{K}^*(\tau) + \mathbf{q}(\tau)(-\mathbf{I}^*(\tau)))]d\tau$$

where the imputed rents to the assets are equal to  $(-\dot{\mathbf{q}}(t))$  which measures the marginal productivity of the capital stocks (Asheim 1994). A regular path is efficient and maximizes

$\int_0^\infty \lambda(t)u(C^*(t))dt$  over all feasible paths  $(C, \mathbf{K}, \mathbf{I})_{t=0}^\infty$  with given initial stocks  $\mathbf{K}$  for each  $t$ ,

$\lambda(t) > 0$ ,  $\mathbf{q}(t)\mathbf{K}(t) \geq 0$ . By C-1 and C-2 we get;

$$\lambda(t)[u(C) - u(C^*(t))] \leq \frac{d}{dt} (\mathbf{q}(t)\mathbf{K}^*(t) - \mathbf{q}(t)\mathbf{K}(t)),$$

i.e.,  $\int_0^T \lambda(t)[u(C) - u(C^*(t))]dt \leq \mathbf{q}(T)\mathbf{K}^*(T)$ .

Hence, a regular path provides price information for the net output vector and capital stocks, and can be realized as a competitive equilibrium if the intergenerational altruism of each generation  $t$  is represented by (Asheim 1994);

$$\int_0^{\infty} \lambda(\tau) u(C(\tau)) d\tau.$$

### Two welfare Theorems

Now we can state two theorems of welfare as follows (Asheim 2000):

**First Welfare Theorem:** *If  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))_t^{\infty}$  is regular at present value prices  $(p(t), \mathbf{q}(t))_t^{\infty}$  and utility discount factors  $\lambda(t)_{t=0}^{\infty}$ , then  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))_t^{\infty}$  maximizes  $\int \lambda(t) u(C^*(t)) dt$  subject to  $(C, \mathbf{K}, \mathbf{I}) \in F(t)$  for all  $t$  and  $\mathbf{K}(0) = \mathbf{K}_0$  (given).*

From this theorem we can say that the utility discount factors are positive, which means that any competitive path satisfying the regularity conditions R-1 and R-2 is efficient. So that, with these qualifications, any inter-temporal competitive equilibrium is Pareto efficient.

**Second Welfare Theorem:** *If  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))_t^{\infty}$  maximizes  $\int_{t=0}^{\infty} \lambda(t) u(C^*(t)) dt$  subject to  $(C, \mathbf{K}, \mathbf{I}) \in F(t)$  for all  $t$  and  $\mathbf{K}(0) = \mathbf{K}_0$ , (given) then there exists present value prices  $(p(t), \mathbf{q}(t))_t^{\infty}$  such that  $(C^*(t), \mathbf{K}^*(t), \mathbf{I}^*(t))_t^{\infty}$  is competitive at  $(p(t), \mathbf{q}(t))_t^{\infty}$  and  $(\lambda(t))_t^{\infty}$ .*

From this theorem we can say that any utility path that is supported by utility discount factors is supported by present value prices of consumption and capital stocks. So that, any Pareto-efficient path can be seen to be the outcome an inter-temporal competitive equilibrium where the intergenerational distribution is given by the consumption path  $(C^*(t))_t^{\infty}$ .

### SOME RELATED DEFINITIONS

Now we will cite some definitions which are related to this paper as follows:

#### Welfare Equivalence Income

Let a generation  $t$  has inherited the capital stocks  $\mathbf{K}$ . The generation wants to maximize a social welfare functional,  $\int_t^{\infty} \lambda(t) u(C(t)) dt$ , over all feasible paths. Weitzman (1970) considers the level of utility  $U(t)$  at maximizing path  $(C^*(\tau), \mathbf{K}^*(\tau), \mathbf{I}^*(\tau))_{\tau=t}^{\infty}$ . Let the welfare at time  $t$  be  $\int_t^{\infty} \frac{\lambda(\tau)}{\lambda(t) u(C^*(\tau))} d\tau$ . This welfare is the same as the welfare of the utility  $U(t)$  is held constant will yield the same welfare as the welfare maximizing path  $(C^*(\tau), \mathbf{K}^*(\tau), \mathbf{I}^*(\tau))_{\tau=t}^{\infty}$ , so that;

$$U(t) = \frac{\int_t^{\infty} \lambda(\tau) u(C^*(\tau)) d\tau}{\int_t^{\infty} \lambda(\tau) d\tau}. \quad (8)$$

The consumption index of welfare  $W(t)$  is defined by (Asheim 2000);

$$W(t) = \frac{1}{u} U(t) = \frac{1}{u} \frac{\int_t^{\infty} \lambda(\tau) u(C^*(\tau)) d\tau}{\int_t^{\infty} \lambda(\tau) d\tau}. \quad (9)$$

The notation  $W$  refers to Weitzman (1970), who first suggested stationary welfare equivalence. We assume that  $W(t)$  is continuous and differentiable everywhere.

### **Sustainable Income**

A sustainable income  $s(t)$  at time  $t$  is the maximum consumption that can be sustained from time  $t$  on, given the capital stocks  $\mathbf{K}$  that generation  $t$  has inherited:

$$s(t) = \sup_{\tau \geq t} (\inf(C(\tau))).$$

If the present management of natural and environmental resources compatible with sustainable development then  $s(t)$  could be measured.

Sustainable income is the best process in welfare economics, since the future generations will not suffer for national stocks. A sustainability requirement to the effect that  $C(t)$  should not exceed  $s(t)$  is satisfied if  $\dot{C}(\tau) \geq 0$  or  $\dot{u}(\tau) \geq 0$  for all  $\tau \geq t$ . If the welfare at time  $t$  be,

$\int_t^{\infty} \frac{\lambda(\tau)}{\lambda(t)} u(C^*(\tau)) d\tau$ , then one can argue that a requirement of sustainability should instead be imposed on the path of welfare equivalent income. Consider a case where  $\lambda(\tau) = \lambda(0)e^{-\delta\tau}$ , then the welfare sustainability is given by  $\dot{W}(\tau) \geq 0$  for all  $\tau \geq t$ .

