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Integration of Indian and the US Stock Markets

International Financial Reporting Standard

How the Remittances Sustain Kerala Model of Development

Foreign Direct Investment in the Indian Express Delivery Sector

Productivity of Commercial Banks in India

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Integration of Indian and the US Stock Markets: An Empirical Analysis

Hari Om Chaturvedi and Pankaj Madan

This article attempts to empirically examine the extent of integration of the Indian Stock Market with the US Stock Market using daily closing values of the BSE Sensex, NASDAQ composite index, and the NYSE index over the period January 1, 1990 to December 31, 2008. The empirical results reveal that integration has not yet taken place between the Indian and the US Stock Markets. However, a short-run relationship between the two stock markets in the post-1998 period, after listing of many Indian companies in the US stock market and raising of funds by Indian companies in the United States, is observed. During this period, US stock market is found to influence the Indian stock market.

Introduction

Integration of international financial markets is currently a subject of enormous public and scholarly interest. Economists frequently speak about globalization of financial services and increasing interdependence of international money and capital markets. Two developments can be identified which are expected to make markets more integrated. These are: (i) financial deregulation by governments across countries, and (ii) rapid development in telecommunications technology. The past decade can be termed as the decade of financial liberalization and information technology revolution all over the world. Even in developing countries, legal restrictions on foreign capital have been abolished, and exchange and interest rate controls have been removed, to name a few. Now, international investors can manage their portfolios more efficiently due to the progress in information management systems. Opportunities for international investors have been further enhanced because of the availability of information online and use of high-technology information monitoring systems.

The transformation of the Indian economy from a controlled regime to a relatively open economy has been speedier during the last decade of the 20th century due to the deliberate and conscious efforts of the Indian Government. This is seen in lifting of import and export restrictions, relaxation in the movement of capital and foreign exchange transactions, allowing foreigners to make direct and portfolio investment and initiation of a number of other economic and capital market reforms. In addition, the cost of information transmission has reduced substantially. A natural outcome of the reform process is the interdependence of the Indian and the world economy.

The issue of financial integration between economies is important for international investors since integrated markets do not give rise to diversification benefits. Therefore, it is imperative to evaluate the extent of integration of the

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Indian economy to the world economy. The economic interdependence is best manifested in the integration of stock markets.

Early evidence to support the postulate that economic liberalization increases interdependence between world stock markets was provided by Jaffe and Westerfield (1985) and Eun and Shim (1989). These earlier studies examined the interdependence between some developed countries and the United States. Later on, the emphasis shifted to the examination of regional integration. For example, European common markets were found to be integrated by Friedman and Shachmurove (1995). An interesting finding of their study was that the size of the market matters in exerting influence on other markets, that is, larger markets such as UK, France and Germany exerted more influence than the smaller markets like Denmark and Belgium.

Kulkarni (1996) indicated a stronger cointegration among the stock markets of Spain, Italy, Turkey, and Greece, than they had with the United States. Aggarwal and Leal (1996) found that Asian emerging markets had stronger interdependence than the Latin American markets, with the US market. Recently, several other studies [for example, see Chan et al (1992), Choudhry (1997), Kanas (1998), and Sheng and Tu (2000)] have also examined the level of interdependence among a group of national stock markets.

Barari and Sengupta (2003) found that though integration on a regional level had taken place between Latin American countries since late 1980s and between Greece and Zimbabwe in EMEA (Europe–Mideast–Africa), since late 1990s, but not between India, Korea and Thailand. However, they did not examine the cointegration between Indian and a developed economy. Janak Raj and Sarat Dhal (2009) investigated the cointegration between Indian and global stock markets and major regional markets. Their studies suggest that the Indian market's dependence upon global markets such as the United States and the United Kingdom is substantially higher than on regional markets such as Singapore and Hong Kong. However, they used the data from April 1993 to January 2008, which was divided into two parts: April, 1993 to March, 2003 and from April, 2003 to January, 18, 2008. In our preliminary analysis we observed that interdependence between Indian and the US stock market started only after the listing of some Indian

companies, such as Wipro, Infosys, etc., in the US stock market. Therefore, in this study co-integration between the Indian and the US stock markets is studied by dividing data into two subperiods, with the listing of Indian companies in the US markets as the point of division.

The rest of the article is organized as follows: The data and methodology used in the study are described in the section "Data and Methodology." Empirical findings are discussed in the section "Empirical Results." Finally, the section "Summary and Conclusions" provides summary and conclusions of the study.

Data and Methodology

Data

The data set used in the study consists of daily closing values of the Sensex (the stock price index of the Bombay Stock Exchange), the NASDAQ composite index and the New York Stock Exchange index (indices compiled by NASDAQ and New York Stock Exchange, respectively). The values for NASDAQ and NYSE indices over the period January 1, 1990 to December 31, 2008 were obtained from their respective websites while those of BSE Sensex were obtained from Prowess database. An increased interdependence between Indian and US stock markets is expected subsequent to listing of some Indian companies in the US stock markets and raising of capital by Indian companies in the United States. With a view to examine the differences in interrelationships between Indian and the US stock markets in the pre- and post-listing/raising of capital periods, the results are also reported by dividing the entire sample period into two subperiods, that is, January 1, 1990 to December 31, 1998 (the period preceding the announcement that these companies are going to be listed) and January 1, 1999 to December 31, 2008.

Methodology

Correlation and Stationarity Tests

Correlation is the most commonly used measure to study the interrelationship between markets. Most of the financial time series exhibit nonstationarity.¹ Modeling with nonstationary data can give rise to spurious correlation, which may be interpreted as causality, when none really exists.

¹A time series is said to be stationary if its mean, variance, and auto-covariances (at various lags) are constant over time. In contrast, nonstationary time series has a time varying mean or a time varying variance or both. Behavior of nonstationary time series changes with time. Therefore, they have very little use in forecasting.

Yule (1926) showed the persistence of spurious correlation in nonstationary time series even in very large samples. Therefore, it is very important to test the stationarity of the time series to validate (or not) the calculated values of correlation coefficients.

A widely popular test of stationarity in time series is the unit root test. The starting point in the unit root test is the autoregressive (AR) process:

$$Y_t = \beta_1 + \rho Y_{t-1} + \varepsilon_t \quad -1 \leq \rho < 1 \quad (1)$$

where ρ is the parameter and ε_t is a white noise error term.

The possibility that $\rho > 1$ is ruled out since in that case the time series would be explosive. The series is nonstationary if $\rho = 1$, that is, it has a unit root. For carrying out the test, Y_{t-1} is subtracted from both sides of equation (1) and simplified to obtain:

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \varepsilon_t \quad (2)$$

where $\delta = \rho - 1$, and instead of testing the null hypothesis that $\rho = 1$, $\delta = 0$ is tested against the alternative hypothesis of $\delta < 0$. A negative value of δ indicates that the time series is stationary.

The null hypothesis that $\delta = 0$ cannot be tested by using the usual t-test since it does not have the asymptotic normal distribution (see Dickey and Fuller, 1979). Dickey and Fuller have shown that the estimated t values of δ follow the τ (tau) statistic and they computed the critical values (of the τ statistic) by Monte Carlo simulations for selected sample sizes. More extensive tables have been prepared by Mackinnon (1991).

Dickey-Fuller test assumes no autocorrelation in the error term. The problem of testing for stationarity when

there is autocorrelation in the residuals is taken care of by augmenting equation (2) by adding the lagged values of the dependent variable ΔY_t on the right hand side. The augmented Dickey-Fuller (ADF) test is carried out by estimating the regression equation:

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \alpha_1 \Delta Y_{t-1} + \alpha_2 \Delta Y_{t-2} + \dots + \alpha_n \Delta Y_{t-n} + \varepsilon_t \quad (3)$$

where ε_t is a pure white noise error term. The number of lags is chosen to be sufficient to remove the autocorrelation in the error term. Phillips and Perron (1988) developed nonparametric method to control the autocorrelation in the error term without adding lagged values of difference terms. The Phillips-Perron (PP) test is carried out by estimating the regression equation:

$$\Delta Y_t = \alpha + \beta Y_{t-1} + \varepsilon_t \quad (4)$$

PP test controls for higher order autocorrelation in ε_t by making correction to the t-statistic of the δ coefficient from the AR(1) regression {equation (2)}. The asymptotic distribution of the PP test is the same as that of the ADF test statistic and it uses the same Mackinnon critical values. In this study, both ADF and PP tests are used to test the stationarity of various stock market index time series.

A practical issue in performing unit root test, is with regard to choosing the appropriate form of the model being tested, that is, a constant, a constant and a linear trend or neither in the test Regression Equation (1).

Selecting an inappropriate form of the model may result in committing a specification error. For determining the existence of trend in the series, we conducted the augmented Dickey-Fuller (ADF) test by using 4, 5, 6 lagged difference terms. The results of which are presented in Table 1.

Table 1. ADF Test for Determination of Trend

	No. of Lag Difference Terms	Coefficient	t-statistics	Probability
BSESENSEX	4	-0.001588	-1.146436	0.2517
	5	-0.001660	-1.197746	0.2311
	6	-0.001639	-1.181617	0.2375
NYSE	4	-6.36×10^{-5}	-0.763329	0.4453
	5	-6.62×10^{-5}	-0.794531	0.4269
	6	-6.91×10^{-5}	-0.829774	0.4067
NASDAQ	4	-0.000529	-0.719945	0.4716
	5	-0.000562	-0.765118	0.4443
	6	-0.000521	-0.709854	0.4778

To be specific, we tested the null hypothesis:

$$H_0: \text{Trend Component, } t = 0$$

against the alternative hypothesis:

$$H_1: \text{Trend Component, } t \neq 0$$

Since, the probability values of the t-statistics is greater than 1% significant level, for all the index series, we can not reject the null hypothesis (H_0 : Trend Component, $t = 0$) for any of the series.

In financial time series, it is often appropriate to include a constant (a positive mean) because over time risky assets are expected to offer a positive rate of return. Therefore, in implementing stationarity and cointegration tests (see next section), a constant but no trend in the series is assumed.

Cointegration Tests

Results presented in section on "Empirical Results" reveal that all the stock index series are nonstationary implying that the estimated correlation coefficients are inappropriate as a measure of association between the series. However, there may be a long-run relationship between Indian and the US stock markets, which needs to be identified. A cointegration methodology is employed in this study to examine whether there are long-term relationships between variables and the speed with which short-term deviations from the long-term equilibrium revert back to that (equilibrium). The cointegration analysis provides a complementary analysis of the benefits of portfolio diversification in addition to the correlation analysis incorporated in mean-variance portfolio structure (see, Clare et al., 1995)

Two nonstationary time series are said to be cointegrated if there exists at least one linear combination of these (series), which is stationary. Such series cannot wander too far away from each other, that is, their independent variation is very limited. Cointegrated markets provide very limited benefits of diversification to investors.

A number of cointegration tests have been devised. Out of which, methodology developed by Johansen (1991) is most widely used in the literature. Gonzalo (1994) found Johansen's methodology best among the five alternative techniques in estimating and testing the long-run equilibrium relationship. Therefore, in this study, Johansen's methodology is used for testing cointegration.

Granger (1986) and Engle and Granger (1969) have demonstrated that an error correction model is embodied within cointegrated variables. The error correction model describes the short-run dynamics which maintain the long-run equilibrium relationship. As an example, Y_1 and Y_2 are two variables which are integrated $I(1)$.

If there is a long-run equilibrium relationship between Y_1 and Y_2 then deviations from that relationship are corrected through the following vector error correction mechanism.²

$$\Delta Y_{1,t} = \alpha_1(Y_{2,t-1} - \beta Y_{1,t-1}) + \varepsilon_{1,t} \quad (5)$$

$$\Delta Y_{2,t} = \alpha_2(Y_{2,t-1} - \beta Y_{1,t-1}) + \varepsilon_{2,t} \quad (6)$$

where the rate of adjustment of the process towards equilibrium is represented by the coefficients α_1 and α_2 . $\varepsilon_{1,t}$ and $\varepsilon_{2,t}$ are the residual or error terms, which may be serially correlated.

Now, if an intercept term and p lagged terms are added to make the error terms serially uncorrelated, a general vector error correction model for N variables can be obtained as:

$$\Delta Y_t = \Pi_0 + \Pi Y_{t-1} + \Pi_1 \Delta Y_{t-1} + \Pi_2 \Delta Y_{t-2} + \dots + \Pi_p \Delta Y_{t-p} + \varepsilon_t \quad (7)$$

where Π is a matrix of error correction terms of the order $N \times N$.

The rank of the Π matrix gives the number of cointegrating vectors in the system. That is, if the rank of Π is zero, there is no cointegration between the variables. On the other extreme, if the rank of the Π matrix is full, that is, if $r = N$, the levels data are already stationary. The given series are cointegrated if the rank of the Π matrix lies between 0 and N . The number of cointegrating vectors in this case being equal to the rank of the Π matrix. Johansen's methodology in essence attempts to identify the rank of the Π matrix and thus the maximum number of cointegrating vectors. Johansen's technique computes rank of the Π matrix by using the relation between the rank of a matrix and its characteristic roots (λ) or the so-called eigenvalues. The rank of a matrix is equal to the number of its characteristic roots which are significantly different from zero. Johansen's trace statistics (or the likelihood ratio test statistics) is:

$$\lambda_{\text{trace}} = -T \times [\log(1 - \lambda_{r+1}) + \log(1 - \lambda_{r+2}) + \dots + \log(1 - \lambda_k)] \quad (8)$$

² Vector error correction model has several possible forms, depending upon the trend assumptions and inclusion of lagged terms in the model. For details see any good textbook on Econometrics.

where T is the number of usable observations. It can be seen from (8) that when λ_s are close to zero, λ_{trace} statistic also approaches zero. With the increase in the value of λ_s , the trace statistic becomes larger. EViews displays the critical values calculated by Osterwald-Lenum (1992).

Empirical Results

Empirical results of the study presented in Table 2 through 7 are for the entire sample period and for two subsample periods. Entire sample period spans from January 1, 1990 to December 31, 2008 and the sub-sample periods are obtained by dividing the entire sample period into pre-1999 and post-1998 periods. Table 2 provides Karl Pearson's coefficient of correlation between BSE and NYSE, and BSE and NASDAQ and their significance level. Tables 3 and 4 show the results of augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests of stationarity of time series. Estimates of a bivariate VAR for all the series over the entire study period and the post-listing period, needed to determine the appropriate lag length for the Johansen's test are given in Table 5. The results of Johansen test of cointegration are presented in Table 6. Finally, pair-wise Granger causality test findings are reported in Table 7.

Table 2. Pearson Correlation between BSE SENSEX, NYSE, and NASDAQ

	BSESENSEX	NYSE	NASDAQ
Panel A : January 1, 1990 to December 31, 2008 N=(4322)			
BSE SENSEX	1		
NYSE	0.638*	1	
NASDAQ	0.690*	0.891*	1
Panel B : January 1, 1990 to December 31, 1998 N=(1930)			
BSE SENSEX	1		
NYSE	0.530*	1	
NASDAQ	0.572*	0.992*	1
Panel C : January 1, 1999 to December 31, 2008 N=(2392)			
BSE SENSEX	1		
NYSE	0.615*	1	
NASDAQ	0.876*	0.712*	1

Note: * Correlation is significant at 0.01 level

Table 3. Unit Root Tests for Series in Levels

	ADF Test – Statistics	PP Test – Statistics
Panel A : January 1, 1990 to December 31, 2008		
BSE SENSEX	-2.628987 ^a	-2.605201 ^a
NYSE	-1.104411 ^a	-1.098224 ^a
NASDAQ	-1.318738 ^a	-1.335179 ^a
Panel B : January 1, 1990 to December 31, 1998		
BSE SENSEX	-2.249794 ^b	-2.210922 ^b
NYSE	+1.537217 ^b	+1.482778 ^b
NASDAQ	+1.535268 ^b	+1.660325 ^b
Panel C : January 1, 1999 to December 31, 2008		
BSE SENSEX	-1.551469 ^c	-1.728383 ^c
NYSE	-1.293202 ^c	-1.465178 ^c
NASDAQ	-0.795654 ^c	-0.866497 ^c

Note: a – Critical value at 0.01 level is -3.43

b – Critical value at 0.01 level is -3.43

c – Critical value at 0.01 level is -3.43

Table 4. Unit Root Tests for Series in First Differences

	ADF Test – Statistics	PP Test – Statistics
Panel A : January 1, 1990 to December 31, 2008		
BSE SENSEX	-22.85912 ^a	-49.64000 ^a
NYSE	-25.11569 ^a	-54.30992 ^a
NASDAQ	-24.94583 ^a	-56.25273 ^a
Panel B : January 1, 1990 to December 31, 1998		
BSE SENSEX	-18.03946 ^b	-39.02648 ^b
NYSE	-20.15582 ^b	-45.57537 ^b
NASDAQ	-18.43045 ^b	-45.51921 ^b
Panel C : January 1, 1999 to December 31, 2008		
BSE SENSEX	-13.96060 ^c	-29.98405 ^c
NYSE	-14.02003 ^c	-29.76663 ^c
NASDAQ	-13.81355 ^c	-30.96509 ^c

Note: a – Critical value at 0.01 level is -3.43

b – Critical value at 0.01 level is -3.43

c – Critical value at 0.01 level is -3.43

Correlation between Indian and US Stock Markets

Three facts stand out from the Pearson correlation between BSE Sensex, NYSE and NASDAQ presented in Table 2.

First, BSE Sensex is related positively to both NYSE and NASDAQ during the entire study period and the two sub-periods. The correlation coefficients are significant at 0.01 level.

Second, the interrelationship between BSE Sensex and NASDAQ is greater than the interrelationship between BSE Sensex and NYSE in all the three cases. This is perhaps because most of the Indian companies listed on the US stock markets belong to the information technology and telecommunication sector and were listed on the NASDAQ market.

Third, the results for the split period presented in Panel B and C reveal a remarkable increase in interdependence in the post-listing period, more particularly between BSE Sensex and NASDAQ, again due to the listing of information technology companies on the NASDAQ and materialization of the effects of Indian economic reforms during this period.

Modeling with nonstationary variables may give rise to spurious correlation. Therefore, it is appropriate to check the series for stationarity. The results of the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests of stationarity for the entire sample period and sub-periods in levels are reported in Table 3. The critical values for the tests statistics are tabulated in Mackinnon (1991) and displayed in EViews.

Results of Cointegration Tests

The results presented in Table 3 indicate that the null hypothesis of unit root cannot be rejected in the case of all the three indices at 0.01 level. Having satisfied that the original stock price indices are nonstationary in levels, we test their stationarity in first differences. Test statistic for ADF and PP test for entire sample period and the two subperiods along with Mackinnon critical values for rejection of hypothesis of a unit root are shown in Table 4. The computed values of test-statistic are smaller than the 1 percent critical values for all the index series for all the periods. This implies that all the stock indices are stationary in the first differences.

Tests carried out in the preceding paragraphs suggest that all the three stock index series are nonstationary in the level but stationary in the first differences. Two

nonstationary (with a unit root) time series are cointegrated if there exists a stationary linear combination of these series. Such a combination may be interpreted as a long-run equilibrium relationship between these variables. Now, we attempt to determine whether Indian and the US stock markets are cointegrated by implementing cointegration tests using the methodology developed by Johansen (1991). Since all the three stock price index series exhibit intercept, but no trend as discussed earlier in the paper, we choose the option of an intercept (no trend) in the specification of the cointegrating equations in EViews. Lag order to be used in the cointegrating equation should be long enough to remove any serial correlation in the residuals. However, choosing too large a lag length may introduce imprecision in the estimates. In this study, Akaike (AIC) and Schwarz information criterion (SIC) are used to test the appropriate lag length by estimating the bivariate Vector Auto-Regression (VAR) of BSE Sensex and NASDAQ and BSE Sensex and NYSE over the entire study period and for the post-listing period, that is, January 1, 1999 to December 31, 2008. The estimated results are displayed in Table 5.

Both Akaike (AIC) and Schwarz information criterion (SIC) select VAR (7) for the entire study period and VAR (4) for the post-listing period in the case of bivariate VAR of BSE Sensex and NASDAQ as seen in Panel A (they have the lowest values of AIC and SIC). However, in the case of BSE sensex and NYSE, AIC selects lag 6 but the SIC selects lag 4 for the entire study period as well as the post-listing period. We, therefore, use the likelihood ratio (LR) test to test the appropriate lag length.

The LR test statistic for the hypothesis of lag 4 against lag 6 is computed as:

$$LR = -2 \times (l_4 - l_6)$$

where l is the log likelihood reported in Table 5. The LR test statistic is χ^2 distributed. Its degrees of freedom are equal to the number of restrictions under test. In this case, the number of zero restrictions to move from VAR (6) to VAR (4) is 12. The LR test statistic for the entire sample period and the post listing period are:

$$LR = -2 \times (-24531.51 + 24501.77) = 59.48$$

and

$$LR = -2 \times (-8487.898 + 8460.1450) = 55.506$$

respectively. The critical value of χ^2 for 12 degrees of freedom at 0.01 level is 26.217. The LR test statistics are

Table 5. Estimate of a Bivariate VAR of BSE Sensex and NASDAQ and BSE Sensex and NYSE over the Entire Study Period and Post-Listing Period for 4, 5, 6, 7 Lag Lengths

Panel A: BSE Sensex and NASDAQ			
Period: January 1, 1990 to December 31, 2008			
Lag Order	Akaike Criterion	Schwarz Criterion	Log Likelihood
4	21.45241	21.48984	-30734.03
5	21.45514	21.50090	-30723.22
6	21.45576	21.50985	-30709.38
7	17.12541	17.18784	-24493.59
Period: January 1, 1999 to December 31, 2008			
Lag Order	Akaike Criterion	Schwarz Criterion	Log Likelihood
4	22.75724	22.85027	-10643.77
5	22.76017	22.87397	-10629.76
6	22.76382	22.89843	-10616.09
7	22.76919	22.92464	-10603.21
Panel B: BSE Sensex and NYSE			
Period: January 1, 1990 to December 31, 2008			
Lag Order	Akaike Criterion	Schwarz Criterion	Log Likelihood
4	17.12557	17.16300	-24531.51
5	17.12770	17.17345	-24521.99
6	17.12236	17.17645	-24501.77
7	17.12541	17.18784	-24493.59
Period: January 1, 1999 to December 31, 2008			
Lag Order	Akaike Criterion	Schwarz Criterion	Log Likelihood
4	18.15560	18.24863	-8487.898
5	18.15839	18.27219	-8476.125
6	18.15218	18.28678	-8460.145
7	18.15873	18.31418	-8450.128

greater than the critical values; therefore, null hypothesis of 4 lags is rejected at 0.01 level for both the entire sample period and the post-listing period in the case of BSE Sensex and NYSE series. Thus, we use the VAR with lag 7 in cointegration tests of BSE Sensex and NASDAQ for the entire sample period and the VAR with lag 4 for the

post-listing period. Further we use the VAR with lag 6 both in cointegration tests of BSE Sensex and NYSE for the entire sample as well as for the post-listing period.