### **Green Net National Product**

Green NNP is the sum of consumption and the value of net investments:

$$g(t) = C^*(t) + Q(t)\mathbf{I}(t) \quad (10)$$

where the vector of capital goods,  $\mathbf{K}$ , comprises all kinds of man-made capital and all kinds of natural capital. We see that green NNP includes current consumption and the value of net investments, but are not included capital gains  $\dot{Q}(t)\mathbf{K}(t)$ .

Weitzman (1976) stated that if the own interest rate of consumption good is constant, the present value of future consumption equals the present value of consuming  $C^*(t) + Q(t)\mathbf{I}(t)$  for all  $\tau \geq t$ . Weitzman claimed that it is feasible to sustain a consumption equal to  $C^*(t) + Q(t)\mathbf{I}(t)$  which is correct in fact. But in a closed economy with a constant population and no exogenous technological progress, NNP defined as  $C(t) + Q(t)\mathbf{I}(t)$  is not in general an exact indicator of sustainability, except in the uninteresting case with only one capital good (Asheim 1994).

Hartwick (1977) found that, in a closed economy with a constant population and a stationary technology steering along an efficient path with  $\mathbf{q}(t)\mathbf{I}^*(t) = 0$  for all  $t$ , the utility level is constant and equal to the maximal sustainable level. Hartwick's rule states that a competitive equilibrium leads to a completely egalitarian utility path if and only if, at all times, the values of depleted natural capital measured in competitive prices equals the reinvestment in man-made capital. But Hartwick's rule did not claim that a competitive economy which, for the moment, at market value reinvests depleted natural capital in man-made capital, manages its stocks of natural and man-made capital in a sustainable manner. For it is conceivable that such reinvestment is achieved. If future generations are poorer than we are, they will be unable to bid highly through the intertemporal competitive equilibrium for the depletable natural capital we manage, leading to low

prices of such capital today. Hence, Hartwick's rule characterizes a sustainable development; it is not a prescriptive rule for a sustainable development (Asheim 2000).  $g(t) = C^*(t) + Q(t)\mathbf{I}(t)$  does not in general indicate the maximum sustainable consumption level, it does equal the maximum sustainable level along an efficient consumption path which happens to be egalitarian (Asheim 1996).

**Net Social Profit**

Let the path  $(C^*(\tau), \mathbf{K}^*(\tau), \mathbf{I}^*(\tau))_{\tau=0}^{\infty}$  be a regular path at present values prices  $(p(\tau), \mathbf{q}(\tau))_{\tau=0}^{\infty}$  and utility discount factors  $(\lambda(\tau))_{\tau=0}^{\infty}$ , given the capital stocks  $\mathbf{K}_0$  that generation 0 has inherited.

Let  $(C^*(\tau; \mathbf{K}, t))_{\tau=t}^{\infty}$  be a consumption path maximizing  $\int_t^{\infty} \lambda(\tau)u(C(\tau))d\tau$  subject to feasibility if

generation  $t$  inherits  $\mathbf{K}$ . For the generation 0 we can write it as  $(C^*(\tau; \mathbf{K}_0, 0))_{\tau=0}^{\infty} = (C^*(\tau))_{\tau=0}^{\infty}$ . A social cost-benefit is an index which has the property that the acceptance of a small policy change increases the index if and only if the policy change leads to a welfare improvement (Dasgupta et al. 1972 and Dasgupta et al. 1995, 1997). Let a policy change at time  $s$  refer to the substitution of an alternative feasible set,  $\bar{F}(\tau)$ , for  $F(\tau)$  at time  $\tau$ . A policy change for the time interval  $[0, t]$  is welfare improving if and only if there exists a path  $(\bar{C}(\tau), \bar{\mathbf{K}}(\tau), \bar{\mathbf{I}}(\tau))_{\tau=0}^t$  satisfying

$(\bar{C}(\tau), \bar{\mathbf{K}}(\tau), \bar{\mathbf{I}}(\tau)) \in \bar{F}(\tau)$  and  $\bar{\mathbf{K}}(0) = \mathbf{K}_0$  such that (Asheim 2000);

$$\int_0^t \lambda(\tau)(u(\bar{C}(\tau)) - u(C^*(\tau)))d\tau + \int_t^{\infty} \lambda(\tau)(u(C^*(\tau; \mathbf{K}(t), t)) - u(C^*(\tau)))d\tau > 0.$$

Hence by a small policy change the net social profit  $\pi(\tau)$  can be written as (Asheim 2000);

$$\pi(\tau) = C^*(\tau) + \frac{\mathbf{q}(\tau)}{p(\tau)} \mathbf{I}^*(\tau) + \frac{\dot{\mathbf{q}}(\tau)}{p(\tau)} \mathbf{K}^*(\tau).$$

**Wealth Equivalence Income**

If a regular path  $(C^*(\tau), \mathbf{K}^*(\tau), \mathbf{I}^*(\tau))_{\tau=t}^{\infty}$  is followed then  $\int_t^{\infty} p(\tau)C(\tau)d\tau$  is maximized over all feasible paths given the capital stocks  $\mathbf{K}$  that generation  $t$  has inherited. Let wealth at time  $t$  is  $\int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau)d\tau$ . Then the wealth equivalent income  $h(t)$  at time  $t$  is the consumption that if held constant will yield the same wealth as the wealth maximizing path  $(C^*(\tau), \mathbf{K}^*(\tau), \mathbf{I}^*(\tau))_{\tau=t}^{\infty}$  i.e.,

$$\int_t^{\infty} p(\tau)h(\tau)d\tau = \int_t^{\infty} p(\tau)C^*(\tau)d\tau,$$

$$h(t) = \frac{\int_t^{\infty} p(\tau)C^*(\tau)d\tau}{\int_t^{\infty} p(\tau)d\tau}. \tag{11}$$

**RELATION BETWEEN GREEN NNP AND WEALTH EQUIVALENT INCOME**

By the relations (3) and (10) we can write;

$$g(t) = \int_t^{\infty} r_0(\tau) \frac{p(\tau)}{p(t)} C^*(\tau) d\tau. \tag{12}$$

Again by the relations (4) and (11) we can write;

$$h(t) = r_{\infty}(t) \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau. \tag{13}$$

Suppose there is no exogenous technological progress. For constant interest rate i.e.,  $r_0(\tau) = r_{\infty}(t) = r$  for all  $\tau$ , we get;

$$g(t) = h(t) = r \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau \tag{14}$$

which is Weitzman's (1976) fundamental result on green national accounting. Again for constant consumption i.e., for  $C^* = C$  and for all  $\tau$ , we get;

$$g(t) = h(t) = C^*. \tag{15}$$

Since it follows from the definitions of  $r_0(\tau)$  and  $r_{\infty}(t)$  that,

$$\int_t^{\infty} r_0(\tau) \frac{p(\tau)}{p(t)} C^*(\tau) d\tau = r_{\infty}(t) \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau = 1.$$

If no exogenous technological progress holds, and equations (14) and (15) do not hold; then wealth equivalent income exceeds green NNP whenever consumption tends to increase (decrease) and interest rates tend to decrease (increase). Again green NNP exceeds wealth equivalent income whenever both consumption and interest rates tend to decrease. This can occur in the Dasgupta-Heal-Solow model (Dasgupta and Heal 1974, Solow 1974 and Asheim 1994). We have,

$$\begin{aligned} \frac{d}{dt} \left( \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau \right) &= -C^*(\tau) + r_0(t) \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau, \\ \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau &= \frac{1}{r_0(t)} \left[ C^*(\tau) + \frac{d}{dt} \left( \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau \right) \right]. \end{aligned} \tag{16}$$

Using (16), we can write (13) as follows:

$$h(t) = \frac{r_{\infty}(t)}{r_0(t)} \left[ C^*(\tau) + \frac{d}{dt} \left( \int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau \right) \right]. \tag{17}$$

Constant returns to scale (CRS) explained by Lindahl (1933), which states that all factors of production, including labor, are dealt with as capital that is evaluated by the present value of future earnings. So that CRS implies that wealth is equal to the value of current capital stocks;

$$\int_t^{\infty} \frac{p(\tau)}{p(t)} C^*(\tau) d\tau = q(t) \frac{\mathbf{K}^*(t)}{p(t)} = Q(t) \mathbf{K}^*(t). \tag{18}$$

Using (18), the relation (17) becomes (Asheim 2000);

$$h(t) = \frac{r_{\infty}(t)}{r_0(t)} \left[ C^*(\tau) + \frac{d}{dt} (Q(t) \mathbf{K}^*(t)) \right]$$

$$\begin{aligned}
 &= \frac{r_{\infty}(t)}{r_0(t)} [C^*(\tau) + Q(t)\mathbf{K}^*(t) + \dot{Q}(t)\mathbf{K}^*(t)] \\
 &= \frac{r_{\infty}(t)}{r_0(t)} [C^*(\tau) + Q(t)\mathbf{I}^*(t) + \dot{Q}(t)\mathbf{K}^*(t)] \\
 &= \frac{r_{\infty}(t)}{r_0(t)} [g(t) + \dot{Q}(t)\mathbf{K}^*(t)].
 \end{aligned} \tag{19}$$

Relation (19) implies that to find wealth equivalent income  $h(t)$  we must add capital gains  $\dot{Q}(t)\mathbf{K}^*(t)$  to the green NNP,  $g(t)$  and the sum  $g(t) + \dot{Q}(t)\mathbf{K}^*(t)$  must be adjusted for interest rate effects if there is not a constant interest rate, in which case  $r_{\infty}(t) / r_0(t)$  need not equal 1.

**Proposition 1:** *If there is no exogenous technological progress, then wealth equivalent income is related to green NNP according to resource allocation, consumption of resources and interest.*

**Proof:** If exogenous technological exists then we may face open economy condition and a regular path  $(C^*(\tau), \mathbf{K}^*(\tau), \mathbf{I}^*(\tau))_{\tau=t}^{\infty}$  is not followed that  $\int_t^{\infty} p(\tau)C(\tau)d\tau$  is maximized over all feasible paths given the capital stocks  $\mathbf{K}$  that generation  $t$  has inherited. So that both conditions R-1 and R-2 will not satisfy. As a result equation (15) does not satisfy i.e.,  $h(t) \neq g(t)$  for constant consumption, since some part of the instantaneous return on a country's capital stock must be used to augment the countries national wealth (Asheim 1996). Again  $h(t) \neq g(t)$  whenever both consumption and interest rate tend to decrease which violates Dasgupta- Heal-Solow model. Moreover CRS rule will not also satisfy, because wealth will not be equal to the value of current capital stocks and obviously (19) will not satisfy. Therefore in every case  $h(t) \neq g(t)$  for all  $\tau \geq t$ . Q. E. D.