The results of the Johansen's cointegration tests are presented in Table 6. The test assumes intercept but no deterministic trend in the data. Essentially, the table reports

Table 6. Cointegration Tests for Series

Series	Period	Lags Interval	Likelihood Ratio	1 Percent Critical Value	Hypothesized No. of CE(S)
BSE NASDAQ	January 1, 1990 to December 31, 2008	1 to 7	12.05792	24.60	None
BSE NASDAQ	January 1, 1999 to December 31, 2008	1 to 4	15.36410	24.60	None
BSE NYSE	January 1, 1990 to December 31, 2008	1 to 6	11.44260	24.60	None
BSE NYSE	January 1, 1999 to December 31, 2008	1 to 6	6.512882	24.60	None

the LR test statistic (Likelihood Ratio), or the so called trace statistic. It tests the hypothesis of no cointegration against the alternative hypothesis of full rank, that is, all series in the VAR are stationary. The test statistic is less than the 1 percent critical value for all the series tested. The null hypothesis of none cointegrating equation is not rejected for all the series. The consistency of results is observed across entire and post-listing period. That is, no long run relationship is found between the Indian and US stock markets. The increased relationship in the post-listing period has not yet been picked by the cointegration.

With no long-run relationship found between Indian and the US stock markets, we are interested in testing for

short-run relationship. A bivariate Granger causation methodology (see, Granger, 1969) is used to examine the short-run relationship. In essence, the Granger test considers the cause-effect relationship, if any, between the two variables.

Since all the index series are nonstationary in the level form, they are made stationary by taking first differences for implementing the Granger causality test. An important practical question in causality tests is the determination of an appropriate number of lagged terms. To some extent, choosing an appropriate lag length is arbitrary. It is primarily based on the researcher's belief as to how many lags are enough to predict the variable under

Table 7. Pair-wise Granger Causality Tests

Lags : 7	F-Statistics	Probability
Panel A: January 1, 1990 to December 31, 2008		
Null Hypothesis		
BSE does not Granger Cause NYSE	1.40323	0.19934
NYSE does not Granger Cause BSE	3.96835	0.00025
BSE does not Granger Cause NASDAQ	0.70045	0.67177
NASDAQ does not Granger Cause BSE	10.1615	1.3 E-12
Panel B: January 1, 1990 to December 31, 1998		
Null Hypothesis		
BSE does not Granger Cause NYSE	0.54431	0.80123
NYSE does not Granger Cause BSE	1.04621	0.39643
BSE does not Granger Cause NASDAQ	0.41285	0.89485
NASDAQ does not Granger Cause BSE	1.18902	0.30556
Panel C: January 1, 1999 to December 31, 2008		
Null Hypothesis		
BSE does not Granger Cause NYSE	1.08769	0.36889
NYSE does not Granger Cause BSE	2.80940	0.00673
BSE does not Granger Cause NASDAQ	0.66473	0.70211
NASDAQ does not Granger Cause BSE	7.60349	6.2 E-09

consideration. Akaike or Schwarz information criterion may also be used for selecting the appropriate number of lags. An investigation using this criterion suggests that 7 lags are most appropriate. The results of the Granger causality tests are presented in Table 7. The table gives the F-statistic and probability for the entire sample period (panel A) and the pre- and post-listing periods (panels B and C, respectively). Panel A reveals that Null hypothesis that (i) NYSE does not Granger cause BSE, and (ii) NASDAQ does not Granger cause BSE, are rejected at 1% significance level. That is, changes in both NYSE and NASDAQ markets cause changes in BSE for the entire study period. However, hypothesis that changes in BSE Sensitive index does not cause changes in either NYSE or NASDAQ market are not rejected even at 10 percent level. It implies that changes in BSE Sensitive index do not affect changes in NYSE or the NASDAQ.

The results for the pre- and post-listing periods reveal remarkable information regarding the interrelationship between Indian and US stock markets. No F-statistic reported in Panel B of Table 7 is significant even at 0.10 level. That is, no causation is shown between Indian and the US stock markets in *either direction* before Indian stocks were listed at the US markets. However, a reversal in results is seen in the post-listing period as shown in Panel C of Table 7. The hypothesis that (i) NYSE does not Granger cause BSE and (ii) NASDAQ does not Granger cause BSE are rejected even at 0.01 level. It implies the influence of NYSE and NASDAQ on the BSE. This is an interesting result in the sense that impact of economic liberalization and stock market reforms on the interdependence between Indian and US stock market was felt only after listing of Indian companies on the US stock markets. However, there is no evidence to suggest that changes in BSE Granger cause change in NYSE or NASDAQ at any level. This result is expected considering the small valuation of Indian stock markets in comparison to the US markets.

Summary and Conclusions

In this article, we have examined the integration of Indian stock market with the world's largest stock market—the US stock market. The sample data consisted of daily closing values of BSE sensdex, the NASDAQ composite index and the New York Stock Exchange index (NYSE) over the period January 1, 1990 to December 31, 2008.

Financial deregulation by the Indian Government and rapid developments in the telecommunication technology are expected to make markets more integrated. A further increase in interdependence between the two markets is expected subsequent to the listing of some Indian companies in the US stock markets and raising of the capital by some Indian companies in the United States in 1999. Therefore, we carried out market integration test for entire as well as pre- and post-listing periods.

Cointegration methodology developed by Johansen (1991) is used in this study to determine whether there are any long-term relationships between Indian and the US stock markets. A bivariate Granger causation methodology is implemented to examine the short-term relationships. Stationarity of the time series is tested by using the unit root test by employing a parametric augmented Dickey–Fuller (ADF) and Phillips–Perron nonparametric methods.

Based on our Johansen's cointegration tests, we conclude that there is no long-run relationship between the Indian and US Stock markets. However, Granger causality test, though, does not reveal causation between Indian and the US stock markets in the pre-1999 period in either direction, it shows a reversal in results in the post-1998 period. Both, NYSE and NASDAQ are found to influence the BSE after listing of the Indian companies on the US stock markets. This increased relationship in the post-listing period has not yet been picked by the cointegration tests. Perhaps, study over a longer period in future may alter our conclusions. From a portfolio management point of view, the gains from diversification for Indian investors in the US stock markets and vice versa will be reduced as these markets become more integrated.

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The reform of State industry and most directly related to that the banking sector, is enormously daunting.

— William Kirby

International Financial Reporting Standard: Adoption or Convergence for India

Monika Kashyap and Dinesh Kumar Sharma

With the commencement of the financial year 2011, nearly 10,000 companies in India will be moving to a different way of preparing their accounts, that is, International Financial Reporting Standards (IFRS). Earlier it was considered to be the gateway to listing companies abroad without a single document needed. But now to become globally competitive and comparable, IFRS has become prerequisite for all the economies. IFRS reform proposal has been given by G-20 working group on enhancing sound regulation and strengthening transparency. Accordingly, the IASB has initiated appropriate modifications to the relevant accounting standards. The present study is an attempt to view the IFRS from Indian perspective and concludes that India can excel in accounting bandwagon and it will be a big opportunity as countries around the world adopt the uniform accounting system IFRS.

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Introduction to IFRS

International Financial Reporting Standard (IFRS) is considered a "principles based" set of standards in that they establish broad rules as well as dictating specific treatments comprising the IFRS—issued after 2001; International Accounting Standards (IAS)—issued before 2001; Interpretations Originated from the International Financial Reporting Interpretation Committee (IFRIC)—issued after 2001; Standing Interpretation Committee (SIC)—issued before 2001; and Framework for the Preparation and Presentation of Financial Statements (1989).

Framework

The framework states basic principles for IFRS. The IASB and FASB frameworks are in the process of being updated and converged. The major objective here is to refine the existing concepts to reflect the changes in markets, business practices, and the economic environment that have occurred in the two or more decades since the concepts were first developed.

Its overall objective is to create a sound foundation for future accounting standards that are principles based, internally consistent, and internationally converged. Therefore the IASB and the US FASB are undertaking the project jointly.

To define the role of framework Deloittee states:

In the absence of a Standard or an Interpretation that specifically applies to a transaction, management must use its judgment in developing and applying an accounting policy that results in information that is relevant and reliable. In making that judgment, IAS 8.11 requires management to consider the definitions, recognition criteria, and measurement concepts for assets, liabilities, income and expenses in the framework. This elevation of the importance of the framework was added in the 2003 revision to IAS 8.

Requirement of IFRS

The financial statements under IFRS will comprise of (IAS18):

- Statement of Financial Position
- Statement of Comprehensive Income or two separate statements comprising an Income Statement and separately a Statement of Comprehensive Income, which reconciles Profit or Loss on the Income Statement to total Comprehensive Income
- Statement of Changes in Equity (SOCE)
- Cash Flow Statement
- Notes including a summary of the significant accounting policies.

Following changes have been made by IFRS and a revised IAS 1 was presented on September 6, 2007:

- Present all nonowner changes in equity (that is, "comprehensive income") either in one statement of comprehensive income or in two statements. Components of comprehensive income may not be presented in the statement of Changes in Equity.
- Present a statement of financial position (balance sheet) as at the beginning of the earliest comparative period in a complete set of financial statements when the equity applies to new standard.
- Present a statement of cash flow.
- Make a necessary disclosure by the way of a note.

This revised IAS 1 is effective for annual periods beginning on or after January 1, 2009. International Financial Reporting Standards are used in many parts of the world including the European Union, Hong Kong, Australia, Pakistan, South Africa, Turkey, Singapore, Malaysia, and GCC Countries. The SEC in the US is slowly but progressively shifting from requiring only US GAAP to accepting IFRS and will most likely accept IFRS standards in the long term.

These global accounting standards if adopted would result in one set of high quality, globally accepted accounting standards that would bring uniformity in reporting and make the world one common market place. Several countries are adopting IFRS whether fully or through convergence. The recent issue for India is adoption or convergence.

Pros of adoption:

- Reduced reporting cost for multinational companies;
- Better comparability of performance of companies across the world;
- Improved allocation of capital by global investors.

Cons of adoption:

- It would result in countries giving significant control of the standard setting process.
- Convergence will help corporate in concerned countries to have a soft landing, while adopting certain standards in IFRS could put their companies in a disadvantageous position.

IFRS: An Opportunity for India

With the shifting of power from West to Asia, India is becoming an economic superpower; whereas China is leading the global growth. This is going to be the decade of Asia and finding their rightful place in the global economic map. Now it is the right time to go for the adoption of IFRS. But India is going to converge rather than adopt. Investors give preference to the countries who had adopted the IFRS fully. Apart from it adoption will give great opportunity for Indian accountants to serve the external world. In convergence with the IFRS, with consideration of the global integration, the ICAI recognized the need for Indian companies to converge to global standards in presenting their financial results.

Following it, RBI has stated that financial statements of banks need to be IFRS compliant for periods beginning on or after April 1, 2010 and has constituted a working group for the proper implementation and to facilitate the convergence of the Indian Banking System with the IFRS. The members of the group include representatives from the Indian Bank Association (IBA), the ICAI and various regulatory and market related departments of the RBI. Besides, professionals with core competence, expertise and experience in IFRS implementation have been drafted in as special invitees.

Convergence toward IFRS is going to take place in phases as below:

Phase I

- Opening Balance Sheet as at April 1, 2011

1. Companies which are part of NSE Index- Nifty 50
2. Companies which are part of BSE Sensex- BSE 30
 - (a) Companies whose shares or other securities are listed on a stock exchange outside India
 - (b) Companies whether listed or not, having net worth of more than INR 1000 crore as on March 31, 2009.

Phase II

- Opening Balance Sheet as at April 1, 2012
- Companies not covered in phase I and having net worth exceeding INR 500 crore

Phase III

- Opening Balance Sheet as at April 1, 2014
- Listed companies not covered in the earlier phases

If the financial year of a company commences at a date other than April 1, then it shall prepare its opening balance sheet at the commencement of immediately following financial year.

It is clear from the above phases that companies having a net worth of INR 1000 crore and companies listed on BSE and NSE will be covered under the first phase of convergence. Transition in phases, whether listed or not, having a net worth of more than 500 crore will convert their opening balance sheet as at April 1, 2013 and listed companies having a net worth of INR 500 crore or less will convert their opening balance sheet as at April 1, 2014. Unlisted companies having a net worth of INR 500 crore or less will continue to apply existing accounting standards which might be modified from time to time. Because of this move, the transition cost for the smaller companies will be much lower as the initial cost of learning will be bear by large companies.

If the last decade belonged to IT, this decade belong to accountancy. Countries around the world are adapting to IFRS therefore industry foresees a big opportunity on the horizon. This adoption will generate huge employment. India is the only country that can take advantage of the emerging accounting scenario post IFRS. The IFRS transition is a very crucial catalyst for Indian "Financial and Accounting Outsourcing" companies (FAOs). US lacks trained accounting manpower therefore analyst are seeing IFRS transition as a billion dollar opportunity for India. The size of BPO industry in India is estimated to

be about \$11 billion today and FAOs account for almost 30–40% of it.

Challenges before India Regarding IFRS

- The Accounting Standards IFRS 9 relating to financial instruments, which is the crucial standard for banks, is itself still evolving and thus convergence with IFRS becomes a moving target.
- The IT systems of banks need to be modified which are programmed to producing financial results as per Indian GAAP.
- As for any other new venture, banks will need to build capacity for making a seamless transition to the new standards and for the adoption of the expected-loan loss provisioning.
- There may some areas where we see carve-outs including areas where fixed assets need to be capitalized on foreign exchange difference, and the option whether to revalue fixed assets and carry them forward or instead of revaluation, continuing valuing according to Indian GAAP.

Recent Issue

In India government encouraged Indian Corporate to voluntarily adopt IFRS and publish it ahead of time. The SEBI had amended the listing agreement to enable corporate to voluntarily publish their IFRS numbers. Following this, many companies went ahead and adopted IFRS as issued by IASB and started publishing their financials as per IFRS. The other side of the coin shows that the current rules of the convergence program in India insist on a transition date of April 1, 2010 for all the corporate irrespective of whether they have earlier adopted IFRS voluntarily or not.

When a company adopts IFRS at a particular point, it needs to take certain positions on treatment of goodwill, stock option expense, etc., and the current rules will totally defeat the purpose and would result in two sets of IFRS financials with no incremental benefit to investors.

Conclusion

India's adoption toward IFRS is junking the Indian generally accepted accounting practices (GAAP). The transition phase has divided the various companies in various slots. But some companies, which are large in terms of fundamental value or which intend to attract foreign capital, might prefer to use India Accounting Standard convergent

with IFRS earlier than required under the road map presented by the government. The government should provide that choice. This separation by RBI may make companies happy, but it will undermine India's position. Presumably, lack of preparedness of Indian companies has led to the decision to defer the adoption of IFRS for a year. India could not prepare itself for the last four years, although it boasts for its IT and accounting skills. If India effectively goes for the adoption of IFRS then it will work as a billion dollar opportunity for its masses as India is full of accounting professionals. If we look at the history, the first ever BPO was for accountancy. The number of FAO employees in India is around 600,000. The large talent pool should see India continue to be the choice location for FAO services.

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"Money plays the largest part in determining the course of history."

— Karl Marx

How the Remittances Sustain Kerala Model of Development

K.V. Joseph

Kerala, the Malayalam speaking state in the Indian Union has attracted worldwide attention during recent years for what is termed the Kerala model of development. It encompasses a remarkable level of achievement in improving the quality of life of the people at large, including visible signs of affluence all over the state, without a corresponding performance in various criteria of economic growth. Apparently some sort of a contradictory situation seems to be inherent in the whole process. However, the sons and daughters of Kerala have been moving in large numbers to distant lands during recent years for the purpose of improving their economic prospects. Most of them have been sending a portion of their earnings to support their kith and kin in Kerala. Presumably the remittances seem to resolve the apparent contradiction in the model of development by providing the necessary material resources required for the seeming affluence in the state. The article seeks to delineate the apparent contradiction in the model and to explore how the remittances sustain it.

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Introduction

Kerala, the Malayalam speaking state in the Indian Union, occupying the south western corner of the Indian sub-continent is able to make remarkable achievements in various criteria of social development. Furthermore, signs of affluence with posh buildings and never-ending shops, flooded with sophisticated consumer durables and all kinds of articles of daily use are visible in every nook and cranny of the state. However, on the other hand, the performance of the state in various parameters of economic growth has not been very satisfactory. Such a development experience beset with contradictory pulls from the opposite directions is termed the Kerala model of development which could attract the attention of scholars from different quarters. Then the question posed is, how such a model could be sustained? However, Kerala has been sending a large number of her sons and daughters to distant lands from where they have been sending huge sums of money to their kith and kin in Kerala. Ipsofacto, the remittances seem to resolve the apparent contradiction in the economy and thereby sustain the Kerala model of development. The article seeks to delineate the nature of this apparent contradiction in the so-called Kerala model of development and to explore how the remittances sustain it.

Kerala: An Affluent State

During the British period, the ease with which land tax could be collected was regarded as the main indicator for evaluating the conditions of affluence and prosperity prevailing in any presidency during the British period. However, during recent years, the level of affluence and prosperity of a region can be properly evaluated with the help of various reliable statistical data; the data relating to per capita income being the most important among them. Kerala had been lagging behind the all-India level in per capita income till the 1990s. However, she could overtake the country as a whole in per capita income by 1993–94

and manage to retain that position since then. In 2008–09, the per capita domestic product of Kerala has been Rs 39,815 as against the all-India figure of Rs 25,494. Only four states, viz, the Punjab, Haryana, Gujarat, and Maharashtra are ahead of Kerala in the size of per capita income¹. Evidently, Kerala might be at par in the level of affluence with most of the economically advanced states in India.

While the level of per capita income broadly indicates the capacity of the people to enjoy better living conditions, the complexion of tangible assets in the possession of the people can shed light on the actual level of affluence prevailing in any state. For this purpose, the quality of dwelling houses seems to be the most important indicator. Accordingly to the 50th Round of National Survey made during 1995–96, houses have been divided into three categories, viz, pucca, semi-pucca, and kutcha. Accordingly to the findings of the survey, the category of pucca houses formed more than 51 percent of the total in Kerala. Only in Punjab and Haryana, the percentage of pucca houses was more than that of Kerala. Similarly, the proportion of low grade houses was lower in Kerala than in any other state.² The conditions of housing have made further improvement since then. According to the findings of 58th Round of Survey, the percentage of pucca houses went up to 72.4 by 2001–02.³ Interestingly, palatial houses with ultra modern fittings exhibiting the prosperity of the state are discernible from one end of the state to the other. Not even the Maharajas could dream of such houses in the past. In 1891, exactly 120 years back, there were only 4025 tiled houses in Travancore out of a total of 537,629. The percentage distribution of the houses as class I, class II, and class III has been 0.73, 4.79, and 94.38, respectively.⁴ Evidently, the overwhelming number of houses were of the lowest category. Indeed the level of progress made in material conditions of prosperity reckoned in terms of housing conditions is really spectacular. The indicators of prosperity prevailing in Kerala are not limited to existence of large number of posh buildings along. Other tangible assets displaying affluence in one way or other are also in plenty. It is not an exaggeration to say that the bazaars and shopping complexes in Kerala are flooded with sophisticated consumer durables like fridges, pump-sets, washing machines, microwave ovens, and so on. Practically, almost all the houses in Kerala are electrified. Telephone connection has become part of the living standard even of the ordinary people in Kerala. On an average, there are 12.02 telephone sets for every 100 persons in Kerala.⁵ No state except Delhi, the Union capital, comes anywhere near Kerala in the density of telephone connections.

Another indicator of opulence is the presence of vehicles overcrowding the roads and narrow lane all over Kerala. The number of vehicles at the end of March 2009 totaled 4,880,059. Approximately, there is one vehicle for every 7 persons in the state. Significantly, ownership of personal vehicles in the state is recording a faster rate of growth reflecting the growing affluence of the people at large.⁶

The mere size of per capita income as such cannot ensure prosperity of the people at large unless it is equitably distributed. Data on the distribution of income seems to be scanty in our country. Nevertheless, the distribution of people on the basis of consumer expenditure can serve as an alternative source. The findings of the 50th Round of NSS Survey on consumer spending for the year 1993–94 can shed light in the matter. According to the methodology of the survey, people have been divided into four categories on the basis of the volume of monthly consumer expenditure. People whose monthly expenditure is less than Rs 170 fall within the poorest category. Such people numbered 303 out of every 1,000 in the country as a whole. In Kerala, on the other hand they numbered only 107. The consumer expenditure class of the lowest category lesser than that of Kerala was only in the Punjab. The second category consisted of people whose monthly expenditure was within the range Rs 190–265. The ratio of this class was 212/1,000 in Kerala against 295/1,000 in India. Thus, the lowest spending category accounted for more than 60 percent in India as a whole against only 32 percent in Kerala. The third category consisted of people whose monthly expenditure was within the range of Rs 265–355 per month. The people falling under this category can be regarded as those belonging to the upper middle class group. In this category, Keralites numbered 262 out of 1,000 against 206 in the country as a whole. No other state except Haryana had a higher representation in this category. The highest spending category consisted of those whose expenditure was more than Rs 355 per month. Against a ratio of 196/1,000 in the country as a whole, the ratio of Kerala under this category was 419/1,000.⁷ Apparently, income might be equitably distributed among the people and the poor classes might be having better access to the income generated in Kerala in sharp contrast to the conditions in other parts of India. The majority of the Keralites would naturally be better off than their counter parts in any other part of India. The well-being of Keralites appeared to have made further improvement according to the 58th Round of NSS Survey. The average consumer expenditure per month has gone up from Rs 390 in 1994 to Rs 881 in 2001–02, the highest among the states in India. The average monthly consumer expenditure was only Rs 778,

in Punjab, the state credited with having the highest per capita income. Furthermore, the class of people spending more than Rs 615, the highest category, formed 63.4 percent against only two percent in the lowest spending category with a monthly expenditure of less than Rs 300.⁸

Data on the incidence of poverty prevailing among the people forms another important yardstick for evaluating the level of affluence among different classes of people. India is one of the poorest countries with the concentration of the largest number of poor people in the world. However, the poor people are not uniformly distributed throughout the country. Kerala is one of the states with a very low level in the actual incidence of poverty. Here the percentage of people living below the poverty line has been stated to be 9.38 in the rural areas and 20.71 in the urban areas as against 27.09 and 23.62, respectively, in India as a whole in 1999–2000.⁹ Apparently, the bulk of Keralites are better off in comparison with their counterparts in other parts of India.