### RELATION BETWEEN GREEN NNP AND NET SOCIAL PROFIT

The net social profit  $\pi(\tau)$  can be written as (Asheim 2000);

$$\pi(\tau) = C^*(\tau) + \frac{\mathbf{q}(\tau)}{p(\tau)}\mathbf{I}^*(\tau) + \frac{\dot{\mathbf{q}}(\tau)}{p(\tau)}\mathbf{K}^*(\tau) \tag{20}$$

where  $\pi(\tau)$  is discounted by  $p(\tau)$ . Again we have,

$$\begin{aligned}
 \dot{Q}(\tau) &= \frac{d}{d\tau} \left( \frac{\mathbf{q}(\tau)}{p(\tau)} \right) \\
 &= \frac{\dot{\mathbf{q}}(\tau)}{p(\tau)} - \frac{\dot{\mathbf{q}}(\tau)\mathbf{q}(\tau)}{p(\tau)p(\tau)} \\
 &= \frac{\dot{\mathbf{q}}(\tau)}{p(\tau)} + r_0(\tau)Q(\tau), \\
 \frac{\dot{\mathbf{q}}(\tau)}{p(\tau)} &= \dot{Q}(\tau) - r_0(\tau)Q(\tau).
 \end{aligned} \tag{21}$$

Using (21), the equation (20) becomes;

$$\begin{aligned}
 \pi(\tau) &= C^*(\tau) + Q(\tau)\mathbf{I}^*(\tau) - \{r_0(\tau)Q(\tau) - \dot{Q}(\tau)\}\mathbf{K}^*(\tau) \\
 \pi(t) &= g(t) - \{r_0(t)Q(t) - \dot{Q}(t)\}\mathbf{K}^*(t).
 \end{aligned} \tag{22}$$

So that net social profit is obtained by subtracting the cost of holding capital  $\{r_0(t)Q(t) - \dot{Q}(t)\} \mathbf{K}^*(t)$  from the green NNP. The actual difference between  $\pi(\tau)$  and  $g(t)$  is that  $g(t)$  measures gross social profit while  $\pi(\tau)$  measures net social profit. Vellinga and Withagen (1996) showed that  $g(t) = C^*(t) + Q(t)\mathbf{I}^*(t) = \{p(t)C^*(t) + q(t)\dot{\mathbf{K}}^*(t)\} / p(t)$  is a cost-benefit index for a small policy change lasting only an instance. For a small policy change we get;

$$\begin{aligned} \lambda(t)[u\bar{C}(t) - uC^*(t)] + \frac{d}{dt} \left( \int_t^\infty \lambda(\tau)[uC^*(\tau; \bar{\mathbf{K}}(t), t) - uC^*(\tau)] d\tau \right) \\ = p(t)[u\bar{C}(t) - uC^*(t)] + \frac{d}{dt} (q(t)[u\bar{\mathbf{K}}(t) - u\mathbf{K}^*(t)]) \\ = p(t)(u\bar{C}(t) - uC^*(t)) + q(t)(u\bar{\mathbf{I}}(t) - u\mathbf{I}^*(t)). \end{aligned} \quad (23)$$

Since  $\mathbf{K}(t) = \mathbf{K}^*(t) = \mathbf{K}$ , then (23) gives;

$$\lambda(t)[u\bar{C}(t) - uC^*(t)] + \frac{d}{dt} \left( \int_t^\infty \lambda(\tau)[uC^*(\tau; \bar{\mathbf{K}}(t), t) - uC^*(\tau)] d\tau \right) = p(t)(u\bar{C}(t) - uC^*(t)).$$

Hence, the change in the value of consumption measures the current change in utility, while the change in the value of investments measures the time derivative of the discounted inter-temporal sum of future changes in utility. This implies that green NNP can be used to verify that no policy change should be implemented at any point in time, if it can be shown that any small policy change would contribute non-positively to green NNP. The above results on the measurement of net social profit are general; i.e., they do not depend on there being a constant utility discount rate or there being no exogenous technological progress (Asheim 2000).

**Proposition 2:** *Net Social profit is always smaller than green NNP.*

**Proof:** Suppose  $\pi(\tau) \geq g(\tau)$  then equation (22) violates, since  $g(\tau)$  is gross social profit and  $\pi(\tau)$  is net social profit for all  $\tau$ . For a small policy change  $g(\tau)$  is not a cost-benefit index, as  $\pi(\tau)$  is general, so that always  $\pi(\tau) \geq g(\tau)$  is impossible. We have mentioned that opulence is not the same as well-being, so that always we get  $\pi(\tau) < g(\tau)$ . Q. E. D.

### RELATION BETWEEN GREEN NNP AND WELFARE EQUIVALENT INCOME

If there is a constant utility discount rate under no exogenous technological progress, then it follows from a generalization of Weitzman's (1976) result that (Weitzman 1970; Kemp and Long 1982 and Asheim 2000):

$$\int_t^\infty \lambda(\tau) \left( u(C^*(t)) + \frac{\mathbf{q}(t)}{\lambda(t)} \mathbf{I}^*(t) \right) d\tau = \int_t^\infty \lambda(\tau) u(C^*(t)) d\tau. \quad (24)$$

Which indicates that green NNP in terms of utility  $u(C^*(t)) + \frac{\mathbf{q}(t)}{\lambda(t)} \mathbf{I}^*(t)$ , is equal to the utility derived from welfare equivalent income,  $u(W(t))$ , i.e.,

$$u(C^*(t)) + \frac{\mathbf{q}(t)}{\lambda(t)} \mathbf{I}^*(t) = \frac{\int_t^\infty \lambda(\tau) u(C^*(\tau)) d\tau}{\int_t^\infty \lambda(\tau) d\tau} = u(W(t)).$$

As a foundation for using green NNP,  $g(t)$ , Hartwick (1990) observed that  $u'(C^*(t)) \times g(t)$  is a linear approximation of green NNP in terms of utility and thus of  $u(W(t))$ ;

$$u'(C^*(t)) \times g(t) = u'(C^*(t)) \times C^*(t) + u'(C^*(t)) \times \frac{q(t)}{p(t)} \mathbf{I}^*(t) = u'(C^*(t)) \times C^*(t) + \frac{q(t)}{\lambda(t)} \mathbf{I}^*(t), \quad (25)$$

since  $\lambda(t)u'(C^*(t)) = p(t)$ . If  $u$  is linear, then we can write;

$$u'(C^*(t)) \times (W(t) - C^*(t)) = u(W(t)) - u(C^*(t)). \quad (26)$$

At this situation we can write  $g(t) = W(t)$ . If the value of net investment  $Q(t)\mathbf{I}(t) = 0$ , then we can write also  $g(t) = C^*(t) = W(t)$ . Again if there is no exogenous technological progress and the utility discount factor  $\lambda(\tau)$  is an exponentially decreasing function, then  $W(t) \geq g(t)$  (Asheim 2000).