Not merely in material prosperity but also in various criteria of social development, Kerala has been topping the country. In fact, in the criteria of social development like literacy rate, infantile mortality, and even birth rate, her ranking has been the highest among the states in India. In fact in those aspects her ranking has been the highest among the states in India, more or less at par with the highly developed countries of the world. Moreover, in human development index Kerala has been at the top among the Indian states 1981 onward. With an index of 0.602 India was occupying only the 126th rank among the countries of the world in 2004. However, Kerala appears to be at par with some of the advanced countries of the world.¹⁰ By reducing the decadal population growth to 9.42 percent for the period 1991–2001 against an all-India rate of 21.34, Kerala has made a real demographic revolution. Interestingly, none of the states in India could come near Kerala in any of these criteria of social development. Indeed, Kerala's achievements both in economic and social developments are really remarkable by any standard.

Sluggish Performance of the Basic Sectors of the Economy

Conditions of affluence depends on better performance of the economy, characterized by faster growth, high productivity, etc., in various sectors of the economy. The sectors themselves may undergo structural changes with the growth of the economy. The economy of Kerala as a whole has been displaying buoyancy during recent years. However, the agricultural sector, one of the basic sectors

of the economy, has been declining importance during recent years. As in the case of any economy, agricultural sector had been the leading sector in Kerala in the past. In 1960–61 agriculture accounted for 53.4 percent of the SDP.¹¹ Since then its share started to decline continuously. In 1980–81 its share was 33 percent. It declined to 28.55 percent by 1990–91 and to 9.7 percent in 2008–09 (see Table 1). The declining importance of agriculture has not been due to structural change arising with the expansion of other sectors. Instead, it is by and large due to the overall stagnation of the agricultural sector in Kerala. Since mid 1970s, the agricultural sector Kerala has been experiencing some sort stagnation or a setback. There was an actual fall both in the number of people engaged in agriculture, and the area of land under crops since then, though there was a partial recovery characterized by the extension of cash crops at the expense of food crops during the subsequent years.¹² However, by the close of the second millennium another set back reversed this partial recovery also. This is well reflected in the fall in the net addition to value added by the agricultural sector. As a matter of fact, the value added by the agricultural sector in real terms came down from Rs 6,256 crore in 1993–94 to Rs 5,165 crore in 2003–2004 at constant prices.¹³

The decelerating trend in agriculture is closely connected with the change in the cropping pattern. The agricultural sector of Kerala is characterized by the dominance of cash-crop cultivation. However, the area under cultivation of both food crops and cash crops was extending in the past. Since the mid 1970s cash-crop cultivation started to extend further at the expense of food crops. Paddy, the main food crop of Kerala became the sacrificial goat of this change in favor of cash crops. The result has been a drastic fall in the area under paddy cultivation in Kerala. By 2008–09, the area under paddy cultivation came down to 234,265. The state, with an annual consumption of approximately 45 lakh tones of rice, meets the requirement by importing rice and wheat from other states which would have far reaching impact on the economy to which further reference would be made in another context.

A far more serious aspect of the agricultural stagnation relates to the fall in the rate of productivity. The agricultural sector of Kerala was reputed for high productivity of land. Till the middle of 1970s, the productivity of land in terms of value of output in Kerala was the highest among the states in India. By 1980s Punjab overtook Kerala in agricultural productivity.¹⁵ Since then, the trend has been for a fall in the productivity in terms of output in the case of all crops except rubber. In the case of coconut, the most important

crop of Kerala for example, the yield per hectare is lower than that of Tamil Nadu and Andhra Pradesh¹⁶. With further fall in the productivity of each crop, the overall productivity of the land in Kerala would certainly come down.

In this context the question is, why agricultural sector is stagnating in the state in spite of the growing pressure of population and the widening gap between the demand for food and the production of food? Though, it is beyond the scope of this article to make a detailed study in the matter, a word of explanation will not be out of place. With the spread of education, there has been a tendency among the education youngsters to abandon traditional callings and to seek new avenues of employment. With the openings in the Gulf region for employment, on which further reference will be made, the urge for migration to the Gulf region became very strong. Actually, many young people prefer to remain idle rather than to take up agriculture as an occupation. In the wake of those developments agriculture became a neglected activity, with stagnation setting in all aspects pertaining to it.

The economy of Kerala is adversely affected not solely with the stagnation of agriculture. The performance of the industrial sector has not been very satisfactory. As a matter of fact, the industrial sector is also experiencing stagnation.

Between 1980–81 and 1987–88, for example, the value added by the manufacturing sector in Kerala has recorded only a growth rate of 1.73 against 10.56 percent for the country as a whole.¹⁷ At no time in the history of Kerala, has the industrial sector been occupying a commanding position in the economy. The industrial sector is dominated by large number of small factory units of the traditional industries like the coir, handloom, cashew, tile, etc., with low productivity. Furthermore, industrial activities with linkage effect have not growth either. Not surprisingly, the share of the industrial sector in the SDP does not come up to even 10 percent. Nor can the industrial sector hope to improve its position in the immediate future as the yearly addition to capital formation in Kerala accounts for hardly two percent of the total capital formation of the country as a whole during recent years.¹⁸

Buoyancy in the Tertiary Sector

Since the primary and secondary sectors of the economy are stagnating, they will not be able to contribute much to the growing prosperity of the state. It would then be depending entirely on the tertiary sector (see Table 1 indicating the percentage share of the different sectors of the economy in Kerala during recent years).

Table 1. Sector-wise Distribution of the State Domestic Product in Kerala over the Years (Percentage)

S. No.	Name of the sector	Years				
		1975–75	1980–81	1990–91	2000–01	2008–09
1.	Primary sector	56.79	39.23	32.85	22.21	12.42
	Agriculture*	52.52	33.84		16.75	9.70
2.	Secondary sector	10.26	24.37	26.48	21.85	25.02
	Manufacturing industries**	7.65	13.90		9.46	7.59
	Construction***	1.78	9.02		10.22	15.87
3.	Tertiary sector					
	a. Transport, storage, and communication	4.40	3.57	6.59	7.03	13.25
	b. Trade, hotels, and restaurants	11.77	15.06	13.51	24.08	21.39
	c. Banking and insurance	1.68	2.99	5.88	5.28	5.67
	d. Real estate and ownership of dwelling houses	1.93	3.19	0.36	5.37	9.43
	e. Public administration	3.87	3.96	5.69	4.97	4.49
	f. Other services	9.19	7.63	8.64	9.17	8.32
	Total tertiary	32.84	36.40	40.67	55.92	62.56
	Grand total	100	100	100	100	100

Source: GOK; Planning Board; Economic Review (various issues).

Notes: * Stands for the share of agriculture in the SDP

** Stands for the share of the manufacturing industries in the SDP

*** Stands for the share of construction in the SDP

As can be seen from Table 1, the share of the tertiary sector, which accounted for only 32.84 percent of the SDP in 1974–75, has gone up to 62.54 percent by 2008–10. Also it is evident from the table that the proportionate share of almost all the sub-sectors of the tertiary sector has increased since then. Apparently, all the sub-sectors of the tertiary sector have been growing at a faster rate than that of the primary and secondary sectors. In this connection the question is how the tertiary sector as a whole could grow when the basic sectors of the economy are exhibiting signs of stagnation, if not of steady decline. The question assumes added significance because the tertiary sector whose share was 35.5 percent of the GDP in 1974–75 in India as a whole contributes only 57.27 percent in 2008–09.¹⁹ Then, how tertiary sector could grow in Kerala much ahead of the level in India becomes another serious question.

In this connection, the distinction between producer services and consumer services seems to serve as a useful conceptual formulation for uncovering the issue.²⁰ Though an exact line of demarcation between the two is not easy, tertiary activities falling under the sub-heads (i) transport, storage, and communication and (ii) trade, hotels, and restaurants, fall under the ambit of producer services. By providing the raw materials to the producing units or by supplying the finished products to the consumers, activities falling under these two sub-heads, serve as an extension to the production process itself. However, as we have seen earlier production activities in Kerala have been experiencing some sort of stagnation. Similarly, tourism, another activity which calls for hotels and transport facilities on an increasing scale, contributes hardly to one percent of the SDP, though it is growing at a fast rate.²¹ Thus none of the productive activities in the state is sufficiently buoyant as to warrant marketing or transport facilities on a wider scale. These two sectors would naturally be functioning primarily as consumer services in Kerala rather than as producer services. Significantly, as mentioned earlier, the bulk of food materials needed in the state comes from other states. Similarly most of the consumer durables and even articles of daily use are also imported from outside the state. The distribution of those goods to every nook and corner of the state calls for trade and transport on a wider scale.

However, trade and transport for such purposes cannot grow without enough purchasing power in the hands of the people. Similarly, growth of banking activities with increasing volume of bank deposits also calls for large volume of money with the people at large. From where the

money needed for meeting all those purposes comes to Kerala becomes another question. Luckily for Kerala, an important source of income from another quarter meets those purposes. It is the inward remittances of money which Kerala receives from her sons and daughters working in far-off places to their native state.

Migration of Keralites and the Inward Remittances

Kerala became the scene of an altogether new form of development since the closing decades of the nineteenth century. Keralites who were till then contented themselves with meeting the bare needs of life and who were regarded as a stay at home people, started to move to distant lands in search of better economic prospects. The number of Malayalam speaking people living in other parts of India totaled only 30,569 in 1901.²² By 1991, it went up to 21.98 lakh, recording an increase of more than 6464 percent since 1901 apparently on account of migration.²³ Side by side, Keralites also started to move to foreign lands like Malaysia, Myanmar, Sri Lanka, and so on. With the opening of the oil-rich Gulf countries as a haven of immigrants from different parts of the world since 1970s emigration of Keralites to foreign lands also assumed massive proportions. It is estimated that nearly 14 lakh Keralites have congregated in various countries in the Gulf region by 1990.²⁴ In addition, the US has become another attractive haven of emigrants from Kerala. Nearly 1.5 lakh immigrants from Kerala are believed to be working in various kinds of occupation in the US by the end of the second millennium.²⁵ Furthermore, hundreds of thousands of Malayalees serve in various European countries, in Canada, Australia, and so on. The Malayalee migrants did not fail to send a portion of their earnings to their kith and kin in Kerala from the formative days of migration. The volume of such remittances was not large in size in those days. It began to swell with the large scale migration to the Gulf since 1970s.

The difficulty with the remittances is the absence of accurate data on the exact volume of money reaching Kerala. One has naturally to rely on the estimates and findings of private researchers. According to Deepak Nayyar, the remittances, from the Gulf countries accounted for 25 percent of the State Domestic Product during 1980s.²⁶ According to the estimates of another authority, the inflow has been around 20 percent of the SDP since 1990.²⁷ Based on a survey, Zachariah estimates the remittances from the Gulf countries at Rs 13,899 crore in 2000. As per this estimate the total remittances from all the countries including the Gulf amount to Rs 15,192 crore.²⁸

It is these remittances which provide the much needed financial resource for meeting the growth of the tertiary sector in Kerala. Apart from facilitating the growth of trade and transport, the remittances boosted the banking sector as a whole in Kerala by providing funds for depositing huge amounts of money including NRE deposits. The NRE deposits alone accounted Rs 30,671 crore in 2006 out of a total deposit of Rs 77,677 crore in the state. In 2006, the per capita bank deposits in Kerala amounted to Rs 23,323—against only Rs 19,130 in the country as a whole. Only in the Punjab, Haryana, Maharashtra, and Gujarat, the per capita bank deposit is higher than that of Kerala.²⁹ Not only in respect of bank deposits but also in banking facilities, Kerala stands foremost among the states in India, Kerala which accounts only for 3.1 percent of the population and 1.2 percent of the land area of the country accounts for 5.5 percent of the branches of banks. With the spurt in the bank deposits and banking facilities, banking sector could grow as an important sub-sector of the tertiary sector. The other sub-sectors are also either directly or indirectly connected with remittances. Significantly, almost all the activities relating to the tertiary sector started to expand with the increase in the inward remittances.

Similarly, construction is a major activity in Kerala, which now accounts for more than 15.87 percent of the SDP against only 7.96 percent in the country as a whole. In no other state, the contribution of the construction sector in the State Domestic Product is as much as in Kerala. However, most of the materials like timber, sand, cement, steel and other materials are imported from areas outside Kerala. With the construction boom ownership of dwelling houses, another sub-sector of the tertiary sector, contributes proportionately a larger share of the State Domestic Product in Kerala than in other states.

How the Remittances Sustain the Kerala Model of Development

However, what the remittances render to sustain the Kerala model of development is far more significant than that of merely financing of the tertiary sector. The Kerala model as we have seen encompasses a striking performance in raising the living standards of the people and in providing access to basic facilities without a corresponding improvement in the performance of the economy. As seen earlier, both agricultural and industrial sectors have been displaying signs of stagnation. Thus there is an apparent contradiction in the pattern of development. However, the stagnation in the basic sectors is being compensated by the spurt in the various sub-sectors of the tertiary sectors.

The tertiary sector in turn is being propped up by the remittances. In so doing, the remittances are able to sustain the Kerala model of development.

Nevertheless, some proponents of the model maintain that the improvement in the living conditions of the population at large and that of the poor section in particular are primarily due to the redistribution of income and wealth brought about by the organized strength and militant activity of the poor people. They even claim that the achievement “without having to wait for large scale economic growth” has to be considered as an alternative development strategy.³⁰ The implication is that the Kerala model, encompassing improvement in the living standard with redistribution can be emulated as an ideal. In this connection, the question is how far such a contention is valid?

Kerala had a lead over the rest of India, even during the pre-independence period in such social indicators like literacy, health care, etc. It was due primarily to the enlightened policies pursued by the rulers of the princely states of Travancore and Cochin. The Christian institutions also played a significant role in those fields. However, in various criteria of economic development, Kerala was lagging behind the all-India level for a long period. Kerala began to surpass the all-India level in economic growth only in the 1980s, perhaps later. In the case of per capita income, Kerala was in fact lagging behind the all-India level till the end of 1980s. Between 1970–71 and 1985–86 the increase in per capita income for instance was from Rs 594 to Rs 636 in Kerala against Rs 718 to Rs 798 for the country as a whole.³¹ As stated earlier, the per capita income of Kerala could surpass the all-India level only since 1993–94.³² In the case of per capita bank deposits, another indicator, Kerala was lagging behind the all-India level even in 1970s, though she had a lead in the developing of banking system as a whole. Per capita bank deposits of Kerala began to rise above the all-India level only since 1978.³³ Similarly, the incidence of poverty also began to decline only since 1980s. In 1977–78 the people below the poverty line accounted for 48.4 percent in Kerala against the all-India level of 48.3 percent. Since then, as already stated the percentage of the people below the poverty line in Kerala started to fall far below the all-India level.³⁴ Furthermore, construction which accounted for only 1.78 percent of the SDP in 1974–75 against 3.84 for the country as a whole has emerged as the second largest economic activity in Kerala. All those developments ensued since 1970s only when remittances began to surface on a significant scale and not earlier. Evidently, the conditions of affluence and

improvement in the living standards discernible in Kerala should be attributed by and large to the inflow of income from outside and not to the growth of income or wealth arising from the productivity activities within the state.

The rise in income accruing in Kerala on account of the inflow of remittances seems to be far more powerful than the political activities or agitations in improving the living conditions of the poor people in Kerala for many reasons. First, a large number of the households which receive remittances are poor by all standards. The remittances form the only source of income for meeting the household consumption needs. At the same time, not less than one fourth of the households in Kerala receive remittances from their kith and kin in far away places. The earnings of most of such poor people get enhanced with the remittances and naturally they will be able to improve their living conditions. Second, the spending pattern of the migrants creates the conditions of affluence in the state. As a class, the migrants are people motivated with expansive sets of wants and they set off to far away places for securing the means to lead a comfortable living. In turn, the purchase of sophisticated consumer durables, construction of posh buildings, etc., have become the main pattern of places. The earnings of most of such poor people get enhanced with the remittances and naturally they will be able to improve their living conditions. Second, the spending pattern of the migrants creates the conditions of affluence in the state. As a class, the migrants are people motivated with expansive sets of wants and they set off to far away places for securing the means to lead a comfortable living. In turn, the purchase of sophisticated consumer durables, construction of posh buildings, etc., have become the main pattern of expenditure. Some of them spend the money for those various purposes in a lavish manner also. Inevitably, conspicuous consumption has become a fait accompli with such a pattern of expenditure. Needless to say, a portion of the money thus spent trickles down among the poor people also.

At the same time, increase in the rate of wages is one of the factors which ensures a better redistribution and thereby promotes the improvement in the living conditions of the poor people. The construction boom which ensued with the inflow of remittances calls for a large number of workers in the construction activities. At the same time, the ranks of the migrants to the Gulf countries include a large number of construction workers. Shortage of workers became inevitable. Wage rates in the construction sector naturally rose very high. With the construction boom what happened in Kerala has been the

immigration of workers from other states on account of the wage rise and shortage of labor here.³⁵ Needless to say, such shortage of workers and high wage rates in the rural areas contributed not only to the improvement in the living conditions of the poor sections but also to the reduction in the incidence of poverty.

Nevertheless, political activities and labor militancy for which Kerala is famous would have been helpful in the redistribution of income at a quicker pace. However, such militant behavior has also been instrumental in promoting the organized labor as a dominant pressure group in Kerala with least regard to commitment for duty. They could definitely make gains by resorting to agitations. However, their militancy has been very harmful to the long term interests of the state, the industrial development of the state has become the main casualty of this militant behavior. According to the findings of a study, "labour unrest has been a major factor responsible for the entrepreneurial migration from Kerala".³⁷ An entrepreneurial upsurge needed for the development of industries could not grow in Kerala due to the agitated approach of labor over the years. Actually, militancy has been directly responsible for redistribution only in the case of headload workers. Their militant behavior became a highhanded one and the state government was compelled to rein their activities through legislation. Even their success in getting a better share has been due to the increased flow of income through remittances.

Conclusion

The Kerala model of development characterized by the display of various indicators of affluence on the one hand, and the stagnant conditions in the basic activities of the economy on the other, has the appearance of an anomalous situation. However, the remittances which the sons of Kerala send to their kith and kin from far-off destinations resolve the seeming anomaly by providing the material resources needed to sustain the buoyant tertiary sector despite the stagnation of the agricultural and industrial sectors, the two basic economic activities. In so doing, the remittances provide the means for improving the standard of living of the people of Kerala and for transforming Kerala into an affluent state.

Nevertheless, some exponents of the model claim that the sustained political activities and militancy of the organized labor facilitate the equitable redistribution which is crucial for the improvement in the living conditions of the poor sections of the population. However, it is the magnitude

of the remittances and the pattern of expenditure thereof, rather than militancy per se that act as far more powerful factor in the whole process. At the most, what militancy does is to accelerate the ongoing process of redistribution of income accruing through remittances. However, behavioral pattern of the labor in Kerala, which quickens the redistribution of income does not promote the long term economic growth of the state, notwithstanding the semblance of maturity exhibited by them during recent years, as the legacy of the militancy seems to persist like the "evil that men do lives after them."

However, the sustenance of the Kerala model through remittance creates some sort of a paradoxical situation in so far as the migrants are concerned. They, who are accustomed to maintain a stubborn individuality and occasionally exhibit militant posture in Kerala, are very often found themselves employed in various kinds of disgraceful occupations under foreign masters. Exploitation and ill-treatment are rampant in many cases. Furthermore, the model appears to be an artificial one with very little chance for endurance in the long run as the economic base at home is very weak. There is no certainty that the remittances which enrich the Kerala economy would continue for ever. Naturally what is needed is timely action to make use of the remittances for strengthening the economic base at home. The political leaders and policy makers should strive to evolve suitable measures for utilizing the remittances for this purpose, instead of pursuing populist policies and stage managed development programs. Otherwise, the bright future which the model projects, may crumble down like a castle built on sand.

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To the generous mind, the heaviest debt is that of gratitude when it is not in our power to repay it.

— Benjamin Franklin

Foreign Direct Investment in the Indian Express Delivery Sector: Experiences of UPS, FedEx, DHL, and TNT

Subrata Mitra, Arpita Mukherjee, Parthapratim Pal, and Souvik Dutta

Globalization, increased trade volumes, and foreign direct investments (FDI) have led to the growth of express delivery services (EDS). The Indian EDS sector, one of the highest growing sectors and worth \$1.7 billion, employs close to 1 million people. The current article highlights the problems and prospects of FDI in the Indian EDS sector and documents the experiences of the top four global EDS companies—UPS, FedEx, DHL, and TNT—in investing and operating in India based on primary and secondary sources of information. Finally, a summary of observations is presented with concluding remarks.

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Introduction

With globalization, removal of tariff and non-tariff barriers and opening up of economies in many erstwhile conservative countries, the worldwide trade of merchandise and services, and FDI have multiplied manifold in the last few years. The process of globalization has especially benefited the fast developing countries such as India and China. The worldwide merchandise trade in the past decade has increased from \$5.4 trillion in 1999 to \$12.2 trillion in 2009. The share of developing countries in the worldwide merchandise trade has increased from 30 percent in 2003 to 38 percent in 2008. In 2009, China overtook Germany and became the leading exporter of goods with a global share of 9.6 percent and second largest importer (after the USA) with a global share of 8 percent. The worldwide services trade has also seen a significant growth in the past decade from \$1.4 trillion in 1999 to \$3.3 trillion in 2009. India and China are now among the top 15 exporters of services. In fact, both these countries have witnessed a growth rate in services trade, which is much higher than the global average. In 2009, China ranked as the 5th largest exporter of services with a global share of 3.9 percent and 4th largest importer of services after the USA, Germany, and the UK. The same year, India ranked as the 12th largest exporter and importer of services with a share of 3.8 percent and 2.4 percent, respectively.¹

Global FDI, on the other hand, was as low as \$200 billion in 1990. It peaked up to about \$1.4 trillion in 2000 and reached an all-time high figure of about \$2 trillion in 2007 before declining to \$1.7 trillion in 2008 and a little over \$1 trillion in 2009 as a result of the global financial and economic crisis. The share of the developing countries of

¹ <http://www.wto.org>

the global FDI in 2009 was 39 percent.² FDI inflows into India and China increased from \$0.2 billion and \$3.5 billion, respectively, in 1990 to \$41.2 billion and \$147.8 billion, respectively, in 2008 before declining to \$34.6 billion and \$78.2 billion, respectively, in 2009.^{3,4} While the global FDI increased at a compounded annual growth rate (CAGR) of 8.84 percent during 1990–2009, for India and China, FDI inflows increased at a CAGR of 31.16 percent and 17.76 percent, respectively, during the same period. The shares of global FDI inflows into India and China also increased from 1 percent and 1.75 percent, respectively, in 1990 to 3.46 percent and 7.82 percent, respectively, in 2009.

With increasing trade in merchandise and services and cross-border investments, shipping has assumed a lot of significance in terms of on-time delivery of consignments and reliability of service. More and more companies around the world are now relying on third parties for providing shipping and transportation services while themselves focusing on their core competencies. Different forms of delivery services have emerged such as logistics, express, and courier services, which can be distinguished based on the size of consignments, time taken for delivery, modes of delivery, means of transport used, types of services offered, etc. While logistics primarily refers to transportation, warehousing, freight forwarding, customs clearance, third-party logistics (3PL), fourth-party logistics (4PL), supply-chain management, and other value-added services, the distinction between courier and express, however, is not very clearly defined. Courier mainly refers to the delivery of low-weight, low-value, non-critical documents and low-end services whereas express refers to the delivery of relatively high-value, critical, time-sensitive documents (correspondence, bills, tenders, reports, certificates, etc.) and non-documents (books, CDs, samples, gifts, etc.) and value-added services. EDS is often distinguished from courier and ordinary mail services in terms of door-to-door convenient pick-up and delivery, time-bound and reliable service, safety and security of consignments, track and trace facilities, proof of delivery, and 24/7 call centers for handling queries.

Two major characteristics of EDS that differentiate it from logistics services are the size of consignments and the speed of delivery. Express consignments are generally smaller in size than ordinary cargo or freight to be shipped by logistics service providers. While ordinary international

cargo is shipped by sea, express consignments are shipped by a mix of air and surface transportation modes to reach any global destination within 24–72 hours. Most low-weight, high-value items and niche products are transported through EDS rather than as ordinary cargo. Air cargo including express consignments accounts for 5 percent by volume but 35–40 percent by value of total international shipments via all modes (Oxford Economic Forecasting, 2009).

EDS originated in the USA in the late 1960s and flourished with the deregulation of air cargo in the 1970s. EDS became global in the 1980s with the growing need of just-in-time deliveries with increased speed and reliability. Today, EDS has become a key component of the international trade. In developing countries like India, EDS has been present for long but had seen a high growth in the post-liberalization period with increased global integration, entry of multinationals, liberalization of transport, among others. It is experienced that EDS is particularly important for countries that are geographically separated from their large markets. Two of India's major markets—the USA and EU—are located at a distance and therefore EDS is crucial for serving those markets ensuring speed of delivery. According to a recent global survey (Oxford Economic Forecasting, 2009) of users of EDS, while in Europe around one-third of companies frequently use the express mode to send products to customers, in Brazil and India, almost half of the companies frequently use this mode for sending products to customers. Around 50 percent of the Indian respondents say that EDS is important for them to compete in both domestic and international markets and around 40 percent respondents say that they will lose one-third of their orders if international EDS is no longer available. This clearly highlights the importance of EDS for Indian companies.

The current article explores the issues in FDI in the Indian express sector based on primary and secondary sources of data. Primary data was collected by administering structured survey questionnaires to EDS company respondents and conducting open-ended, face-to-face interviews with EDS company personnel whereas secondary data were collected from company websites and various reports and articles available in hard copy or on the Internet. EDS in India is one of the fastest growing sectors. However, in order to sustain the growth rate of this sector, more private and foreign investments are

²<http://www.wto.org> and <http://www.unctad.org>

³<http://www.wto.org> and <http://www.unctad.org>

⁴<http://www.worldbank.org>

necessary. We discuss the major issues that multinationals face in investing and operating in this sector. We also highlight the key initiatives that the Indian government has already taken and should take in the immediate future to remove the roadblocks and make this sector more attractive for investments. In this context, the experiences of the top four global EDS companies in investing and operating in the Indian express sector are noted. The article is organized as follows. The next section provides an overview of the global and Indian express industries. The next section highlights the issues faced by multinationals in investing in the Indian express sector. Then the experiences of the top four global EDS companies—UPS, FedEx, DHL, and TNT—in investing and operating in India are presented. Finally, the summary of observations and conclusions are drawn.

Overview of Global and Indian Express Industries

The global express industry is one of the fastest growing industries in the world. The service providers are mostly private with postal departments in many countries (India Post in India, Royal Mail in the UK, La Poste in France, etc.) also providing EMS in the form of speed post, business post, etc., along with ordinary mail services. However, EDS is a value-added service which government-owned postal departments, normally operating in a limited geographical network, cannot match, and hence EDS companies command a higher market share than postal departments. Some of the EDS companies such as DHL and TNT also provide mail services in their respective countries. Besides a few large EDS companies, there are numerous small- and medium-sized operators whose activities are limited to niche areas. Since competition is ever-increasing and there is growing pressure on margins, of late a lot of consolidation activities have been witnessed in the EDS sector globally. The users of EDS represent almost all the industries/sectors. However, the major users are from the manufacturing, engineering, automotive, hi-tech, retail, IT/ITeS, telecommunications, pharmaceuticals, banking, and financial services sectors.

According to a report (Oxford Economic Forecasting, 2009), global express revenues were \$175 billion in 2008, up from \$130 billion in 2003 registering a CAGR of 6.13 percent. The four largest EDS companies, UPS, FedEx, DHL, and TNT—arranged in the decreasing order of EDS revenues generated by them—accounted for \$125 billion or 71.43 percent of global express revenues in 2008. The USA represents the largest market contributing \$76 billion in 2008 with a market share of 43.43 percent, followed by

Europe and the Asia-Pacific region accounting for \$49 billion and \$42 billion capturing market shares of 28 percent and 24 percent, respectively, in the same year. The USA, Europe and the Asia-Pacific region together control 95 percent of the global express business with the Asia-Pacific region experiencing the highest growth rate of 9 percent per annum among all the regions. Also, a significant amount of express deliveries are originated in and confined to intra-continentals and trading blocs. For example, out of \$175 billion global express revenues realized in 2008, \$110 billion was contributed by express deliveries originated in and confined to intra-North America and intra-EU trading blocs. On the other hand, intra-Asia EDS business accounted for \$32.9 billion in 2008 mainly because the major markets for the Asian countries are the USA and EU. Although, intra-Asia trade is still at a low level, it is growing at a fast pace.

Apart from contributing to the GDP of a country, EDS is also an employment generator, providing direct employment to 1.3 million people globally in 2008, and if indirect employment is also factored in, 2.75 million people were engaged in EDS, directly or indirectly, in 2008. According to an estimate (Oxford Economic Forecasting, 2009), direct and indirect employments in EDS are going to reach 1.8 million and 4.5 million, respectively, in 2018.

The global EDS industry is facing a few major problems that are a cause for concern and may impede its growth. First and foremost is the unfair competition that it has to encounter from the government-owned postal departments in terms of government support, subsidization, and differential treatment. In many countries, EDS companies cannot charge competitive prices for consignments below a certain weight that are the exclusive privilege of the postal departments to protect them from private and foreign competition. In order to operate in this weight category, private and foreign players have to charge a specific price—multiple many times over the ordinary postal charges making the prices extremely uncompetitive. Moreover, there may be weight and volume restrictions for foreign players, which may put them at a disadvantage vis-à-vis domestic players. In many countries, there are restrictions on FDI in the EDS sector. Foreign players may be permitted in the international shipment segment, but may not be allowed to carry domestic shipments for which they have to enter into sales agreements with domestic players. Even if FDI is allowed, foreign players may have to enter into joint ventures with domestic players and 100 percent FDI is ruled out jeopardizing the end-to-end control over the

delivery of consignments which is of utmost importance to time-bound EDS. In addition, restrictions may be imposed on the ownership of domestic airlines and surface transportation modes. The other major problems that EDS companies experience are lengthy and cumbersome customs procedures, delays caused by heightened security concerns, bureaucracy and non-transparency of rules and regulations in many developing countries, and inadequate and restrictive ground handling facilities at many airports. Since EDS makes significant contributions to a country's economy and also generates employment, barriers to its growth should be gradually removed and procedures made simple to further fuel the growth of this sector.

The Indian EDS sector, although 30 years old, is still in its infancy. The first authentic source of information on the Indian EDS sector is the CARE report (CARE, 2006). According to this report, the sector generated \$1.5 billion worth of revenues in 2005–06 growing at an average rate of 20–25 percent per annum. The sector is fragmented with about 2,500 players most of which belong to the unorganized sector; only a handful (20–30) of players belong to the organized sector, who control the majority of the market. The Indian postal department (India Post) also provides EDS through EMS capturing 13 percent market share. The sector provides direct and indirect employments to close to 1 million people. The prospect of the Indian express sector is very promising since the Indian GDP is growing at a rate close to 8 percent (even in the recession year, 2008, when most of the developed countries experienced negative GDP growths, India's GDP grew by more than 5 percent),⁵ second only to China among the top countries in terms of GDP, and there is a direct link between the economic growth and the growth of EDS in a country (Data for several countries show that the growth of the EDS sector is roughly 2–2.5 times the GDP growth for a country).

The authors of the current article conducted a survey of EDS providers in India in 2008. It was observed that about 14 percent of the respondents contributed more than 76 percent of the net revenues realized by all respondents in 2007–08 confirming the fragmented nature of the Indian EDS sector. From the financial data collected from the respondents, it was estimated that the Indian EDS sector was worth about \$1.7 billion in 2008 growing at a CAGR of about 16 percent (conservative estimate as a consequence of the global

economic crisis). The respondents identified poor rail/road/airport infrastructure, bureaucratic procedures, lengthy and cumbersome paperwork at state borders and at airports for customs clearance, non-uniform tax structures, levy of toll tax and octroi⁶ (which India Post is not required to pay for EMS and hence is at a competitive advantage), restrictive government policies, high costs of operations and low margins as some of the major problems faced by them. On the other hand, sustained GDP growth, infrastructure development, favorable government policies, globalization and FDI in EDS and other sectors were seen as the facilitators for growth of the sector. For more details on the survey, readers may refer to Mitra et al. (2009, 2010).

Foreign Direct Investment in the Indian Express Delivery Sector

India's economic liberalization process began in the early 1990s, and so did the flow of FDI into India. As already mentioned, FDI inflow into India increased from a mere \$200 million in 1990 to about \$35 billion in 2009. Different sectors have different FDI restrictions. However, 100 percent FDI is allowed in EDS. The top four global players—UPS, FedEx, DHL, and TNT—have their presence in India for many years. The initial strategy of foreign players to enter the Indian market was through forming alliances with local players. Gradually, to increase their presence, foreign players took the direct investment and acquisition routes. As a result, a lot of investments are going into the creation of infrastructure and the acquisition of local players to augment the breadth of service offerings and the depth of delivery networks. Like other players, foreign players are also facing some major problems in this sector. Problems more specific to them are differences in cultures, traditions, rules, regulations, policies, and procedures in different countries of their operation, restrictions on inbound and outbound flight timings and ownership of domestic airlines, complicated customs clearance, poor airport infrastructure and unfavourable ground handling policies (limiting the number of ground handlers for security concerns and proper capacity utilization in contrast to allowing self ground handling by EDS companies). However, sustained economic growth, government investments in infrastructure, policies conducive to the growth of the sector, globalization, and increasing imports and exports are also seen as the prospects for the sector.

One contentious issue for foreign players is the proposed Indian Post Office (Amendment) Bill, 2006, which,

⁵<http://www.worldbank.org>

⁶A form of tax levied by the local authority

if implemented, will limit FDI to 49 percent in the sector, reserve "letters" below 300 gm (or 150 gm as per updated information available) exclusively for India Post, require EDS companies to register and pay a one-time registration fee, and charge EDS companies 10 percent of their annual revenues as compensation for India Post's universal service obligations (USO).⁷ According to EDS companies, these steps mooted by India Post are anti-competitive and retrograde. When other sectors are gradually being liberalized and negotiations with WTO are on, limiting FDI to 49 percent will not only compel many foreign players to realign their equity structures, but create a negative impression about the country's FDI policy, especially when the top foreign players—UPS, FedEx, and DHL—are pursuing vigorous expansion plans in another Asian country, China (Armbruster, 2005). Also, it is a fact that many developed countries do provide their respective postal departments with exclusive rights to carry letters below a certain minimum weight, say 50 gm; however, they allow private and foreign EDS companies too to carry letters below the designated weight albeit at a price-multiple, say between 2.5 and 4 times the price charged by the postal department for the minimum weight slab. In a few years' time, even these restrictions will have to be lifted as per WTO agreements and it will be a free market for all competitors. Registration fees and USO charges exist nowhere in the developed world. EDS companies contend that while the sector contributes about \$1.5 billion to the GDP, pays the exchequer over \$200 million annually in the form of various taxes and generates direct and indirect employment of 1 million people, implementation of the Indian Post Office (Amendment) Bill, in its current form, will not only wipe out many courier and EDS companies and thousands of jobs, but also affect service quality and India's competitiveness in the global marketplace (Mitra et al., 2009).

Following are the case studies on the top four global EDS companies—UPS, FedEx, DHL, and TNT—and their experiences in the Indian EDS sector.

UPS

Founded as United Parcel Service, Inc. in the USA in 1907 as a messenger company, UPS, headquartered in Atlanta, Georgia has grown into the largest express and package-delivery company in the world. UPS is also a leading provider of specialized transportation, logistics, capital and

e-commerce services, serving 7.9 million customers (1.8 million pick-up and 6.1 million delivery) daily in more than 215 countries and territories. Today, UPS employs 408,000 people worldwide with 340,000 in the USA and the remaining 68,000 in other countries. In 2009, UPS generated revenues of \$45.3 billion out of which \$37.9 billion was contributed by the express business. UPS has a fleet of 95,244 package cars, vans, tractors, and motorcycles, including 2,022 alternative-fuel vehicles, 1,801 operating facilities, and 12 air hubs, 6 of which are in the USA. It has a fleet of 238 company-owned aircraft (216 in service) and 296 chartered aircraft serving 388 domestic airports and 378 international airports.

UPS was the first package-delivery company to serve every address in the 48 contiguous states in the USA. With growing demand for faster service, UPS entered the overnight air delivery business, and by 1985, UPS Next Day Air service was available in all the 48 states and Puerto Rico. UPS received authorization from the Federal Aviation Administration (FAA) to operate its own aircraft, thereby officially becoming an airline. Today, UPS Airline is one of the 9 largest airlines in the world. UPS first went international in 1975 when it extended its services to Toronto, Canada. In 1985, UPS started international air services between the USA and 6 European countries. In 1989, domestic air services in Germany were added. Since then, UPS has continued to expand its services worldwide, especially in Europe, Asia, and Latin America. UPS Asia-Pacific, headquartered in Singapore, serves more than 40 countries and territories with 13,604 employees, 2,111 vehicles and 302 operating facilities. UPS operates 23 aircraft in the Asia-Pacific region with 3 air hubs in Shanghai, Shenzhen, and Hong Kong. With Asia-Pacific identified as the primary growth market, UPS in 2005 launched the first non-stop delivery service between the USA and China. The same year, UPS acquired direct control of its international express operations from its partner Sinotrans in 23 locations across China covering 200 cities and introduced domestic express services for select customers on a contractual basis. Since then, UPS has continued to expand its network and service offerings to the whole of the Asia-Pacific region.⁸

Although UPS had entered India in 1988, it did not have major footprints until 2000 when it formed a 60:40 joint venture with Jetair Ltd, India's largest General Sales Agency (GSA), to provide international express delivery services in India. When asked about their mode of entry

⁷<http://www.eiciindia.org>

⁸<http://www.ups.com>

and operation in different Asian markets, Steven R. Okun, Vice President (Public Affairs), Asia—Pacific, UPS said,

We primarily follow three models, namely wholly owned subsidiary, joint venture and agent operation that covers strategic alliance, franchisee, local agency etc. If the country is large, it makes sense to invest in wholly owned subsidiaries (WO) or joint ventures (JV). Often the choice between WO and JV depends upon the government policy. Generally we start with JV and gradually move into WO. In Asia, we primarily operate through the agency model in smaller countries. For bigger Asian countries, we start with local agencies with a view to move into a JV subsequently, but sometimes take a long time to enter into a JV such as with Jetair Ltd. in the case of India.

Jetair Ltd was established in 1974 and today it represents the express and freight business of 18 international airlines through associate GSA companies such as National Travel Service, International Cargo Carriers Pvt. Ltd and France Air Ltd. Jetair also represents one of the country's most preferred domestic airlines, Jet Airways. When asked about their Indian operations and why they chose Jetair, Steve pointed out that foreign companies are not allowed to own airlines in India and Jet Airways has an extensive network. The joint venture, called UPS Jetair Express Pvt. Ltd and headquartered in Mumbai, offers Indian customers cost-effective shipping solutions, including the export and import of express documents and packages, throughout more than 200 countries and territories that UPS serves worldwide. UPS Jetair employs 800 people and has a fleet of 175 vehicles comprising trucks, vans, and bikes. The company operates through its own network and also involves agencies in some cases. Its major clients in India include companies from the garments, textiles, engineering, and manufacturing sectors. Although the company incurred losses in the initial years of its operations, it has now turned into a profitable company.⁹

When asked about the Indian Post Office (Amendment) Bill, Steve said,

The Indian Postal Law dates back to 1898. There is confusion regarding the definition of 'letter' and what courier companies can and cannot carry. The purpose of according monopoly to postal departments is to allow them to meet their USO. Like in the USA and EU, India should also introduce price-multiples and weight restrictions. As long as you charge more than India Post for the basic product, you should be allowed to stay in the market. Price-multiple leads to market segmentation in the sense that customers are willing to pay more for the facilities offered by courier companies like on-time delivery, tracking and in that sense ordinary post and courier are different products.

As far as the proposed ground handling policy is concerned, Steve said that UPS did not mind to engage an independent handler instead of self-handling for security and capacity concerns.

Self-handling only applies to own aircraft. If you do not have enough cargo/flights, there is no point in doing self-handling. In a very few Asian countries (China, Japan and Philippines), we do self-handling. However, the ground handling charges should be competitive for engaging third-party handlers.

With reference to customs, Steve opined that it was the biggest problem UPS faced in India. However, despite all these problems, he also saw a lot of opportunities in the Indian market.

UPS has inculcated its global human resource best practices in India. It has introduced different kinds of mandatory training programmes for the staff of UPS Jetair. UPS India has also shouldered corporate social responsibility by contributing volunteer hours to community service with primary areas of focus being the environment, community safety, public health and hygiene, malnutrition, lack of medical attention, economic and global literacy and diversity.¹⁰ UPS has also built state-of-the-art computer labs with internet access via satellite in some of the remote Indian villages to provide connectivity to the world.¹¹ Every year, UPS donates over \$100,000 to several Indian NGOs for rendering social service such as spreading literacy among the underprivileged children and youths.¹²

⁹<http://www.ups.com/in>

¹⁰"UPS India delivers over 3,500 volunteer hours to Indian communities" (9 November, 2009) available at http://www.ups.com/content/in/en/about/news/press_releases/11_09_2009_India.html

¹¹"UPS delivers opportunities to rural India" (19 November, 2006) available at http://www.ups.com/content/in/en/about/news/press_releases/1227b2006.html

¹²"UPS awards over \$100,000 in grants to four Indian NGO's" (15 December, 2006) available at http://www.ups.com/content/in/en/about/news/press_releases/12272006.html

As far as technology is concerned, UPS has deployed its industry-leading Delivery Information Acquisition Device (DIAD) in India for enhanced customer service experience. The DIAD hand-held data collector digitally captures customer signatures and package information. UPS drivers use the DIAD to record, store, and transmit package information, helping UPS and its customers keep track of shipments and verify deliveries on a real-time basis. UPS Jetair has also introduced technology-based tools, TradeAbility and Quantum View Manage, to enable small and medium enterprises (SME), which are generally at a disadvantage in terms of accessibility of information compared to their bigger counterparts, to access a host of information online to extend their global reach.¹³

UPS is committed to the Indian market. Since its joint venture with Jetair Ltd, UPS has continuously expanded the existing facilities and created new facilities. In 2007, UPS opened a new operations centre in Tirupur, a small town in the state of Tamil Nadu accounting for 90 percent (\$900 million) of India's cotton knitwear export. The 2,300 sq. ft facility has an expanded package sorting capacity and provides convenient access for factories to export their products globally.¹⁴ In 2008, UPS Jetair entered into a commercial alliance with AFL Pvt. Ltd to expand accessibility of UPS services in India while providing export capabilities to AFL. While UPS Jetair continued to operate as an international express delivery service provider connecting India with the global marketplace, AFL continued to function as a domestic service provider connecting businesses across India.^{15,16} Since the alliance with AFL, there were talks that UPS Jetair might acquire AFL.¹⁷ However, with the announcement in November, 2010 of FedEx acquiring AFL, the alliance between UPS Jetair and AFL will naturally have to be called off (more about AFL and its takeover by FedEx is given in the FedEx case below). Despite the impending broken tie with AFL, UPS Jetair will continue its aggressive expansion plan for further penetration, and is also committed to offering more services and bringing in more technology in support of its operations.