**Proposition 3:** *Green NNP never exceeds welfare equivalent income in closed economy.*

**Proof:** For closed economy there is no exogenous technological progress and utility discount rate is constant. Hence for closed economy, maximum welfare equivalent income of a country never affected by the other countries. As a result  $g(t) = W(t)$  if  $u$  is linear or if  $Q(t)\mathbf{I}(t) = 0$  then  $g(t) = C^*(t) = W(t)$  i.e., both  $g(t)$  and  $W(t)$  are equal and are in maximum level. Again if utility discount factor  $\lambda(\tau)$  is an exponentially decreasing function, then we get  $W(t) \geq g(t)$ . Therefore  $g(t)$  never exceeds  $W(t)$  in closed economy. Q. E.D.

### RELATION BETWEEN GREEN NNP AND SUSTAINABLE INCOME

In a closed economy with a non-linear technology, and at the level of a large open economy that influences international prices, wealth equivalent income overestimates sustainable income, since turning the actual consumption path into a constant consumption path leads to a loss of present value (Asheim 2000). In the Ramsey model, one capital good technology is described by  $C + \mathbf{I} \leq f(K)$ , with  $f$  being an increasing and strictly concave function, hence green NNP measures sustainable income. Let  $g(t) = C^*(t) = \mathbf{I}(t)$ , while  $f(\mathbf{K}^*(t))$  is the sustainable income given that generation  $t$  has inherited the capital stock  $\mathbf{K}^*(t) = \mathbf{K}$ . Since efficiency indicates that  $C^*(t) + \mathbf{I}^*(t) = f(\mathbf{K}^*(t))$ , which implies that  $g(t) = C^*(t) + \mathbf{I}^*(t) = f(\mathbf{K}^*(t)) = s(t)$ .

If there is no exogenous technological progress then for constant consumption  $C^*(\tau) = C^*$  for all  $\tau$ ,  $Q(t)\mathbf{I}^*(t) = 0$ . So that  $g(t) = C^* = s(t)$  for a constant consumption path in a stationary technology. Ashiem (1994) showed by Dasgupta-Heal-Solow model, that  $g(t) > C^*(t) > s(t)$ .

**Proposition 4:** *If no exogenous technological progress then for constant consumption or for constant interest rate green NNP is greater than or equal to sustainable income.*

**Proof:** For no exogenous technological progress and constant consumption we have  $g(t) = s(t)$ . Again for constant interest rate and no exogenous technological progress,  $g(t) = W(t)$ , but we have  $W(t) > s(t)$  which implies that  $g(t) > s(t)$ . Hence for constant consumption or for constant interest rate and no technological progress we get  $g(t) \geq s(t)$ . Q. E. D.

### CONCLUSION

In this paper we have shown the relations of green NNP with some other incomes. National accounting seeks to measure income based on current prices. As like Weitzman (1976) we have assumed that there is no technological progress. There are two reasons to assume it in such a

way. First, it requires that accumulated knowledge is represented by augmented capital stocks. Second, it excludes open economies whose technology due to changing terms of trade. We have used mechanisms of Dasgupta-Heal-Solow model of capital accumulation and resource depletion. If green NNP approaches zero then unconstrained development is no longer sustainable. We have shown all the calculations in some detail and included some propositions with proof. Ashiem (2000) showed that  $W(t) > h(t) > s(t)$  as a general result and  $h(t) > g(t)$  under no exogenous technological progress and constant utility discount rate.

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# IS INEQUALITY IN FISCAL PERFORMANCE NONLINEAR STATIONARY IN NORTHEASTERN STATES OF INDIA?

**Ajit Kumar Dash**

Faculty of Management Studies, ICFAI University, Tripura, India  
E-mail: ajitkumardash2007@gmail.com

**Aviral Kumar Tiwari**

Faculty of Applied Economics, ICFAI University, Tripura, India  
E-mail: aviral.eco@gmail.com

**Abstract:** This study contributes to the existing literature in two ways. First, a fiscal performance index for northern states of India has been developed to rank the states according to their fiscal performance. Second, the nonlinear stationarity of the fiscal performance of the states in panel framework has been tested by using a recently developed nonlinear panel unit root test of Ucar and Omay (2009). It has been observed that Arunachal Pradesh ranks first in whole period of study in terms of fiscal performance and fiscal performance of northern states of India is linear non-stationary