FedEx

FedEx was founded as Federal Express in 1971 in the USA. It started operations in 1973, and was incorporated as FedEx in 2000. FedEx, which is the first express delivery company to introduce overnight shipments and to have its own fleet of aircraft, has its headquarters located in Memphis, Tennessee, and it serves every zip code in the USA and more than 220 countries and territories. FedEx employs more than 140,000 people worldwide and handles approximately 3.5 million packages and 11 million pounds of freight daily on an average. FedEx with its fleet of 664 aircraft serves more than 375 airports worldwide. FedEx deploys 41,000 motorized vehicles for surface transportation. It has 1,057 operating facilities with 676 in the USA and the rest 381 outside the USA, and 10 air express hubs with 7 in the USA and the remaining 3 outside the USA.¹⁸ In 2009, the express business of FedEx generated \$22.4 billion of revenues out of \$36 billion of revenues for the entire FedEx Corporation.¹⁹

In the Asia-Pacific region, headquartered in Hong Kong, China, FedEx serves almost all major cities in more than 30 countries and territories with more than 14,000 employees. Among the major hubs that FedEx operates outside the USA, one is located in Guangzhou, China, which was set up in late 2008. FedEx became the sole USA-based express service provider with aviation rights to China in 1996. In 2004, FedEx received additional rights from the USA government to fly cargo aircraft to and from China. FedEx continues to increase flights to China, providing access to more cities across the country and throughout the Asia-Pacific region than any other global express provider. In 2007, FedEx introduced domestic express services within China.

FedEx entered the Indian market in 1984 in alliance with Blue Dart. However, the relationship got strained around 1997, when FedEx set up its direct presence in India, since as per the contract, Blue Dart was not allowed to use its fleet of aircraft and surface transportation to carry freight for FedEx's major competitors including UPS, DHL, and

¹³"UPS Jetair Express unveils tech-based tools for SMEs" (The Hindu Business Line, 13 May, 2005) available at <http://www.thehindubusinessline.com>

¹⁴"UPS opens operations centre in Tirupur, India" (1 June, 2007) available at http://www.ups.com/content/in/en/about/news/press_releases/0822a2007.html

¹⁵"UPS Jetair, AFL tie up for UPS' delivery services (Business Standard, 29 November, 2007) available at <http://www.business-standard.com>

¹⁶"UPS at your doorstep from Jan 1" (the Economic Times, 8 December, 2007) available at <http://economictimes.indiatimes.com>

¹⁷"UPS arm in talks to buy AFL for Rs 200 cr" (The Economic Times, 9 May, 2008) available at <http://economictimes.indiatimes.com>

¹⁸<http://www.fedex.com>

¹⁹FedEx Annual Report 2009 available at <http://www.fedex.com>

TNT. The relationship finally broke up in 2002 and Blue Dart was subsequently acquired by DHL in 2005 (details about DHL and Blue Dart follow in the DHL case below). Since its break-up with Blue Dart, FedEx operated in the Indian market in association with its domestic sales partner Prakash Airfreight Pvt. Ltd (PAFEX) until 2007 when it acquired PAFEX. PAFEX, which started express operations in 1986, has more than 384 offices and depots serving nearly 4,400 destinations in every city in India. The acquisition of PAFEX gave FedEx instant access to every Indian city. PAFEX, on the other hand, got instant access to FedEx's extensive global network.²⁰ Today, with 150 retail outlets and 202 offices, FedEx employs 3,600 people in India and has a delivery fleet of over 300 vehicles along with a total of 16 weekly flights connecting India to the rest of the world.²¹

FedEx aims to partner India in its growth story by introducing products and services that will help Indian businesses compete with large global players. FedEx recently expanded its service portfolio in India and launched the FedEx International Economy service, which is both cost-effective and reliable. "We believe there is a clear demand for a service that lies between our premium International Priority express service and air cargo," said Hamdi Osman, Senior Vice President, FedEx Express Europe, Middle East, Indian sub-continent and Africa (EMEA). He also added, "Our International Economy service meets that need of customers and at the same time broadens the portfolio of shipping options that FedEx offers". The new service is primarily targeted at the Indian SME sector to provide them with a cost-effective solution that enables them to compete on a global platform. The role of SMEs has magnified gradually at the global level with SME exports contributing around 33 percent of India's total exports. With the FedEx International Economy service, these SMEs can now enjoy the convenience of door-to-door pick-up and delivery, including customs clearance at an economical price.

FedEx EMEA has developed unique solutions for different industries such as aerospace and aviation, automotive, fashion and luxury goods, healthcare and life sciences, and hi-tech. This specialized service has helped India's fashion industry to a great extent. FedEx International Priority Direct Distribution is a contractual service that allows the fashion and luxury goods industry (FedEx has the exclusive privilege to carry precious gems

and jewellery) and their partners to consolidate multiple pieces to multiple recipients in one shipment that clears customs as a single unit under one international airway bill. Once it is cleared, the shipment is electronically deconsolidated into individual packages for delivery to the respective destinations. FedEx in 2007 sponsored the 24th India Knit Fair (IKF) Spring/Summer collection 2008 held in Tirupur, Tamil Nadu. Organized by the Apparel Export Promotion Council (AEP) and Tirupur Exporters' Association, IKF is an event attended by leading garment exporters and importers from around the world. FedEx connects Tirupur with key global markets in 48 hours. The company also offers a suite of special packaging options for the fashion industry. In this edition of IKF, FedEx provided visitors with a unique opportunity to actually ship with FedEx at the fair itself.

In 2007, FedEx launched the FedEx Purple Club, an exclusive online club for its customers. The Purple Club, the first of its kind to be launched by an express company for its customers in India, allows customers to earn points every time they ship with FedEx. Customers can redeem reward points by choosing from a selection of more than 500 exciting gifts that are delivered to their doorstep. Jacques Creeten, Vice President, FedEx Express India, said:

FedEx strives to deliver an outstanding experience to all our customers, and the FedEx Purple Club is another step in that direction. We have created an online platform to help us get to know our customers better and to engage them in ongoing communications with FedEx – both rewarding and connecting with them. We are proud to have been able to deliver the first ever online loyalty programme in the express industry, and I am sure that the FedEx Purple Club will bring a revolution in customer relationship management within our industry.

FedEx has one of the best human resource management practices. In 2010, it has been ranked 22nd in the prestigious Great Places to Work (GPTW) survey in India, and is the only express company to feature in the top 25 of the GPTW survey. The annual GPTW survey is conducted by the GPTW Institute in association with *The Economic Times* and covers more than 400 companies across India. FedEx has been ranked amongst the top 25 companies for seven consecutive years, and was awarded the Platinum Award for Excellence in People Management

²⁰"FedEx Express announces acquisition of Indian express company PAFEX" (31 January, 2007) available at <http://news.van.fedex.com/node/5478>

²¹<http://www.fedex.com/in>

in 2007 for consistent rankings.²² "People are the cornerstone of FedEx's 'People-Service-Profit' philosophy," said Taarek Hinedi, Managing Director, Operations, FedEx Express. He also added, "We invest a significant amount of time and effort to gather feedback from our employees and ensure that appropriate measures are taken to address their concerns."

FedEx has also played its role in corporate social responsibility. Safe Kids Foundation, India's first childhood injury prevention organization and FedEx launched the Safe Kids Walk This Way programme with school children in Mumbai in 2007. This programme aims to educate child pedestrians and save lives. "Our effort with Safe Kids demonstrates our commitment to make a positive impact on the communities we serve. We have FedEx volunteers working to educate families, raise awareness and, in the end, save children from being injured or killed," said Jacques Creeten. In 2007, FedEx also organized a free eye check-up camp in Mumbai for children in association with an NGO working for the welfare of street children.

Like other global players, FedEx also faces a lot of constraints and barriers in the Indian express sector. One of the major constraints is customs clearance. According to Vimal Rawat, Manager, Planning, Engineering and OPS Support, FedEx India, there is a clear lack of knowledge/awareness among customs officers, who are stationed at the airports. Rawat said,

Customs officials are not well aware of the India-USA bilateral agreement—exemption of duties on consignments and aviation fuel in case of domestic transshipments (FedEx India has been engaged in international shipments only till recently), exemption of duties on material handling equipment imported by FedEx for self ground handling, valuation of 'samples' and 'gifts', list of dutiable and non-dutiable items, levy of duties etc. The duty structure is much complex with differential tariffs for different items. These tariffs and duties are not written down in a single document and there are thousands of notifications, which one has to go through. Also, customs laws and regulations are subject to interpretation by customs officials, which may vary from airport to airport.

Of late, Electronic Data Interchange (EDI) systems are being implemented at Indian airports to reduce

paperwork and speed up customs clearance. However, the EDI system is so complex that FedEx would not be able to fit in their systems and as a result their internal systems would need to be revamped at a huge cost. According to Rawat, "(The EDI system) will only automate the manual process, but will not expedite the entire process."

FedEx believes that the Indian government needs to treat the sector as a trade facilitator and not an industry in itself and form a separate panel for immediate actions. FedEx also thinks that restrictions on foreign ownership of airlines should be removed since having control over domestic movements of goods by air helps improve efficiency and delivery performance. According to FedEx, removal of restrictions will promote and encourage more foreign investments in the domestic cargo airline sector. In 2009, FedEx was also hit by the economic downturn, rising fuel prices and increased costs of operations, both globally and in India. FedEx is aggressively working to maintain service levels for the existing customers and win new customers by introducing various marketing campaigns across the globe. In India, FedEx has expanded its portfolio of services by launching broad-based economy services to outbound worldwide destinations.

FedEx sees a lot of opportunities in the Indian express sector in the coming years as exports are growing because of globalization and the increased competitiveness of Indian businesses, especially in the manufacture of automobiles, auto ancillaries, pharmaceuticals, hi-tech electronics, processed foods, textiles, etc.²³ So are the prospects of the express, and logistics, sector. This is further fueled by the huge investments being made to improve the country's infrastructure. This will also help FedEx foray into the Tier II and Tier III cities even better to expand its portfolio of services across the length and breadth of the country and foster economic growth in different parts of India. In order to strengthen its domestic network and penetrate the Indian market even more, FedEx, in November, 2010, announced the takeover of AFL Pvt. Ltd and its affiliate, Unifreight India Pvt. Ltd. Founded in 1945, AFL pioneered express services in India in 1979, and is a recognized leader in the transportation and logistics sector in India. AFL offers express services through more than 160 express service centers, 23 hubs, and 50 warehouses, serving more than 5000 zip codes across 144 cities in India. With the acquisition of AFL, FedEx will get ready access to the 20-year old network of AFL, including its warehousing facilities,

²²FedEx Express ranks among top 25 great places to work in India" (16 August, 2010) available at <http://news.van.fedex.com/node/16846>

²³FedEx expansion plans affirm commitment to Indian businesses" (16 August, 2010) available at <http://news.van.fedex.com/node/16845>

and its decent customer base. AFL, on the other hand, will have access to FedEx's global network, and enjoy an enhanced level of service, new service offerings and the adoption of global best practices.^{24,25}

DHL

DHL started its operations in 1969 from San Francisco, USA. Over the last four decades, DHL has grown into the largest logistics company in the world generating consolidated revenues worth over €46 billion in 2009. DHL is 100 percent owned by Deutsche Post World Net (DPWN), and it has four divisions—mail, express, freight forwarding, and supply chain.

The express division is headquartered in Bonn, Germany, which serves 120,000 destinations in more than 220 countries employing approximately 100,000 people, 62,000 vehicles, 11 aircraft, 6 major hubs, and 4,500 facilities. In 2009, DHL Express handled 842 million shipments, and generated revenues of about €10.3 billion.²⁶ While the global revenues, and revenues generated by Europe and Americas declined by 24.4 percent, 15.5 percent, and 58.6 percent, respectively, in 2009 over the previous year, the revenues generated (€3.63 billion in 2009) by the emerging markets such as the Asia–Pacific region, Eastern Europe, Middle East, and Africa declined by only 7.34 percent during the corresponding period.²⁷ Also, going by the interim Annual Report (January–September, 2010), while the revenues generated by the European markets declined by 3.9 percent, the revenues generated by the emerging markets, as defined above, increased by 28.02 percent over the corresponding period last year.²⁸ This is why DHL has focused on high-growth domestic express markets in the Asia–Pacific region, Latin and South America, India and China. Particularly in the Asia–Pacific region, DHL has invested more than €1.9 billion over the past few years to augment its infrastructure and create more air hubs. Among the 6 major global hubs that DHL operates, Hong Kong happens to be one that handles over 60 percent intra-Asia–Pacific processed cargo. In 2007, DHL announced that it would build a North Asia hub at

Shanghai International Airport in China for \$175 million scheduled to be completed by 2010. The facility would provide more regional connections for customers in the China and North Asia regions and intercontinental links to Europe and the USA. Across the Asia–Pacific region, besides Hong Kong, DHL also operates hubs in Singapore, Incheon (South Korea), Bangkok, and Sydney. No doubt, DHL's facilities and networks have catapulted it to the top position with 36 percent share in the international express market of the Asia–Pacific region in 2009 (worth over €5.5 billion), followed by FedEx (23 percent), UPS (11 percent), and TNT (7 percent).²⁹

In India, DHL set up its operations in 1979 in Mumbai. DHL India has 1500 employees, 300 vehicles, and 5 hubs/gateways. In 2008, DHL India handled 7.7 million shipments carrying about 24.2 million tonnes of cargo. DHL is the number one international air express services provider in India offering its customers the entire spectrum of express services from international air express to high-end logistics solutions. DHL has been the first to introduce India's only 24-hour customer service call centre in the express industry and to provide track-and-trace services in India via email, SMS, Internet, and WAP phones. In order to increase its presence in the Indian domestic market, DHL entered into a sales agreement with Blue Dart, the number one domestic courier and express company, in 2002, and subsequently in 2005, acquired 81.03 percent of the equity of Blue Dart, which still continues to operate as an independent brand³⁰. Blue Dart started its operations in 1983 in Mumbai. Currently, it employs about 7,000 people and serves more than 25,000 destinations with about 5,500 vehicles, 7 aircraft, 9 domestic hubs, and 294 facilities. In 2009, it handled 77 million shipments carrying about 268,000 ton. Blue Dart possesses indigenously developed state-of-the-art technologies for track-and-trace, MIS, ERP, customer service, space control, and reservations. It is an ISO 9001-2000 certified company and it received the "Superbrand" status for the fifth year in a row awarded by the Superbrands Council.³¹ The acquisition of Blue Dart created a platform for DHL to build on current capabilities

²⁴"FedEx Express to acquire AFL Pvt. Ltd. businesses" (2 November, 2010) available at <http://news.van.fedex.com/node/16970>

²⁵"FedEx to acquire AFL to step up India play" (The Economic Times, 4 November, 2010) available at <http://economictimes.indiatimes.com>

²⁶http://www.dhl.com/en/about_us/express.html

²⁷DHL Annual Report 2009 available at <http://www.dp-dhl.com/reports/2009/gb/en/group-management-report/divisions.html>

²⁸DHL Annual Report 2010 (January - September) available at <http://www.dp-dhl.com/reports/2010/interim-report-q3/interim-report-by-the-board-of-management/overview.html>

²⁹<http://www.dp-dhl.com/reports/2009/gb/en/group-management-report/asia-pacific.html>

³⁰http://www.dhl.co.in/en/about_us/dhl_in_india.html

³¹<http://www.bluedart.com>

and further expand service offerings in the Indian market. Also, Blue Dart got access to DHL's extensive global network and best practices. DHL, being a foreign company, is not allowed to own airlines under the current policy on FDI in the aviation sector. However, after the acquisition of Blue Dart, DHL can now use its fleet of aircraft for regional deliveries. As a result, DHL has been able to increase its presence in India and it expects its Indian business to grow by 15–20 percent. DHL and Blue Dart also have a vision of setting up a South Asia hub and enhancing intra-SAARC trade.

According to Tom Wheelwright, Senior Vice President (Public Policy), Asia-Pacific, DHL, the company initially enters into sales agreements with local partners to penetrate a new market and subsequently acquires a controlling stake in order to have a better control on its operations. In India too, DHL had a sales alliance with Blue Dart before taking it over in 2005. Wheelwright said, "Blue Dart has a fantastic business and we are happy with its independent management." Wheelwright expressed his concerns about the proposed Indian Post Office (Amendment) Bill, and added, "(The proposed bill) will wipe out 50 percent of DHL and 60 percent of Blue Dart shipments. Price-multiple is the best way to preserve USO." He also expressed concerns about the proposed ground handling policy and said that self-handling was preferred for end-to-end control over shipments. The other problems faced by DHL are IT and airport infrastructure. Wheelwright added:

The challenge before the Indian customs department is investment in IT infrastructure. India is the world leader in IT but it has one of the poorest IT implementations in customs. Also, DHL would have preferred a lot more aircraft movements in India, but Indian airports are congested.

As far as the business opportunities in India are concerned, Wheelwright said, "India still needs to grow a lot before it can compete with China in terms of traffic flows. If China continues to grow even at its present rate, it will account for half of the Asian market." However, he also added, "If India continues to grow at the present rate, it has the potential to rival China."

TNT

Headquartered in the Netherlands, TNT was established in 1946 in Australia to provide road transportation services.

Over the last six decades, TNT has grown by expansion and acquisition into a global company operating extensive air and road networks throughout the world. In the Netherlands, TNT operates the national postal service under the name TNT Post. The group also offers postal services in eight other European countries, including the UK, Germany, Italy, and Belgium. Until 2006, TNT operated its logistics division, which it sold off to Apollo Management LLC to focus on mail and express delivery services. Further in 2010, TNT decided to convert its mail and express divisions into two independent companies.

TNT Express has company-owned operations in 64 countries employing about 155,000 people. It serves over 200 countries deploying more than 30,000 vehicles, 48 aircraft (mostly leased or sub-contracted) and 2,409 depots or hubs. In 2009, TNT handled 230 million consignments carrying about 7.7 million tonnes of cargo.³² In 2009, the revenues of mail and express divisions were €10.4 billion out of which about €6 billion were contributed by the express division, which was 10.5 percent lower than the corresponding figure in 2008. While the revenues from the international and domestic markets shrank by 14.1 percent, the revenues from the emerging markets such as the Asia-Pacific region, India, China, Latin America, Middle East and Africa, Russia, and Turkey grew by 5.7 percent to about €1.3 billion over this period. This has been recorded in the 2009 Annual Report of the company as the relative insensitivity to the repercussions of the global financial meltdown and growing domestic demand in these emerging markets.³³

To strengthen its position in the Indian, and Asian, markets, TNT in 2006 acquired Speedage Express Cargo Services, one of the leading road-express companies in India. This acquisition was very important from the strategic point of view of TNT because the extensive domestic road network of Speedage complemented TNT's global operations, and it expected to become a leading express delivery-service provider in the Asian region, especially in India and China. Speedage, founded in 1995, is a profitable venture generating about €17 million of revenues in 2005–06 before it was taken over by TNT. It has an impressive list of customers, including many global players. This acquisition added 514 depots, 26 transit hubs, 730 vehicles, and 1,195 employees to TNT's existing resources. TNT expected to reach a top 3 position in the

³²<http://group.tnt.com/aboutus/tntataglance/index.aspx>

³³TNT Annual Report 2009 available at <http://group.tnt.com>

fast growing Indian domestic road express market and generate €100 million of revenues by 2007.³⁴

TNT is very optimistic about the growth potential of the Indian express sector and its position in the Indian express market. In 2009, TNT experienced impressive growth in India, especially in the hi-tech, telecom, automotive, and healthcare sectors. The international freight business of TNT between India and Europe grew by 60 percent in 2009. TNT's ability to penetrate even the Tier II and Tier III cities and seamlessly integrate the domestic road network with the international air and road networks in China, Southeast Asia, and Europe would further fuel its growth. In addition to it, the sustained economic growth, major government investments in infrastructure, implementation of a uniform tax structure, and the opportunity to leverage the bilateral trade between India and Europe are expected to help TNT become the market leader in express delivery services in India.³⁵

Summary and Concluding Remarks

This article highlights the issues in FDI in the Indian EDS sector and the problems and prospects faced by the top four global EDS companies—UPS, FedEx, DHL, and TNT. The Indian EDS sector is experiencing a high growth rate compared to the world average even in the face of global economic crises. The Indian economy has gradually been liberalized since the early 1990s, and there has been a steep rise in the inflow of FDI in different sectors since then. Globalization, removal of barriers, and cross-border investments have fuelled the growth of trade in merchandise and services around the world. The Indian story is no different from others with increased imports and exports and FDI inflows. The increased volume of trade has given rise to the growth of time-definite EDS. The Indian EDS sector is completely liberalized allowing 100 percent FDI. Foreign players enter the Indian market through sales alliances. Subsequently, they enter into joint ventures with their local partners or acquire controlling stakes in domestic players. However, foreign players investing or willing to invest in this sector experience a few major problems. The first and foremost is the poor airport infrastructure, including space constraints and restricted flight timings, since all of them are primarily into international shipments. The second major problem should be the delay in customs clearance, which

affects time-bound, cross-border deliveries. The other major problems foreign players face are poor road/rail infrastructure, interstate checkpoint delays, multiple documentations, differential tax structures, and, of course, different cultures, traditions, rules, regulations, policies, and procedures in different countries. All of the top four global EDS companies have expressed their concerns over the inadequate airport infrastructure and cumbersome paperwork and delay in customs clearance. They have also lobbied for simple documentations, uniform tax structures, and easing of restrictive government policies. Although 100 percent FDI is allowed in EDS, there are restrictions on the foreign ownership of domestic airlines, which jeopardize the end-to-end control over shipments. All these four global EDS companies operate their own aircraft for international shipments; however, for domestic shipments, they have to rely on other domestic airlines. Another contentious issue these global players face is the impending Indian Post Office (Amendment) Bill, which, if implemented in the current form, will create a monopolistic status for India Post and impose a limit to the extent of foreign ownership of Indian EDS companies. This will not only put the foreign players at a disadvantage against India Post, but lead to retrenchments and job losses.