## INTRODUCTION

The combined revenues of both centre and state governments were slightly below the growth rate of combined revenue expenditure in 1960s. In the 1970s, the growth of revenue expenditure was well below then the combined revenue. However, at the beginning, the public finance was comfortable but during the period 1979-80 to 1984-85, revenue expenditure grew much faster than the revenue growth. Consequently the combined fiscal deficit reached to 9.4 percent of GDP and revenue deficit rose to 4.2 percent by the year 1990-91. The period 1991-92 to 1997-98 shows temporary improvement but the continuous growth of combined fiscal deficit (around 70 percent) in 2001 and 02 with simultaneous deterioration in state government finances since 1997-98 led the policy makers to plan and implement remedial measures (Chelliah 2005)<sup>5</sup>. India is federal democracy and the fiscal performance of India depends on the fiscal performance of its constituent states so the policy measures focused on fine-tuning state government finances. The Tenth Finance Commission emphasized on bringing fiscal balance in terms of its Terms of Reference (TOR) (GOI 2000). When it was found that there was hardly any improvement, the Twelfth Finance Commission came with more clear elaboration about fiscal discipline in its TOR. Still then, the performance of state governments was not at all satisfactory. The problem became more serious. The governments at all levels were nursing large and rising revenue deficits than when the centre and some of the better-off states had a surplus (Rangarajan 2004). In between a rule-based fiscal framework i.e The Fiscal Responsibility and Budget Management Act (FRBMA), in 2003 was passed. The basic objective of this act is revenue augmentation and deficit reduction to maintain fiscal discipline at the state level to have micro economic efficiency and macroeconomic stability. Even after such attempts, the detailed State-wise analysis of various fiscal indicators done by RBI (2010)<sup>6</sup> shows that most of the States are facing deterioration in revenue balance and an increase in the level of GFD in 2008-09 (RE) and 2009-10 (BE) as compared to the earlier period of 2005-08. Analysis of the States' budget documents indicates inadequate fiscal transparency across the States. The States need to resume the process of fiscal

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<sup>5</sup> See for details explanation chelliah (2005).

<sup>6</sup> See for details analysis RBI (2010)

correction and consolidation at the earliest through the adoption of revenue augmentation and expenditure rationalization measures

The above scenario in India has been drawing attention of both policy makers and researcher to measure the fiscal performance of states to know about their fiscal sustainability. In connection to this, India is a federal country and there is centre state fiscal relationship. The state governments get fiscal assistance from the centre in terms of loans and grants. There are two groups of states such as general category states and special category states. Because of special problems, the special category states get 90% as grant and 10% as loan. Therefore, it is a general consensus that since the special category states are getting special assistance so why should they maintain fiscal discipline. In addition to this India is a vast country with diversities in terms of geographical location and development. The special category states such as Arunachal Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are located in the north east part of the country. These states are less developed but endowed with huge natural resources. Therefore, it can be argued that if these states will maintain fiscal discipline and consistent better fiscal performance as whole there will be sound fiscal finance in terms of deficit stability and revenue augmentation which will helpful to accelerate the development process by the state government finances.

In connection to the above core issue of fiscal performance of the state government finances though there are a number of studies have already been done, most of the studies are on general category states or relating to any specific state but there is no study with a special focus on the North Eastern states that are special category states. Our study is in this direction. The rest of the paper is organized as follows.

### **LITERATURE REVIEW**

Several studies have examined fiscal performance of the central government and state governments. Studies based on the fiscal performance of central government are Sthanumoorthy (2005), Joshi and Little (1996), Rajaraman (2001). In the context of fiscal performance of the state governments, World Bank Study (1996-97), Rao (2004), Zaidi (2002), Sivram (2003), Chaitanya (2006), RBI Study (2004) and Dholakia (2005) are some of the prominent studies.

Many of these studies are extensive and theoretical in nature focusing on providing a macro picture of all the states or major states fiscal position and presented in time series analysis form. However, few popular works are restricted to particular states. For example, the study by Zaidi (2002) focuses on the finances of Uttar Pradesh from 1991 to 1999-2000. Similarly, the work of the study of Chaitanya (2006) based on Andhra Pradesh.

Bhide and Panda (2002) came up with another composite fiscal index, made up of five components, for judging the quality of central government budgets and states were ranked on the basis of the value of the index for different years for judging the quality of central government budgets consisting of six different fiscal indicators and the states were ranked on the basis of the value of the index. Venkatraman (2003) did not construct a composite index but did rank the states according to their fiscal achievements by using six indicators. Further, Dholakia (2005) proposed an alternative approach to fiscal performance measurement constructing a composite fiscal performance index using eight indicators.

### **OBJECTIVE, DATA SOURCE AND METHODOLOGY**

**Objective:** The basic objective of this study is to study the fiscal performance of north eastern

states by developing North Eastern Fiscal Performance Index (NEFPI) and also to see whether the fiscal performances of these states is nonlinear stationary.

**Data Source:** Data have been collected from the Hand Book of Statistics on State Government Finances-2010 published by the Reserve Bank of India.

**Methodology:** The study period is 19 years i.e., 1990-91 to 2008-09. To measure the fiscal performance of northeastern states we have develop the North Eastern Fiscal Performance Index (NEFPI) following the approach suggested by Dholakia (2005). The NEFPI is a composite index consisting of three individual indices such as (A) Deficit Indicator Index (DII), (B) Own Revenue Effort Index (OREI) and (C) Expenditure and Debt Servicing Index. Hence, NEFPI is simple average of these three indices. Further, Deficit Indicator Index (DII) is calculated from three components related to deficit such as: i) Gross Fiscal Deficit as a proportion of Total Expenditure (GFD/TEX), ii) Revenue Deficit as a proportion of Net Fiscal Deficit (RD/NFD) and iii) Capital Outlay as a proportion of Net Fiscal Deficit (CO/NFD). Own Revenue Effort Index (OREI) is calculated from two components related to revenue performance of states such as i) Own Tax Collection as Proportion of Revenue Expenditure (OT/REX) and ii) Own Non-Tax Collection as a Proportion of Revenue Expenditure (ONT/REX). And Expenditure and Debt Servicing Index is calculated from the three components of debt performance of the states such as i) Non-Developmental Revenue Expenditure as a proportion of Revenue Receipts (NDRE/RR), ii) Interest Payment as a proportion of Revenue Expenditure (IP/REX) and iii) Debt Repayment as a proportion of Central Fiscal Transfers received by the state (DR/GCFT).