The four global players, however, see a lot of growth opportunities in the Indian market since India's economy is growing at a healthy rate, and import and export volumes are also steadily increasing over the past few years. They are making investments in infrastructure and acquiring local companies to complement their breadth of service offerings and geographic reach. Three of these EDS companies—UPS, FedEx, and DHL—are also into providing logistics or 3PL services worldwide. Since the Indian logistics sector is also growing at a fast pace (Mitra, 2011), investing in infrastructure and increasing their presence in India will help them garner a larger market share in the promising logistics sector besides EDS. The Indian government has also taken initiatives in setting up new airports and modernizing existing airports through the public-private partnership (PPP) mode. About \$50 billion is expected to be invested in upgrading national and state highways in the 11th five-year plan (2007–12) of which 53 percent is expected to be contributed by the private sector.³⁶ The government is also trying to simplify documentations and bring in uniformity in tax structures. For example, single-

³⁴"TNT acquires Speedage to build leading position in domestic express market India" (1 September, 2006) available at http://group.tnt.com/press/400567/TNT_acquires_Speedage_to_build_leading_position_in_domestic_express_market_India.aspx

³⁵"TNT confident about its India growth prospects" (18 February, 2010) available at http://www.tnt.com/express/en_in/data/press_releases/tnt_confident_about.html

³⁶Department of Road Transport and Highways, Ministry of Shipping, Road Transport and Highways, Government of India, available at <http://morth.nic.in>

window clearances have been incorporated in many departments and EDI systems have been implemented for customs clearance to reduce paperwork and delay. A uniform goods and services tax (GST), still on the discussion table and yet to be introduced, is expected to address the concern related to the differential tax structures. Finally, the government should reconsider the proposed Postal Bill before implementation because the EDS sector not only contributes to the economy and the exchequer, but also provides employment to close to 1 million people.

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In order to succeed, your desire for success should be greater than your fear of failure.

— Bill Cosby

The Productivity of Commercial Banks in India: A Bank Group Wise Study

Anand S. Kodan, Sandeep Mehra, Kuldip S. Chikkara, and Amit Yadav

The study indicates that the productivity performance of public sector bank group has been better than private and foreign bank groups; both, public and private sector bank groups are operating under increasing return to scale, while, foreign bank group is operating under decreasing return to scale; and the public and private sector bank groups are labor intensive, while, foreign bank group is capital intensive.

Introduction

Banking institutions play a vital role in economic development of different countries across the world. Because banking sector constitutes a predominant component of the financial services industry,¹ and the performance of any economy to a large extent depends on the performance of banks, an efficient and diversified banking system is a must for promoting savings and channelizing them into healthy investments so as to achieve a faster rate of economic growth. Thus, the good health of an economy is reflected by the good health of its banking system. In a modern economy, banks are considered not only as the dealers in money, but also the leaders of development. For instance, enhanced efficiency in banking can result into greater and more appropriate innovations, improved profitability, as well as, greater safety and soundness, when the improvement in productivity is channeled towards strengthening capital buffers that absorb risk. Therefore, productivity should be measured to find out the strengths and weaknesses of the banking system and consequently certain necessary pre-emptive steps be taken by the regulator to enhance the productivity, profitability, and efficiency of the industry. Hence, investigation and measurement of productivity² in the banking sector have always been areas of interest for economic researchers. So, present study was made to analyse the productivity and economic efficiency of commercial banks (bank groupwise, that is, public sector, private sector, and foreign banks) using Cobb-Douglas Production Function and further, to compare the productivity of sample bank groups using Friedman's Test.

Objectives, Hypotheses, and Research Methodology

Objectives of the Study

- 1) To study the trends in productivity of commercial bank groups in India;

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¹It accounts for more than half the assets of the financial sector.

²Productivity is construed as the ability and willingness of an economic unit to produce maximum possible output with given inputs and technology. Higher the output per unit of input, higher is the productivity.

- 2) To compare the productivity of commercial bank groups in India; and
- 3) To find out the economic efficiency of commercial bank groups in India.

Hypotheses of the Study

- H_{01} = there is no significant difference in total factor productivity of different commercial bank groups in India during the period under study; and
- H_{02} = all commercial bank groups in India are run under increasing return to sale.

Research Methodology

The present study is based on secondary data, which was collected from sources like www.rbi.org, www.iba.org, report on trend and progress of banking in India, economic survey of India, related research work and magazines. The study covers the period from June 2005 to October 2009. The study analyzed the trend in productivity of commercial bank in India with the help of appropriate statistical techniques. In this study time series data has been used.

Average Compound Growth Rate (ACGR)

The average compound growth rate is compounded by employing formula:

$$Y = ab$$

By using logarithm, it may be written as:

$$\log y = \log a + t \log b$$

$$Y^* = a^* + t.b^* \text{ (where } \log y = y^*, \log a = a^* \text{ and } \log b = b^*)$$

The value of b^* is computed by using OLS Method. Further, the value of ACGR can be calculated by followed method:

$$ACGR = (\text{Antilog } b^* - 1) \times 100$$

Friedman's Test- A Distribution Free Approach Test

Friedman's Test is used to test the null hypothesis relating to several independent samples come from the same population. This test is a non-parametric test. This test requires less restrictive assumptions concerning the level of data measurement. The test does not require the assumption of normality and equal variance. It can be used whenever the number of sample is greater than or equal/ parallel to way analysis of variance. The calculation of total ranks (row total and column total) is shown in Table 3. In order to calculate the "F" values for this study, ranks are assigned for the partial as well as total factor productivity

of commercial banks, for each year, from June 2005 to October 2009 in India. The lowest ratio in each year (among the three classifications of commercial bank groups) received a rank of 1, where the highest ratio received the rank of 3. Intermediary ratio received rank 2. Hence, the total ranks in each row are constant and equal to:

$$K(K + 1)/2 = 3(3 + 1)/2 = 6$$

where

K = Number of samples, 3 (number of classifications of commercial bank groups)

The Freidman Test Statistics:

$$H = 12/N(N + 1) * (R_1^2 + R_2^2 + \dots + R_k^2) - 3(N + 1)$$

In "F" test, the sampling distribution "F" can be approximated by a χ^2 (chi-square) distribution with $k-1$ degree of freedom. The chi-square (χ) value at 5 percent level of significance of $\chi^2 = 5.99$ and 1 percent level of significance the value is $\chi^2 = 9.21$.

The calculated value of "F" is compared with the table value of chi-square (χ^2) at 5 per cent level of significance. If the calculated value of "H" is less than or equal to the table value of chi-square (χ^2 at 5 per cent level of significance), the null hypothesis is accepted and vice versa.

Total Factor Productivity (TFP)

Generally total factor productivity is a combination of partial factor productivity of capital and labor (except agriculture). The TFP in algebraic form is expressed as follows:

$$TFP = \sqrt{\{PFP(C) * PFP(L)\}} \quad (i)$$

$$PFP(C) = O(t)/K(t) \quad (ii)$$

$$PFP(L) = O(t)/L(t) \quad (iii)$$

where,

TFP: Total Factor Productivity,

PFP (C): Partial Factor of Capital,

PFP (L): Partial Factor Productivity of Labor,

O (t): Index Value of Output³ for the Year t,

K (t): Index Value of Capital Invested for the Year t and

L (t): Index Value of Labor for the Year t.

The Cobb–Douglas Production Function

In economics, the Cobb–Douglas functional form of production functions is widely used to represent the

³In this study we have taken advances, deposits and investments as an output of Decision Making Units (bank groups) in India from 2005/06 to 2009/10.

relationship of an output to inputs. It was proposed by Knut Wick sell (1851–1926), and tested against statistical evidence by Charles Cobb and Paul Douglas in 1900–28.

For production, the function is

$$Y = AK^{\alpha}L^{\beta} \quad (iv)$$

where:

Y = total production (the monetary value of all goods produced in a year)

K = capital input

L = labor input

A = total factor productivity (TFP)

α and β are the output elasticities of capital and labor, respectively.

Output elasticity measures the responsiveness of output to a change in levels of either labor or capital used in production, *ceteris paribus*.

Further, if:

$$\alpha + \beta = 1,$$

The production function has constant returns to scale. That is, if L and K each are increased by 20 per cent, Y increases by 20 per cent. If

$$\alpha + \beta < 1,$$

Returns to scale are decreasing, and if

$$\alpha + \beta > 1$$

Returns to scale are increasing.

Equation (iv) of production function in log form is:

$$\text{Log}(Y) = \text{log } A + \alpha \text{ log } K + \beta \text{ log } L + \varepsilon \quad (v)$$

Result and Discussions

Table 1 shows the partial factor productivity of capital (K) and labor (L) of commercial bank groups (that is, public sector bank group, private sector bank group, and foreign bank group) from June 2005 to October 2009. It is evident from the table that the trend of PFP (K) in public and private sector bank group has been mixed (increased and decreased) while, in case of foreign bank groups, it has continuously decreased from 10.84523 to 8.114551. The average compound growth rate of PFP (K) and PFP (L) have been 1.53 and 18.05 per cent in PSBG, -6.44 and 3.53 per cent in PVSBG and -5.64 and 11.13 per cent, respectively, in foreign banks in same period. The table clearly indicates that the performance of public sector bank group has been better in both terms (that is, PFP { K } and PFP { L }) than private and foreign bank groups from June 2005 to October 2009. During the period, maximum consistency of PFP (K) was observed at 3.54 per cent in public sector bank group, while, in case of PFP (L) it was observed at 6.81 per cent in private sector bank group.

Table 1. Trend in Partial Productivity of Capital and Labor of Indian Domestic Bank

Year	Public Sector Banks		Private Sector Banks		Foreign Banks	
	PFP (K)	PFP (L)	PFP (K)	PFP (L)	PFP (K)	PFP (L)
2005/06	29.226	4.517234	21.03886	8.343387	10.84523	11.92255
2006/07	30.223	5.623989	23.40644	8.605467	10.53847	12.26201
2007/08	28.898	7.130014	16.11029	9.268261	9.146274	13.28282
2008/09	30.644	8.727841	16.23611	9.176853	8.505848	17.23396
2009/10	31.530	10.34433	15.08044	9.926335	8.114551	20.20038
ACGR	1.53	18.05	-6.44	3.53	-5.64	11.13

Source: Researcher's Calculations

⁴It includes; Investments, deposits and advances and all amounts Rs. in crore.

⁵It includes; Capital and reserve & surplus and all amount Rs. in crore.

⁶Employees in numbers.

Table 2. Trends in Total Factor Productivity of Commercial Banks in India

Year	Public Sector Bank	Private Sector Bank	Foreign Bank
2005/06	11.49011	13.248976	11.37114
2006/07	13.037491	14.192368	11.367625
2007/08	14.354448	12.219425	11.022172
2008/09	16.354327	12.206408	12.107413
2009/10	18.059922	12.234931	12.803009
ACGR	9.45	-1.57	2.40

Source: Researcher's Calculations

Table 2 explores that the total factor productivity (TFP) of public sector bank group has continuously been increased from 11.49 to 18.05 with 9.45 per cent ACGR from June 2005 to October 2009. In case of private sector bank group, it has been increased from 13.24 per cent in June 2005 to 14.19 in July 2006, the ratio decreased from 12.21 to 12.20, in later years and in remaining period of the study, it increased and stood at 12.2349 in October 2009. The average compound growth rate of TFP in private sector bank group has been negative (-1.59). the TFP of foreign bank group has also increased continuously during the same period (except September 2008) with the 2.40 per cent ACGR. The total factor productivity also indicate that the performance of public sector bank group has again

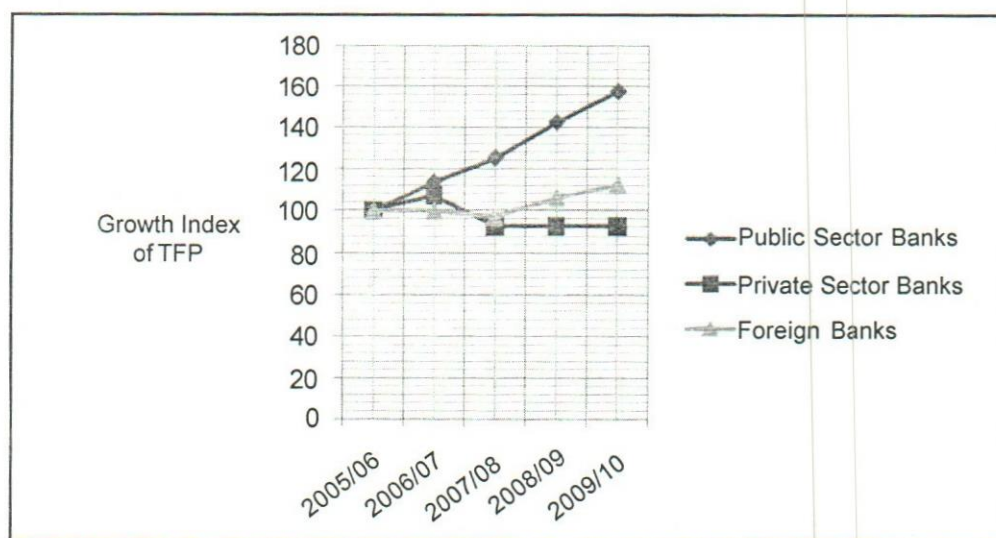


Figure 1. Growth Index of Total Factor Productivity (Bank Group-wise)

Table 3. Comparative Study of TFP of Commercial Bank Group in India

Year	Public Sector Banks	Private Sector Banks	Foreign Banks	Total Rank (Total Row)
2005/06	11.49011 (2)	13.248976 (3)	11.37114 (1)	6
2006/07	13.037491 (2)	14.192368 (3)	11.367625 (1)	6
2007/08	14.354448 (3)	12.219425 (2)	11.022172 (1)	6
2008/09	16.354327 (3)	12.206408 (2)	12.107413 (1)	6
2009/10	18.059922 (3)	12.234931 (1)	12.803009 (2)	6
Total Rank (Column Total)	13	11	6	30

Source: Researcher Calculations

been better during the period under consideration. To know the significant difference in TFP of all selected bank groups, we have applied Friedman's test. The calculation of Friedman's test are shown in Table 3.

In order to test the hypothesis, 'F' value is calculated on the basis of performance score as are shown in Table 3.

$$F = 12/nk(k + 1) = \sum R_j^2 - 3n(k + 1)$$

$$\begin{aligned} F &= 12/5 \cdot 3(3 + 1) \cdot [13^2 + 11^2 + 6^2] - 3 \cdot 5(3 + 1) \\ &= (12/60) \cdot (169 + 121 + 36) - (60) \\ &= 5.20 \end{aligned}$$

The calculated value of "F" is less than the tabulated value of "F", both at 5 percent and 1 percent levels of significance. Hence, the null hypothesis of this study is accepted. To conclude, we can say that there is no significant difference in the TFP of different types of bank groups from June 2005 to October 2009.

OLS estimates of a Cobb–Douglas production function for commercial bank groups are presented in tables 4 and 5. The production elasticity of capital is 1.097 in public sector bank group, 0.156 in private bank group, and 0.674 in foreign bank group. The production elasticity of labor is 1.136 in public sector bank group, 0.979 in private bank group and 0.148 in foreign bank group. The R² value is

0.997 in public sector bank group, 0.995 in private bank group, and 0.998 in foreign bank group. The α is significant at 0.001 per cent level of significance in public and foreign bank groups, while, β is significant only in case of private bank group at the level of 0.005 per cent.

Table 5 underlines the economic efficiency (that is, in terms of return to scale) of commercial bank (bank group-wise) during the period of June 2005 to October 2009. Production function expresses the technological relationship between factor input and output. It describes the law which governs the transformation of factor input into outputs at any particular time period. In order to find out whether the commercial bank groups operating in India are labor intensive or capital intensive the Cobb–Douglas production function has been used. The results of Cobb–Douglas production function are explored in tables 4 and 5. The results of Cobb–Douglas production function indicate the sum of coefficients of independent variables (Capital {K: α } and labor {L: β }) has 2.233 in case of public sector bank group, 1.135 in private sector bank group, and 0.822 in foreign bank group. It means, public and private sector bank groups are operating under increasing return to scale, while, foreign bank group is operating under decreasing return to scale. The Cobb–Douglas production function further reveals that both public and private sector bank group are labor intensive (Because, β is more than α), while foreign bank group is capital intensive (because, α is more than β).

Table 4. Bank Group-wise Productivity from June 2005 to October 2009

Bank Groups		Constant	Log K (α)	Log L (β)	R ²	Adj. R ²	D-W	F
Public Sector Bank	Coefficient	-5.689	1.097	1.136	0.997	0.995	2.962	396.586
	t-value	-1.446	27.652	1.718				
	p-value	0.285	0.001	0.228				
Private Sector Bank	Coefficient	0.302	0.156	0.979	0.995	0.990	2.413	204.332
	t-value	0.442	1.531	4.438				
	p-value	0.701	0.265	0.047				
Foreign Bank	Coefficient	1.827	0.674	0.148	0.998	0.995	3.073	408.848
	t-value	5.637	20.957	1.656				
	p-value	0.030	0.002	0.240				

Source: Researchers Calculations

Table 5. Bank Group-wise Economic Efficiency from June 2005 to October 2009

S. No	Bank Groups	Coefficient ($\alpha + \beta$)	Proxy of Efficiency	Economic Efficiency
1	Public Sector Bank	1.097 + 1.136 = 2.233	$\alpha + \beta > 1$	Increasing return to scale
2	Private Sector Bank	0.156 + 0.979 = 1.135	$\alpha + \beta > 1$	Increasing return to scale
3	Foreign Bank	0.674 + 0.148 = 0.822	$\alpha + \beta < 1$	Decreasing return to scale

Source: Researchers Calculations

Conclusion

In this article we have analysed the productivity of commercial bank groups operating in India using Cobb–Douglas production function and further, compared the productivity (TFP) with the help of Friedman's test from June 2005 to October 2009. After analysing the productivity, we found that the partial factor productivity of capital and labor, and total factor productivity of public sector bank group have been better than private and foreign bank groups during the period under study. The study further revealed that both public and private sector bank groups are operating under increasing return to scale while foreign bank group is operating under decreasing return to scale. It was also found that both public and private sector bank group are labor intensive while foreign bank group is capital intensive.

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A man is usually more careful of his money than of his principles.

— Oliver Wendell Holmes Jr.

Appendix 5A. 1.

Year	Public Sector Bank			Private Sector Bank			Foreign Bank		
	Output ⁴	Capital ⁵	Labor ⁶	Output	Capital	Labor	Output	Capital	Labor
2005/06	3,362,326	115,044	744,333	921,986	43,823	110,505	263,691	24,314	22,117
2006/07	4,099,202	135,630	728,878	1,181,393	50,473	137,284	348,560	33,075	28,426
2007/08	5,051,109	174,785	708,429	1,472,013	91,371	158,823	451,204	49,332	33,969
2008/09	6,384,625	208,342	731,524	1,618,237	99,669	176,339	509,815	59,937	29,582
2009/10	7,598,885	241,002	734,594	1,809,412	119,984	182,284	560,399	69,061	27,742

Appendix 5A. 2. Estimated Correlation Matrixes for the Selected Variables (Public Sector Bank group)

	Average	Minimum	Maximum	Coefficient of Variation	Output	Labor	Capital
Output	5299229.40	3362326	7598885	32.30	1		
Capital	174960.60	115044	241002	29.44	.996**	1	
Labour	729551.60	708429	744333	1.80	-.098	-.168	1

Note: ** Correlation is significant at the 0.01 level (1-tailed).

Appendix 5A. 3. Estimated Correlation Matrixes for the Selected Variables (Private Sector Bank Group)

	Average	Minimum	Maximum	Coefficient of Variation	Output	Labor	Capital
Output	1400608.20	921986.00	1809412.00	25.15	1		
Capital	81604.00	43823.00	1199484.00	40.39	0.980**	1	
Labour	153047.00	110505.00	182284.00	19.29	0.991	0.956**	1

Note: ** Correlation is significant at the 0.01 level (1-tailed).

Appendix 5A. 4. Estimated Correlation Matrixes for the Selected Variables (Foreign Bank Group)

	Average	Minimum	Maximum	Coefficient of Variation	Output	Labor	Capital
Output	426733.80	263691.00	560399.00	28.23	1		
Capital	47143.80	24314.00	69061.00	39.22	0.995**	1	
Labor	28367.20	22117.00	33969.00	14.98	0.570	0.496	1

Note: ** Correlation is significant at the 0.01 level (1-tailed).

Deposit Mobilization by Central Cooperative Banks in Haryana: A Case Study of Jhajjar

Pradeep

The study of the Jhajjar Cooperative Bank (JCCB) Ltd, Haryana reveals that the high cost deposits have been decreasing while the low cost deposits (viz., saving and current account deposits) have been increasing during 2003–09. The cooperative banks employees are working efficiently in mobilizing deposits as compared to the average ratio of District Central Cooperative Banks (DCCBs) in India.

Introduction

Cooperative Banks were officially introduced in India in 1904, with the passing of the Cooperative Credit Societies Act. Owing to the increasing demand of cooperative credit, a new Act was passed in 1912, which provided for the establishment of cooperative central banks by a union of primary credit societies or by a union of primary credit societies and individuals. In 1914, the Mclagan Committee recommended three-tier structure for cooperative banking. State cooperative banks are apex cooperative institutions in the State. Central or district cooperative banks work at the district level. At the lowest level, cooperative societies come up as primary credit agencies, which work at the village level.

Bank deposits play an important role in economic development in general and in coping with the increasing demand for credit requirements, in particular. In recent years, emphasis is being placed on deposit mobilization by banks as one of the major means for sustaining economic growth. A rise in deposits with the banks helps to bring savings to the organized market which otherwise remain idle or wasted in creating assets which are either unnecessary or have low priorities in our planned development. Besides, the disbursement of credit deposits mobilization is also the main function of cooperative banks. Deposits are the main source of banks funds. They are the life blood of banking industry and also account for the largest component in banks liabilities. Deposits are the basic function of a bank. As per Section 5(b) of Banking Regulation Act, 1949: "Banking means accepting for the purpose of lending or investment of deposits of money from the public repayable on demand or otherwise and withdrawable by cheques, draft order or other wise."

The Jhajjar Central Cooperative Banks Ltd: A Profile

The Jhajjar Central Cooperative Bank Ltd (JCCB) was established on March 29, 2001 with the Registrar of

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Haryana Cooperative Societies Act, 1912. The area of the bank covers the whole district of Jhajjar. The bank has been providing short-term and medium-term loans for agriculture and non-agriculture purpose and has opened 22 branches and 2 extension counters. The branch is headed by a branch manager and 5 to 10 subordinates. The authorized share capital of the bank is Rs 800 lakh made up of ordinary shares of the face value of Rs 100. The bank is operating through 21 Primary Agricultural Credit Societies. At present, 184 employees are working in the bank. The business (deposits and advances) of the bank has increased from Rs 21,616.340 lakh in the year 2004 to Rs 50671.941 lakh in the year 2010.

Analysis and Interpretation

Deposits—Account-wise

The JCCB Ltd, Jhajjar accepts deposits from customers mainly in three accounts namely:

1. Fixed Deposits Account
2. Saving Bank Account

3. Current Deposits Account

Table 1 shows that the total deposits of the banks which stood at Rs 8,999.688 lakh in the year 2004 increased to Rs 24,340.510 lakh in the year 2010. There was a net increase of 170.45 percent during the study period. The fixed deposits of the bank accounted for a major contribution in the total deposits. These have increased to Rs 11,047.045 lakh in 2010 from Rs 4,752.880 lakh in 2004. They showed the net increase of 132.42 percent during this period. The saving bank deposits increased to Rs 12,884.738 lakh in 2010 from Rs 4,104.608 lakh in 2004. They made an increase of 213.90 percent during 2004–10. The current account deposits also increased to Rs 340.803 lakh in the year 2010 from Rs 133.501 lakh in the year 2004. They showed an increase of 155.28 percent in the year 2010 over the year 2004. Other deposits of the bank have also shown a net increase of 682.62 percent during the study period. This reveals that the high cost deposits (Fixed Deposits) as well as low cost deposits (saving and current account) of the bank increased during the period 2004–10.

Table 1. Deposits under various accounts from 2004 to 2010 (as on March 31)

(Rs in Lakh)

Year	Fixed Deposits Account	Saving Banks Account	Current Account	Others Deposits	Total Deposits
2003–04	4,752.880 (52.81)	4,104.608 (45.60)	133.501 (1.48)	8.679 (0.09)	8,999.688 (100.00)
2004–05	4,959.233 (47.37)	5,217.945 (49.84)	274.272 (2.62)	16.334 (0.15)	10,467.784 (100.00)
2005–06	4,967.951 (41.96)	6,724.954 (56.80)	109.278 (0.92)	36.607 (0.30)	11,838.790 (100.00)
2006–07	5,143.207 (31.98)	10,760.515 (66.92)	174.217 (1.08)	36.701 (0.22)	16,077.938 (100.00)
2007–08	6,098.694 (30.74)	13,468.342 (67.88)	228.603 (1.15)	47.724 (0.22)	19,839.367 (100.00)
2008–09	7,665.825 (38.21)	11,985.891 (59.75)	355.765 (1.77)	49.816 (0.24)	20,057.229 (100.00)
2009–10	1,1047.045 (45.38)	12,884.738 (52.93)	340.803 (1.40)	67.924 (0.27)	24340.510 (100.00)
Growth rate 2004–10	132.42	213.90	155.28	682.62	170.45

Source: Compiled from Annual Reports: The JCCB Ltd, 2004–10.

Note: (a) Figures in brackets indicate percentage of total.

(b) Other deposits include money all call and short notice in operative balance, FD matured but not drawn.

Deposits—Source-wise

There are two main depositors of the JCCB Ltd., viz. individuals and societies. The position of deposits made by individuals and societies is shown in Table 2.

To analyze the bank's performance in mobilizing deposits, it is necessary to study the deposits source-wise. Table 2 depicts the contribution of individual's as well as society's deposits in the total deposits of the bank during the period 2004–10. It shows that the individual deposits increased to Rs 23,681.987 lakh in the year 2010 as compared to Rs 8,691.905 lakh in the year 2004 and registered a growth rate 172.46 percent.

With respect of the society's deposits, it is seen the deposits increased to Rs 590.599 lakh in the year 2010 from Rs 299.082 lakh at the end of year 2004. There was a net increase of the Rs 291.517 lakh during the study period. In percentage terms there was an increase of 97.47 percent in the year 2010 as compared to the year 2004. The percentage of societies, deposits to total deposits varied between 2.12 percent to 3.97 percent during the period 2004–10. But the percentage of individual's deposits of the bank remained, above 95 percent during the study period. This shows that the bank is more effective in attracting deposits from the individuals in comparison to societies.

Table 2. Sourcewise deposit of the JCCB Ltd from 2003–04 to 2009–10 (as on March 31) (Rs in Lakh)

Year	Individual Deposits	Society's Deposits	Others Deposits	Total Deposits
2003–04	8,691.905 (96.58)	299.082 (3.32)	8.679 (0.09)	8,999.666 (100.00)
2004–05	10,035.841 (95.87)	415.610 (3.97)	16.334 (0.15)	10,467.785 (100.00)
2005–06	11,448.836 (96.14)	421.833 (3.54)	36.607 (0.30)	11,907.328 (100.00)
2006–07	15,665.176 (97.20)	413.160 (2.56)	36.701 (0.22)	16,115.037 (100.00)
2007–08	19,309.271 (97.30)	486.367 (2.45)	43.724 (0.24)	19,843.362 (100.00)
2008–09	19,582.207 (97.63)	425.271 (2.12)	49.816 (0.24)	20,057.294 (100.00)
2009–10	23,681.987 (97.29)	590.599 (2.42)	67.924 (0.27)	24,340.510 (100.00)
Growth rate 2004–10	172.46	97.46	682.62	170.12

Source: Compiled from Annual Reports: The JCCB Ltd, 2004–10.

Note: (a) Figures in brackets indicate percentage of total.

(b) Other deposits include money all call and short notice in operative balance, FD matured but not drawn.

Productivity of Bank in Mobilizing Deposits

Productivity of the JCCB bank in mobilizing deposits is measured in terms of deposits per employee and deposits per branch. The average of bank has been compared with the average ratio of District Central Cooperative Banks (DCCBs) in India.

Table 3 depicts the productivity efficiency of the JCCB Ltd. In mobilizing deposits during 2004–10 with reference to deposits per employee, the table under reference exhibits that deposits per employee of the bank

were Rs 43.68 lakh in the 2004, which increased to Rs 132.28 lakh in the year 2010. The average ratio of deposits per employee of DCCBs in India was Rs 117.73 lakh in the year 2010 as compared to Rs 65.33 lakh in the year 2004. Hence, the banks employees are working efficiently vis-à-vis the overall industry in this regard. Deposits per branch of the bank were Rs 1106.38 lakh in the year 2010 which were Rs 562.48 lakh in the year 2004. The banks productivity is therefore good vis-à-vis the performance relative to industry during the reference period.

Table 3. Deposits per employee and per branch of the bank from 2004 to 2010 (as on March 31) (Rs in lakh)

Year	Deposits per Employee		Deposits per Branch	
	JCCB Ltd	Average Ratio of DCCBs in India	JCCB Ltd	Average Ratio of DCCBs in India
2004	43.68	65.33	562.48	558.73
2005	51.06	69.67	581.54	593.81
2006	59.19	73.76	591.93	626.02
2007	76.92	40.42	803.89	667.02
2008	97.93	50.17	991.91	712.26
2009	105.56	117.73	911.69	805.98
2010	132.28	N.A.	1106.38	N.A.

Source: Compiled from Annual Reports: The JCCB Ltd and NAFSCOB 2004–10.

Findings, Conclusions, and Suggestions

The aggregate deposits of the JCCB Ltd have increased with high growth rate during the reference period (2003–04 to 2009–10). The reasons for this is that the fixed deposits of bank in tandem with the low cost deposits (viz. saving account and current account) showed good growth. The share of deposits mobilization from individuals to total deposits remained above 95 percent during 2004–10. However, society's deposits are found to be very insignificant during the period. The employees of the bank are working efficiently in deposit mobilization in comparison to the average figures of industry (DCCBs in India). The JCCB bank should consider the following suggestive measures for mobilizing more deposits from various segments of the society:

- Bank should make a policy of providing monetary incentives/commission to member cooperative societies. The direct involvement of member

cooperative societies in district Jhajjar will help the bank in mobilization of low cost demand deposits.

- Bank should organize "We deposit" mobilization campaign in district Jhajjar specially in rural areas with the help of block administration/district registrar/member cooperative societies/gram panchayat.
- Bank should introduce the system of charges in case of non-adherence of terms and conditions for all types of depositors, i.e., charges for non-maintenance of minimum balances, checks return charges, duplicate passbook charges, etc.
- Meeting and conference may be arranged with senior officers for formulating plans and framing strategies to fight out competition form commercial banks.
- Bank management should make such a policy in which the young educated students are employed on commission basis for helping in opening new accounts in the bank.

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It is a wiseman who lives with money in the bank, it is a fool who dies that way.

— Proverb

Productivity Growth of Indian Manufacturing Firms in an Era of Economic Reforms: A Review

Dipayan Datta Chaudhuri

This article provides an overview of recent studies on productivity growth of Indian manufacturing firms in the post-1991 period. The central question is whether there has been a significant acceleration in productivity growth rates of manufacturing firms in India in an era of economic liberalization. This article has observed that impact of economic reforms is not uniform across all sectors. Studies have shown that factors like import of disembodied technology, availability of wider varieties of imported inputs, foreign investment, change in market structure and R&D intensity are significant determinants for productivity growth in the post-reform period.

Introduction

Structural reform measures initiated in 1991 have provided an opportunity to study the impact of trade liberalization on productivity growth of Indian firms. A number of studies have tried to address the question whether economic liberalization has improved productivity of the corporate sector. The objective of this article is to provide an overview of recent studies on productivity growth of Indian manufacturing firms in an era of economic reforms (that is, from early 1990s).

This article is organized in the following manner: section "Theoretical Underpinnings" presents the theoretical background for the impact of trade liberalization upon productivity growth, section "Methodology" deals with analytical framework or methodology used for estimating productivity growth, section "Productivity Growth of Indian Manufacturing Firms" discusses recent empirical studies on the link between policy shift and productivity growth at the firm-level, section "Determinants of Productivity Growth at the Firm – Level" analyzes studies on the determinants of productivity growth and the last section concludes.

Theoretical Underpinnings

In trade theory literature the impact of greater openness of an economy on productivity growth is not unambiguous. According to Rodrik (1992), in the presence of imperfect competition trade reform can affect welfare of an economy through four channels: (i) the volume of trade effect, (ii) the excess profits effect, (iii) the scale efficiency effect and (iv) the technical efficiency effect. As a result of trade reforms, firms are able to access cheaper imported inputs, capital goods, and superior technology which are likely to improve firm-level productivity. Protected sectors in developing economies are generally those with excess profits and unexploited scale economies. Entry of new firms into those

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sectors is likely to make market structure more competitive, thereby resulting in reduction of X-inefficiency (Srivastava, 1996). The relationship between world prices and domestic marginal costs determine whether domestic output will get reduced or expanded in import-competing sectors. Opening up of the economy may squeeze the import-competing sector if domestic marginal costs are above international prices. When the effect of liberalization is to squeeze domestic import-competing sector, the impact of economic liberalization on efficiency is ambiguous.

Methodology

The Total Factor Productivity Growth (TFPG) can be measured by following either the *growth accounting method* or the *production function approach*. At the firm-level, the technical efficiency can be estimated by the *stochastic frontier approach* (SFA) or by the *data envelopment approach* (DEA). One of the disadvantages of the SFA is that it assumes an explicit functional form of a stochastic production frontier. The parameter estimates are sensitive to the choice of the probability distribution specified for the disturbance term. On the other hand, the linear programming technique of DEA does not impose any assumptions about functional form and hence is less prone to misspecification. DEA is a non-parametric technique and it is commonly used to evaluate the relative efficiency of a number of producers. It compares each producer with only the "best" producers. However, the DEA estimates may be biased if the production process is largely characterized by stochastic elements. This approach does not take into account the random factor.

Productivity Growth of Indian Manufacturing Firms

A number of studies have examined the impact of economic reforms on productivity growth of firms in India. Krishna and Mitra (1998) have collected firm-level data from the Center for Monitoring Indian Economy (CMIE) database for four industries namely, electronics, electrical machinery, non-electrical machinery, and transport equipment for the period 1986–1993. There was a reduction in average tariffs in all four sectors between 1990–91 and 1991–92. This study has adopted the production function method assuming Cournot behavior on the part of firms. An intercept dummy is used to measure the change in productivity growth of firms in the post-1991 period. This study has found strong evidence of an increase in competition as reflected in the reductions in price–marginal cost markups. Regression

results also indicate increase in growth rate of productivity in three industries namely, electronics, non-electrical machinery, and electrical machinery.

Balakrishnan and Suresh Babu (2000) have carried out a study based on firm-level data in order to examine whether there is a shift in productivity growth in those sectors of manufacturing where the reform has been most pronounced since 1991. Trade liberalization is defined as significant reductions in the tariff rate. On the basis of the record of tariff reduction since 1991, the industry groups chosen are machinery, transport equipment and parts, textiles, textile products and chemicals. The data for a panel of 2,300 firms spread over five industry groups are collected from the *Prowess* database for the years 1988–89 to 1997–98. The time dummy variable used in the regression analysis indicate a statistically significant decline in the TFPG rates since 1991–92. It is however observed that the period studied is too soon after the launching of reforms for there to have emerged the increase in the productivity growth and the reforms have so far remained mainly macroeconomic in nature. Productivity growth may well have strong microeconomic foundations which are not yet addressed.

Srivastava (2001) has focused on the TFPG rates and technical efficiency at the firm level using the data of 3,100 companies for the period 1980–81 to 1996–97. He has observed that for the full sample, the productivity growth rate has declined during the 1990s. The estimates obtained from both the Cobb–Douglas and Translog specifications of production functions indicate a significant downward movement in average productivity growth rates in the nineties as compared to the eighties. At the sectoral level, the results obtained from the estimation of productivity growth rates in production function framework are in conformity with those obtained using the growth accounting framework. The sectoral productivity growth performance derived from the estimation of production functions are shown in Table 1.

Topalova (2004) based on *Prowess* database for the period 1989 to 2001, has observed that lowering of tariffs has led to faster productivity growth. The process of trade liberalization has increased productivity mostly in the private companies. Foreign companies operating in India experienced no change in productivity as a result of reduction in tariffs as they are already exposed to the potential competition from abroad. The size of the firm does not affect the ability of firm to respond to the trade liberalization shock.

Table 1. Changes in TFPG in the 1990s relative to the 1980s: Econometric Estimates

TFPG rates decreased	TFPG rates increased	Mixed evidence
<i>Food product and beverages</i>	Fabricated metal products	<i>Textiles</i>
Non-metallic mineral products	Paper and paper products	<i>Other transport equipment</i>
Tobacco products	Publishing and printing	<i>Chemicals</i>
Wood and wood products	Basic metals and alloys	<i>Motor vehicles</i>
Machinery and equipment	<i>Leather and leather products</i>	Electrical machinery
	Rubber and plastic products	

Source: Srivastava (2001).

Note: Sectors in italics are the expanding sectors of the 1990s.

The analytical framework of Balakrishnan et al. (2006) is similar to the study of Krishna and Mitra (1998) but all input variables are constructed differently. The study period is from 1988–89 to 1997–98. The impact of economic liberalization on the productivity of firms is measured by including a dummy variable in the regression equation. The dummy variable is set to zero for the years prior to 1992–93 and to one for all subsequent years inclusive of it. The firm-level data for the study is collected from the *Prowess* database for 13 sectors namely, food products, beverages and tobacco, textiles, textile products, paper, chemicals, rubber, plastic and petroleum products, basic metals, non-metallic minerals, metal products, machinery, transport and other industries. The group of other industries consists of leather and leather products, wood and wood products and miscellaneous as shown in the original source. The dataset consists of 3,582 firms and these firms account for more than 60 percent of the output of corresponding industrial group reported in the annual survey of industries.

It has been observed that there is statistically significant rise in the productivity growth rates for three industry groups namely, paper, basic metals, and metal products. But, there is a statistically significant decline in productivity growth rates for two groups namely, rubber, plastic, and petroleum products and chemicals. It is therefore, concluded, “there is no evidence of a widespread rise across industry groups in the rate of productivity growth” during the study period. This study however, does not provide any explanations for differential productivity growth rates across the industry groups in an era of economic liberalization.

Sivadasan (2009) has analyzed the impact of two reforms—liberalization of foreign direct investment (FDI) and

reduction of tariff rates—on productivity on the basis of plant-level data from 1986–87 to 1994–95. It has been observed that both FDI and tariff liberalization have resulted in significant improvements in mean intra-plant productivity levels in the liberalized industries over the longer term (1993–94). These improvements take a couple of years to be realized in the case of FDI reform. This delayed effect may be due to the fact that changes in work flows or production processes take time to yield benefits. Moreover, firms also had concerns about the permanence of the reform process. The study of Topalova and Khandelwal (2010) explores whether there exists a causal link between changes in tariffs and firm productivity. It has been observed that movements in tariffs were “strikingly uniform” during the Eighth Plan (1992–97). But, the uniformity in tariff movements is not visible after 1997. This suggests that policymakers may have been more selective in setting product tariffs during 1997–2001. So, this article deals with the possible endogeneity of trade policy. It has been estimated that a 10 percent reduction in output tariffs, effective rates of protection and input tariffs raises firm productivity by 0.32 percent, 0.25 percent, and 4.8 percent, respectively. This study therefore, concludes that there is an evidence of improvement of productivity of firms in India due to increased access to wider varieties of possibly higher quality imported inputs.

Determinants of Productivity Growth at the Firm Level

Some studies have tried to identify the determinants of productivity growth of firms in India. Ray (2004) has examined the trends in the efficiency of manufacturing firms in the era of economic reforms and also identified the changing role of various factors that determine this efficiency. She carried out the Data Envelopment Analysis

in order to estimate the efficiency of firms for 27 industry groups for the period 1991–2001. The data for the study are collected from the *Capitaline* database. It is observed that the average efficiency has declined over the period 1991 to 1996. After 1996, there is some improvement in the average efficiency although it could not reach 1991 level. The industries that have shown an increase in efficiency in 2001 compared to 1991 are automobiles, electronics, personal care, auto ancillaries, cement, and fertilizers. In most of these industries the entry of foreign firms with new technology is mainly responsible for the

improvement in technical efficiency. The level of technical efficiency has stagnated in industries like steel, paper, and textiles over the period 1991 to 2001 where technologies are standardized. A regression analysis for each of the years 1991 to 2001 is carried out to identify the factors influencing the efficiency estimates. The study has observed that the ownership of domestic firms by multinational enterprises (MNEs) has resulted in improvement of efficiency in these firms over the years. Moreover, strategic alliances with MNEs have helped domestic firms to enhance their level of technical efficiency. The domestic firms have also benefited from knowledge spillovers about best practices from their affiliation with the MNEs.

In analyzing the impact of FDI spillovers on the productivity of Indian enterprises for the years 1993–2000, Siddharthan and Lal (2004) have argued in favour of taking into account the entry and exit of firms. The firm-level data for the sectors such as air conditioning, automobile ancillaries, automobile heavy and light commercial vehicles, automobile motorcycles, automobile passenger cars, chemical, domestic appliances, dry cells, electrical goods, electronic components, consumer electronic goods, engines, paints, personal care, pesticide, pharmaceuticals, telecommunications, and engineering are collected from the *Capitaline* database. This study has estimated separate firm level cross section equations for each year to analyze the possible changes in the values of spillover coefficients over time. The value added per unit cost of labor is taken as a measure for labor productivity. The study has used the panel data techniques, pooling of time-series with cross-section data, and has estimated the fixed effect and the random effect models. The regression analysis has indicated the presence of significant spillover effects from FDI in the Indian industrial sector. During the initial years of liberalization, the spillover effects were modest, but increased sharply in later years. The study has further observed that the domestic firms with lower productivity

gaps with MNEs are able to enjoy higher spillovers while those with larger productivity gap did not benefit much.

The impact of ownership on efficiency of engineering firms in India has been analyzed in the study of Goldar et al. (2004). The technical efficiency of firms is estimated with the help of a stochastic frontier production function. A comparison of technical efficiency is made among three groups of firms in Indian engineering namely, (i) firms with foreign ownership, (ii) domestically owned private sector firms and (iii) public sector firms. The study has tried to find out whether the technical efficiency of foreign firms is

generally higher than that of domestically owned private sector and public sector firms and to what extent the domestically owned firms did catch up with the foreign firms in terms of technical efficiency during 1990s. The data is collected from 63 firms (12 public sector, 39 private sector, and 12 foreign firms) in the engineering industries from the *Prowess* database of CMIE. All these 63 firms are the large firms having sales turnover of Rs 50 crore and above during the period of study, that is, 1990–91 to 1999–2000. It is observed that the technical efficiency of the foreign firms is higher than the domestically owned firms, both private and public sector enterprises. However, the domestically owned firms are catching up with foreign owned firms in terms of technical efficiency. So, the results indicated a process of convergence in technical efficiency. There is no significant difference in the technical efficiency between private and public sector firms among the domestically owned firms. The study has also observed a positive relationship between international trade orientation of a firm and the level of its technical efficiency.

In her study Banga (2004) has analyzed whether the source of foreign direct investment in a firm has an impact on its productivity growth. The productivity growth in Japan-affiliated, US-affiliated, and domestic firms is compared in automobiles, electrical, and chemical industries for the period 1993–2000. The estimation is carried out at three levels. First, TFPG is estimated by using the “time-variant firm specific” approach (parametric approach). Second, the impact of the source of affiliation on the TFPG of a firm is estimated using the least square regressions on seven-year averages. Finally, the Data Envelopment Analysis (DEA), non-parametric approach, is carried out and Malmquist indices are estimated in order to investigate to what extent TFPG in a firm is explained due to change in technology (that is caused by the frontier shift) and change in technical efficiency (defined as the distance of an average firm from the efficiency frontier).

The analysis is based on the data for 276 firms (153 domestic, 78 US-affiliated, and 45 Japanese-affiliated) from *Capitaline* database. The study has reported low rate of growth of TFP, that is, less than 1 percent during 1993–2000. TFPG is the highest for the Japanese firms, and the average TFPG of the US firms is found to be less than the domestic firms. The regression results indicate that Japanese affiliation has a significant positive impact on productivity growth in a firm while the impact of US affiliation is not significant. The factors such as the R&D intensity of

the firms and import of disembodied technology by the firms are also found to be significant determinants of productivity growth in Indian firms. Using the DEA approach, it is shown that US-affiliated firms rely mainly on technological improvements to achieve productivity growth, while the major thrust to productivity growth in Japanese-affiliated firms comes from efficiency improvements. The domestic firms have experienced both technological progress and efficiency growth in the electrical and chemical industries in the post-1991 period.