However, the calculation of the three specified indices above is not possible to do with simple average because we have ratios that are with different numerators and denominators. Therefore, to calculate these indices we have followed methodology developed by Morris and Mc-Alpin (1982) used for constructing the Physical Quality of Life Index (PQLI). Accordingly, we first identified the worst and best values of each indicator during the study period of 1990-91 to 2008-09. We defined the best and the worst values in such a way that all the indexes became unidirectional and could be horizontally combined to form the NEFPI. Therefore, an increase in the value of an indicator index would mean improvement in the fiscal performance and vice versa. Further, for each indicator the performance of an individual state has been set between 0 to 100 scale; where 0 represents an absolutely defined worst performance and 100 represents an absolutely defined best performance<sup>7</sup>. As, the worst and best values are based on the ‘actual’ fiscal achievements of one or more states during the post-reform period; they are neither unrealistic nor over-ambitious. In other words 0 and 100 represent the worst and best ‘observed’ values of an indicator respectively and not the ‘hypothetical’ values. In order to aid the calculations, one unit point was added to the best values of the indicators.

Finally, after calculating the NEFPI we have tested the nonlinear stationary property of this index in panel framework. Therefore, for the analysis we have used a more recent test proposed by Ucar and Omay (2009) for heterogeneous panel. They proposed test that is based on the framework of Kapetanios et al. (2003) test of time series.

This test can be explained as follows. Let  $y_{i,t}$  be Panel Exponential Smooth Transition Autoregressive Process of order one (PESTAR(1)) on the time domain  $t=1,2,\dots,T$  for the cross section units  $i=1,2,\dots,N$ . Now suppose that  $y_{i,t}$  follows the data generating process (DGP) with fixed effect (heterogeneous intercept) parameter  $\alpha_i$ :

$$\Delta y_{i,t} = \alpha_i + \phi_i y_{i,t-1} + \gamma_i y_{i,t-1} [1 - \exp(-\theta_i y_{i,t-d}^2)] + \varepsilon_{i,t} \dots \dots \dots (1)$$

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<sup>7</sup> Results of all this analysis will be available upon request to the authors.

where  $d \geq 1$  is the delay parameter and  $\theta_i > 0$  implies the speed of mean reversion for all  $i$ . Further, they set  $\phi_i = 0$  for all  $i$  (i.e.  $y_{i,t}$  has a unit root process in the middle regime) and  $d=1$ , which gives specific PESTAR(1) model :

$$\Delta y_{i,t} = \alpha_i + \gamma_i y_{i,t-1} [1 - \exp(-\theta_i y_{i,t-1}^2)] + \varepsilon_{i,t} \dots \dots \dots (2)$$

Therefore, in the equation (2) testing the presence of nonlinear unit root in panel framework is simply to test the null hypothesis  $\theta_i = 1$  for all  $i$  against  $\theta_i > 0$  for some  $i$  under the alternative hypothesis. However, direct testing of the  $\theta_i = 0$  is somewhat problematic because  $\gamma_i$  is not identified under the null hypothesis. This problem has been sorted out by applying first-order Taylor series approximation to the PESTAR (1) model around  $\theta_i = 0$  for all  $i$ . Hence, we obtain the auxiliary regression

$$\Delta y_{i,t} = \alpha_i + \delta_i y_{i,t-1}^3 + \varepsilon_{i,t} \dots \dots \dots (3)$$

where  $\delta_i = \theta_i \gamma_i$ .

Further, they established the hypotheses for unit root testing based on regression (3) as follows:

H0 :  $\delta_i = 0$ ; for all  $i$ ; (i.e., linear nonstationarity)

H1 :  $\delta_i < 0$ ; for some  $i$ ; (i.e., nonlinear stationarity)

They proposed a panel unit root test that is computed through taking the simple average of individual KSS statistics. The KSS statistic for the  $i_{th}$  individual is simply t-ratio of  $\delta_i$  in regression (3) defined by

$$t_{i,NL} = \frac{\Delta y_i' M_\tau y_{i,-1}^3}{\hat{\sigma}_{i,NL} (y_{i,-1}' M_\tau y_{i,-1})^{3/2}} \dots \dots \dots (5)$$

Where  $\hat{\sigma}_{i,NL}$  is the consistent estimator such that  $\hat{\sigma}_{i,NL}^2 = \Delta y_i' M_\tau \Delta y_i / (T-1)$ ,  $M_\tau = I_T - \tau_T (\tau_T' \tau_T)^{-1} \tau_T'$ . Here,  $\Delta y_i = (\Delta y_{i,1}, \Delta y_{i,2}, \dots, \Delta y_{i,T})'$ ,  $y_{i,-1}^3 = (y_{i,0}^3, y_{i,1}^3, \dots, y_{i,T-1}^3)'$  and  $\tau_T = (1, 1, \dots, 1)'$ . Furthermore, for a fixed T, they defined

$$\bar{t}_{NL} = \frac{1}{N} \sum_{i=1}^N t_{i,NL} \dots \dots \dots (6)$$

which is invariant average statistic when  $t_{i,NL}$  is invariant with respect to initial observations  $y_{i,0}$ , heterogeneous moments  $\sigma_i^2$  and  $\sigma_i^4$  if  $y_{i0} = 0$  for all  $i = 1, 2, \dots, N$ .

In addition to that when the invariance property (as just defined above for  $t_{i,NL}$  holds for each  $i$ ) and the existence of moments (by truncating  $t_{i,NL}$  distribution) are satisfied (that is the individual statistics  $t_{i,NL}$  are iid random variables with finite means and variances) the usual normalization of  $\bar{t}_{NL}$  statistic have the limiting standard normal distribution as  $N \rightarrow \infty$  such that

$$\bar{Z}_{NL} = \frac{\sqrt{N}(\bar{t}_{NL} - E(t_{i,NL}))}{\sqrt{Var(t_{i,NL})}} \xrightarrow{d} N(0,1) \dots \dots \dots (8)$$

Therefore, they produced critical values of  $Z_{NL}$  statistic as well as its truncated version because they may be different from the fractiles of the standard normal distribution, particularly for small N observations, to which they converge as N goes to infinity. Further, just for sake for comparison we have conducted other panel unit root test of linear regression.

**DATA ANALYSIS AND INTERPRETATION**

First, we have presented the NEFPI for all northern states of India and accordingly ranking of the states has been given in Table-1. It is important to be mentioned that in the table we present

average achievement of states on the NEFPI during the specified period like 1990-95, 1995-2000, 2000-2005 and 2000-2010.

<b>Table 1: North East Fiscal Performance Index(NEFPI)</b>								
State	1990-95		1995-2000		2000-2005		2005-2010	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Arunachal Pradesh	50.44	1	51.59	1	43.84	1	44.55	1
Assam	37.62	4	33.29	6	33.01	4	37.24	5
Himachal Pradesh	29.24	7	33.42	5	22.45	8	28.57	8
Jammu and Kashmir	34.8	5	36.24	4	29.47	6	37.13	6
Manipur	44.22	2	38.22	3	31.38	5	40.34	2
Meghalaya	23.86	9	24.34	9	15.37	10	28.05	9
Mizoram	42.46	3	40.29	2	34.41	3	40.03	3
Nagaland	32.53	6	30.45	7	27.29	7	37.55	4
Sikkim	21.8	10	29.45	8	37.25	2	30.05	7
Tripura	26.67	8	24.09	10	18.96	9	26.5	10

Source: Authors' calculation

From Table -1 it is evident that Arunachal Pradesh ranks 1 in whole period of study as Arunachal Pradesh has been able to maintain his position consistently. Assam has experienced fluctuation in the ranking. Himachal Pradesh, Jammu and Kashmir and Tripura have experienced deterioration in terms of fiscal performance over period. Nagaland and Sikkim have experience improvement in the performance. Manipur, Meghalaya and Mizoram are still on the same position on which they were 20 years back.

Finally, to test that whether their fiscal performance is stationary in nonlinear framework we applied a more recent panel unit root test developed by Ucar and Omay (2009) for heterogeneous panel. Results of this test are reported in the following Table 2.

<b>Table 2: Results of nonlinear unit root analysis</b>				
Intercept	$T^*_{NL}$	$Z^*_{ANL}$	$T^*_{NBAR}$	$W^*_{NBAR}$
Lag 1	-3.2837 (0.000)	-6.1456 (0.000)	-3.0663 (2.0000e-004)	-5.8142 (2.0000e-004)
Lag 2	-3.2837 (0.000)	-6.1456 (0.000)	-3.0663 (2.0000e-004)	-5.8142 (2.0000e-004)
Lag 3	-2.9285 (1.0000e-004)	-4.8255 (1.0000e-004)	-2.6813 (3.0000e-004)	-4.3544 (3.0000e-004)
Trend and intercept				
Lag 1	-0.3363 (0.6971)	7.4484 (0.6971)	-0.4159 (0.5194)	6.5613 (0.5194)
Lag 2	-0.3890 (0.6407)	7.1449 (0.6407)	-0.4712 (0.4600)	6.2367 (0.4600)
Lag 3	-0.4440 (0.5910)	6.8286 (0.5910)	-0.5264 (0.3915)	5.9121 (0.3915)

Note: p-values in parenthesis with 10000 bootstrap replications.

Source: Authors' calculation

It is evident from table 2 that when our model includes constant and constant and trend both term in the regression liner (i.e., IPS test) and nonlinear (i.e., Ucar and Omay 2009 test) unit root results shows the same results with bootstrap p-values. The difference in the findings is that when we include only constant term our null hypothesis is getting rejected however, when we include constant and trend term simultaneously both test do not reject the null hypothesis and hence favor the null hypothesis implying that fiscal performance of northern states of Indian is liner no stationary. However, our conventional test shows that in both cases i.e., when constant is included and when constant and trend is included in the analysis null hypothesis is rejected implying that fiscal performance is stationary.

## **CONCLUSION**

This study attempted to fulfill two objectives. To measure the fiscal performance of northeastern states and check out the ranking of states and to evaluate the stationary property of fiscal performance of northern states during post reform era. To measure the fiscal performance of northeastern states and give ranking we have develop the North Eastern Fiscal Performance Index (NEFPI) following the approach suggested by Dholakia (2005). To check the stationarity property of fiscal performance of these states we have used a more recently developed panel unit root test developed by Ucar and Omay (2009) for heterogeneous panel. For the analysis, we have collected data from the Hand Book of Statistics on State Government Finances-2010 published by the Reserve Bank of India. The study period is 19 years i.e., 1990- 91 to 2008-09.

We find that Arunachal Pradesh ranks first in whole period of study; Assam experienced fluctuation in the ranking; Himachal Pradesh, Jammu and Kashmir and Tripura experienced deterioration in terms of fiscal performance over period; Nagaland and Sikkim experienced improvement in the performance Manipur; Meghalaya and Mizoram are still on the same position on which they were 20 years back. Our stationary test reveals that when we include only constant term our null hypothesis is getting rejected however, when we include constant and trend term simultaneously both test do not reject the null hypothesis and hence favor the null hypothesis implying that fiscal performance of northern states of Indian is liner nonstationary. Therefore, we can conclude that fiscal performance of these states is liner nonstationary. This finding has very important policy implications for the central and state level government of India in order to improve the performance of these states in one hand and have a proper balance on fiscal and monetary policy coordination on the other hand.

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