The study of Kato (2009) has examined the effects of product market competition on the TFPG rates of firms in Indian manufacturing industry for the decade from 1991–92 to 2001–02. The extent of competition has been measured by market shares, Herfindahl indices and import ratios for each product market. The focus of the study is on eight manufacturing sectors namely, chemicals, plastic and rubbers, non-metallic mineral products, base metals, non-electrical machinery, electrical machinery, electronics, and transport equipment. The study has observed that the import penetration ratio faced by each firm has gone up but, market share of each firm and the Herfindahl index have declined between 1992–93 and 2001–02. This indicates that product market competition intensified during 1990s due to economic deregulation policies of the central government. The author has estimated the effects of product market competition on TFPG. The result indicates that a firm with a smaller market share has higher TFPG in a less concentrated market. Competitive pressure is likely to be high in a less concentrated market. The study therefore, concludes that product market competition has enhanced productivity growth rates, as an effective competitive environment creates pressure for managers to make effort to improve productivity.

Conclusion

We have reviewed in this article the productivity growth of Indian manufacturing firms and also the factors which have

influenced the productivity growth in an era of economic reforms. In most of the studies, economic liberalization is defined in terms of reduction of tariff rates or inflows of FDI. Some studies have demarcated pre- and post-reform period by using dummy variable. It may not be appropriate to use dummy variable in order to capture the impact of trade liberalization upon productivity growth when liberalization is an on-going process (Chand and Sen, 2002). The survey of literature does not provide any conclusive evidence regarding the impact of economic

reforms on firm-level productivity growth. Moreover, the impact of economic reforms is also not uniform across all sectors.

Studies have shown that import of disembodied technology, R&D intensity and availability of wider varieties of higher quality imported inputs have favorable impact on productivity growth of Indian firms. Productivity of firms has improved in sectors where the market structures have become more competitive as a result of deregulation. Studies have observed the presence of significant spillover effects from FDI in Indian manufacturing sector. Entry of foreign firms with new technology has caused an improvement in productivity at the sectoral level due to diffusion of technology. The domestic firms with lower productivity gaps with MNEs have benefited more due to the spillover effect. It is interesting to note that the source of FDI is an important determinant for productivity growth as Japanese affiliation has a more positive impact on productivity growth of a firm compared to US affiliation.

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Being rich is having money, being wealthy is having time.

— Margaret Bonnano

Electronics Industry under Economic Reform: Firm-level Productivity Analysis

Suresh R.

An attempt has been made to study productivity in different production method both aggregate as well as across different regions. To study Productivity in electronics industry ASI unit level data has been used. The Total factor productivity growth (Multilateral production function) for the period 1984-85 through 2004-05 has been either sluggish, if positive, or negative over the period. TFPG (Multilateral production function) depicts the same result as that of Cobb–Douglas production function except some changes. During the pre-reform period TFPG was positive, it turned to be negative during the first phase of reform period and become positive during the second phase of the reform period. Regional level comparison of TFPG of the 1990's with that of the 2000's shows that it has increased across various states. A large number of regions experienced negative TFPG during 1990's and almost same number of states have turned positive during the 2000's.

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Introduction

Liberalization of the Indian economy has reduced the dominance of the public sector and encouraged the private sector in the country's manufacturing sector. This is so even in the electronics industry. During the pre-reform period the Indian electronics industry was dominated by the public sector, whereas in the post-reform period competition increased from the domestic private and multinational entrepreneurs. The liberalization of the Indian economy during 1980s resulted increase of domestic private sector participation and during 1990s major economic reforms through structural adjustment programs have allowed foreign firms to enter the Indian electronics industry. However, one of the aims of reforms is to ensure increasing efficiency of industry.¹

Periodic technological advancements results to the increasing returns to scale of the factors of production in the long run.² The openness of the Indian economy has increased technology import, capital accumulation, intermediate inputs import, skilled labor, etc. Imported capital or technology has a significant effect on productivity (Hasan, 2002). Hence, to encourage private participation, particularly foreign participation, trade restrictions have been either reduced or removed. The average tariff rate on import of manufactured products was 122 percent in 1986 and 129 percent in 1991, which declined to 40 percent in 1996 and 35 percent in 1998. It fell to 12 percent by 2007 (Purell et al., 2007; Goldar et al., 2008). India's excise

¹ With regard to the public sector, the aim of the economic reform is to increase the efficiency of the public sector and reducing the burden on the budget by the loss making public sector enterprises through disinvestment.

² This has been the basis of the many studies starting from Karl Marx to Schumpeter and to the evolutionary economists like Nelson and Winter. The theory is as follows: the returns to scale of different factors of production like Land, Labour and Capital rises initially but after a period of time it tends to reach a plateau and thereafter decreases. This happens under the assumption that there is no change in the underlying technology. The modern growth models emphasize the role of technological change and factors like research and development, investments on human capital as the main reasons for long-run economic growth.

duty is still higher than many other countries (particularly East Asian countries). Trade policy on electronics products emphasize free import and export³ but Special Additional Duty (SAD) or Additional Customs Duty (ACD) at 4 percent, Countervailing Duty (CVD) at 8 percent, and Cess at .43 percent are still being imposed.

However, competition among firms increases efficiency in the use of available resources. The participation of MNCs with their capital and technology would result in the industry being increasingly capital intensive. Reform of entry and exit barriers creates conducive environment for efficient firms and the inefficient firms exit, so that overall performance of electronics industry increases. On the basis of these explanations one can expect an improvement in productivity in the post-reform period. Apart from a handful of studies, there have not been many firm and region-specific studies analyzing the performance of the electronics industry.⁴ Firms in an industry are heterogeneous and consequent to economic reforms there is entry and exit of firms with their own technology. So it is appropriate to use of firm level data rather than industry aggregates to study total factor productivity (Liu and Tybout, 1996, Bartelsman and Doms, 2000).

The objective of this article is to study the productivity at firm level (the unit-level ASI data) during the reform period. Secondly, attempt has been made for panel⁵ study (ASI unit level) and analyze whether there is any variation in productivity in different production method (parametric and non-parametric). Thirdly, to examine whether there is any variation in firm-level productivity across different regions.

Prominence and Historical Perspectives of Electronics Industry

Electronics industry occupies an important place in the economy. As a key industry, it links every sector, provides employment, and facilitates to the growth of the economy. It is not only an important player in the economy but also one of the most globalized industries in the world. Without electronics it is hard to imagine any services, be it internet, telecom, engineering industries, aviation, energy, banking, etc. Indian electronics can broadly be classified into six categories. They are consumer electronics, industrial electronics⁶, strategic electronics, computer electronics, communication and broadcasting equipment electronics and electronics components. The nanotechnology⁷ has been used in various applications in general and defense sector in particular. With microelectronics, there would be drastic shift in industrial production technique. Use of microfluidic chips, integrated circuits, semiconductor⁸, results to reduce the size of electronics products viz. mobile phone, television, radio, etc.

The electronics industry is characterized by short product life cycles, falling prices, high obsolescence costs, and rapid changes in technology. Domestic demand for the electronics products have been rising as its price is falling. To meet its domestic demand, India cannot afford to imports entirely. So, the hardware base is very much required with adequate capital and advanced technology to make electronics industry competitive. To strengthen electronics hardware base electronics hardware technology parks are established and special economic zones, export processing zones and export

³See appendix 1, Structure of IT products. This has been prepared in accordance with NAMA agreement. List of Electronics identified in paragraph 10 of the Draft modalities for consideration by developing countries such as India for reduction or elimination of customs tariffs as part of the Non-Agricultural Market Access (NAMA) Negotiations at the WTO.

⁴See, for example Joseph (1991), Pingle (2000), Sarosh and Stephen (2001), Das (2004), Baptista and Swann (1999).

⁵ASI unit level data has Permanent Serial Number (PSL) till the year 1998-99 and PSL-State combination is unique to every firm. So there is no difficulty in identifying firms to make a panel. From the year 1998-99 onwards ASI suppresses firm identity. Here firms are identified and panel has made by concatenating NIC code, State code, and Year of Establishment. Initially attempts are made to identify firms through opening and closing capital stock, i.e. Closing value of capital stock on 31 March of one financial year and Opening value of Capital stock on 1 April of the immediately next financial year. Since firms obtained are very less, this method was dropped and the above mentioned method is the one used.

⁶Industrial electronics refers to all tools, equipment and processes of electrical or electronics equipment in an industrial activity. Industrial electronics can be used in the field of research and development laboratory, factory automation, mechatronics, intelligent systems, chemical processing plants, power generating station etc.

⁷One nanometer (nm) is equal to one billionth of a meter. Nanotechnology is been used in Defence sector. It can be fitted in soldiers uniform so that can be traced out position and condition of the soldier. It can also be used to produce solar energy, solving large extent energy crisis in the country.

⁸Semiconductor is a product consisting of transistors and other circuitry elements which is designed to perform an electronic circuitry function.

oriented units are encouraged. This has influenced on production, export and employment in electronics industry. Electronics hardware sector has recorded employment around 4.8 million during the year 2008. India's share in world total electronics hardware equipment is estimated to be 1.24 percent. Its production during the year 2009–10 registered Rs 109,940 crore and growth of 13 percent over the year 2008–09 when it was recorded Rs 97,260 crore. During the year 2008–09, export of electronics goods recorded Rs 31,230 crore registered a growth of 136 percent over the previous year that has recorded Rs 13,200 crore.⁹ The electronics hardware equipments production in the world is estimated to be US\$ 1611 billion (Electronics & Computer Software (ECS) and Ministry of Information Technology 2009–10).

As a sunrise (electronics) industry and knowing the extent and impact of this industry, many of the central public sectors firms are established immediate after independence. Some of them are as follows. The first firm that has established was Indian Telephone industries (1948) for telecommunications and equipment products. Hindustan Cables Ltd (1952) has emphasized the manufacture of telecommunications cable. Hindustan Machine Tools (1953) for production of Watches (Electronics). Bharat Electronics Ltd (1954) has emphasized defense and telecommunications equipment manufacture. Hindustan Teleprinters Ltd (1960) focused its operation on teleprinters and electronic typewriter.

In India, the computer industry began during 1960s and was dominated by foreign firms. International Business Machines (IBM) began its operation in 1964. Digital Equipment Corporation (DEC) and International Computers Limited started its operation during 1968. These companies were mainly involved in kit-assembling by importing required inputs from their parent companies established in United States. The computer systems installed in the country were once it had been introduced in the developed countries more than five to ten years earlier (Grieco, 1984, Joseph, 1997). Realizing importance of foreign participation, Bhabha Committee, recommended foreign firms to associate their capital with Indian firms and increase their manufacturing activities within the country. This discouraged many of the foreign companies operation in India as a result of which some companies stopped and others reduced their operation viz., IBM, ICL, etc. However, ICL behaved a bit different from IBM, by reducing its equity participation and naming

differently a new firm called International Computers Indian Manufacture (ICIM). The foreign firms' entry and exit has affected not only production but also employment. Foreign firms' restrictions were intensified latter by introducing the Monopolies and Restrictive Trade Practices (MRTP) act of 1969 and Foreign Exchange Regulation Act (FERA) of 1973. Realizing importance of indigenous industry, the Electronics Corporation of India Limited (ECIL) was established during 1967 to strengthen computer and communication instrumentation and increase the employment opportunity. During 1970s, the other computer companies that were operating in the economy are Hewlett Packard (USA), Control Data Corporation (USA), Inter Data (USA), Micronics (UK), Electronorg Technika (USSR), Computer Automation, Digital Equipment Corporation, Burroughs, Honeywell, Univac, etc.

During 1980s Indian experienced the entry of private firms into the electronics industry. Delhi Cloth and General Mills Company Limited (DCM) began its production during 1978 with its Galaxy 15 and Spectrum 7 minicomputers. HCL began its operation as a joint venture with UP State Electronics Corporation but later became independent company and introduced microcomputers like 8C, 8CK and HCL-1600. The ORG company has expertise in software and brought ORG 2100 computer into the market. WIPRO developed the Intel 680386 microprocessor based supercomputer and 386 based systems. Pragathi Systems India (PSI)—entered by emphasizing on research and development activity but could not cope up with fast changing technology and had to close (Joseph, 1997). Since many of these companies did not focused research and development activities and objective was for short run profit by engaging in kit-assembling that has affected employment generation in the electronics industry.

During 1970s, television industry was mainly small scale firms and experienced lack of research and development facility and emphasized on assembly of completely knocked down or semi knocked down kits. Since electronics industry is capital intensive, large scale units were encouraged during 1980s. There were many companies that existed during pre-reform period and beginning of the reform period. Some of them are as follows, Beltek Electronics Pvt. Ltd, Besta Vision Electronics Ltd, Bush India Ltd, Weston Electronics Ltd, Video Electronics Ltd, Televista Electronics Pvt. Ltd, Electronics Consortium Pvt. Ltd.

Electronics industry as capital and technology intensive industry, large scale units are very much essential

⁹See appendix 3, for detailed production and export and its growth of electronics industry at dis-aggregate level.

to have economies of scale. During post reform period, India has experienced increase in private sector participation including multinational enterprises. However, merging Indian electronics industry with foreign companies emerged with several challenges as well as new opportunities. It is challenges because of entry of foreign firms with import of foreign capital and also new opportunities arose from the opening up of the world markets for the Indian electronics industry. As multinational enterprises participation increased, many of the small scale firms had to close, due to high cost of production. Multinational enterprises participation with Indian firms has its own advantages as well as disadvantages. Indian firms may get research and development support, access to latest technology and capital. As regards foreign partners, they can utilize available skilled labor, low cost of production, and growing market. In this process foreign firms are subsequently increased affecting structure of employment in electronics industry.

This study is organized as follows. The first section introduces the subject and the second section interprets prominence and development of electronics industry, the third section discusses data, variables, and methodology, the fourth section explains total factor productivity growth—first phase and second phase of reform period, the fifth section analyzes Cobb–Douglas TFPG from 1994–95 to 2004–05, the sixth section studies Multilateral Total Factor Productivity Growth, the seventh section analyses state-level total factor productivity growth, the eighth section studies the relation among emolument, contract labor, employees and workers and finally, summary of the study are given in the ninth section.

Sources of Data, Measurement of Variables, and Methodology

Sources of Data

In this study we use micro-level data. This data consists of important variables at firm level collected by the Annual Survey of Industry, Central Statistical Organisation (CSO), and Government of India. This dataset is not available in a published form, but can be obtained electronically from the Annual Survey of Industry, CSO. The data used are for the years 1983–84, 1984–85, 1989–90, 1993–94, 1994–95, 1996–97, 1997–98, 1998–99, 1999, 2000–01, 2001–02, 2002–03, 2003–04, and 2004–05 for firms in the electronics industry, which covers units related to manufacture of office, accounting and computing

machinery, manufacture of electronic valves and tubes and other electronic components, manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy, manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods, manufacture of medical and surgical equipment and orthopedic appliances, manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes except industrial process control equipment, manufacture of industrial process control equipment [apparatus used for automatic continuous measurement and control of variables such as temperature, pressure, viscosity and the like of materials or products as they are being manufactured or otherwise processed], and manufacture of photographic equipment. This data has concorded NIC-98 with NIC-87 by using concordance table. These products at five-digit level have been compared with the products of Electronics industry, Data bank of Department of Information Technology, New Delhi.

Measurement of Variables

Total Output = Value of products and by-products + Income from services (industrial/non industrial including work done for others on materials supplied by them and sale value of waste left by the party) + Value of electricity generated and sold + sale value of goods sold in the same condition as purchased.

Total employees = Total workers + Supervisory and managerial staff + Other employees + Unpaid family members/proprietor/Coop. members

Total Workers = Male workers employed directly + Female workers employed directly + Child workers employed directly + Workers employed through contractors

Total input = Fuels consumed + materials consumed + work done by others on materials supplied by the industrial undertaking + repair and maintenance (building + plant and machinery + pollution control equipment + other fixed assets) + operating expenses + non-operating expenses (excluding insurance charges) + insurance charges + purchase value of goods sold in the same condition as purchased.

Material consumed = Total basic items + Non-basic: all kinds + Packing items + Consumeable store + Other items imported.

Fixed assets = Land + building + plant and machinery + transport equipment + computer equipment + computer

equipment including software + pollution control equipment + others + capital work in progress

Energy = Fuel = Electricity purchased and consumed + petrol, diesel, oil, and lubricants consumed + coal consumed + other fuel consumed.

Methodology

Multilateral TFP index

The formula for the multifactor productivity index when there are four factors of production: Capital (K), Labor (L), Energy (E), and Materials (M).

Let SL_b be the income share of labor in the firm-year b and \overline{SL} be the arithmetic mean of income share of labor across all observations. Then α_b can be written as:

$$\alpha_b = \frac{SL_b + \overline{SL}}{2}$$

Similarly, $\alpha_c, \beta_c, \gamma_c, \lambda_c, \beta_b, \gamma$ and γ_b are defined.

Now,

TFPbc =

$$\left(\frac{Y_b}{Y_c}\right) \left(\frac{\overline{L}}{L_b}\right)^{\alpha_b} \left(\frac{\overline{K}}{K_b}\right)^{\beta_b} \left(\frac{\overline{E}}{E_b}\right)^{\gamma_b} \left(\frac{\overline{M}}{M_b}\right)^{\lambda_b} \left(\frac{L_c}{\overline{L}}\right)^{\alpha_c} \left(\frac{K_c}{\overline{K}}\right)^{\beta_c} \left(\frac{E_c}{\overline{E}}\right)^{\gamma_c} \left(\frac{M_c}{\overline{M}}\right)^{\lambda_c}$$

where Y = Output

K = Capital

L = Labor input

E = Energy or Fuel input

M = Material input

$\alpha_b, \alpha_c, \beta_c, \gamma_c, \lambda_c, \beta_b, \gamma_b$ and λ_b are weights based on income shares.

This index expresses the productivity level in firm-year b (say, Firm x in year 2004–05) as a ratio of the productivity level in firm-year c (say, firm y in year 2000). L, K, E, and M with a bar above are sample averages (geometric means). The coefficients represent respective income shares.

Econometric Estimation of Productivity

Cobb–Douglas Production function

In the Cobb–Douglas production function (econometric) method, the total factor productivity growth is explained by the coefficient of “t” value. Here, the Cobb–Douglas production function (CD) has been used, to estimate total factor productivity growth.

Total Factor Productivity Growth—First Phase and Second Phase of Reform Period

Description of TFPG during first phase (1993–94 to 1998–99) and second phase (1999–2000 to 2004–05) of the reform period is as follows.

To analyze inter-firm variations in productivity growth the Cobb–Douglas production function has been used. To study this production function GLS method, FE, and RE models have been used. This model has been estimated for a panel data set (pooled cross section and time series). Hausman Specification (HS) test is applied to choose random effect against fixed effect model. HS test suggested the RE model over FE model. The database for this study has been used from ASI unit level. This study divides the post-reform period into two phases: the first phase from 1993–94 to 1998–99 and the second phase from 1999–2000 to 2004–05. Here Unbalanced Panel have been used, and during the first phase the number of firms consists of 1071 and during the second phase the number of firms rises to 2380. The overall R square is 0.91 during the 1990s and it is increased to 0.96 during the 2000s. It depicts that the independent variables, viz. capital, labor, energy, and material, are better associated with output during the second phase of the reform period.

Total Factor Productivity Growth: First Phase of Reform Period

Here the output has been regressed on labor, capital, energy, and material. During the first phase (1993–94 to 1999–2000) of the reform period the output elasticity of capital, labor, energy, and material were recorded at 0.139, 0.316, 0.188, and 0.48, respectively. The “t” time value is negative (–0.122); in other words the technical change has been negative. Output elasticity of material recorded the highest (0.480) followed by labor (0.316), energy (0.188), and capital (0.139).

Total Factor Productivity Growth: Second Phase of Reform Period

During the second phase of the reform period the “t” time value (technical change) has been recorded 0.026. Hence, during the second phase of the reform period the technical change has become positive. During the 2000s, the output elasticity has been determined by material (0.621), labor (0.242), capital (0.141), and energy (0.066), respectively. Hence, the output growth during the second phase in comparison to the first phase has been mainly contributed by material, capital, and technical change. The comparison

Table 1. Cobb–Douglas Production Function, 1993–94 to 1998–99

Random-effects GLS regression 1993–98			
Output (Dependent Var)	Coef.	Std. Err.	Z
Capital	0.139*	0.02	6.74
Labor	0.316*	0.036	8.56
Energy	0.188*	0.022	8.36
Material	0.48*	0.016	18.94
t	-0.122*	0.025	-8.64
cons	4.4*	0.235	18.68
R-Sq within	0.88		
R-Sq between	0.915		
R-Sq overall	0.912		
No. of obs.	1071		
No. of groups	945		
Obs per group min	1		
Avg	1.2		
Max	4		
Wald chi2(5)	8280.35		
Prob > chi2	0.0000		

Note: *=statistically significant at 1 percent,

of the 1990s with the 2000s mean values of variables depicts that the increase in total factor productivity growth has been accompanied by an increase in material and capital. The labor and the fuel coefficients have declined during the second phase of the reform period.

The output elasticity of capital has increased slightly during the second phase of reform period comparing to the initial phase of the reform period. This would have contributed to the positive technical change. The output elasticity of capital during the first phase recorded 0.139, whereas during the second phase it recorded 0.141. Capital consists of machinery, tools, factory building, etc. The electronics industry is highly capital intensive in nature, and most of the public sector firms during the pre-reform period had been experiencing shortage of capital. The economic reform has encouraged private participation, and this has improved the capital stock. The public–private participation has also strengthened the capital stock. The total factor productivity growth during the first phase of reform period, that is, the 1990s, has been negative, while it has turned to be positive during the second phase, that

Table 2. Cobb–Douglas production function, 1999–2000 to 2004–05

Random-effects GLS regression 1999–2004			
Variables	Coef.	Std. Err.	Z
Capital	0.141*	0.007	15.33
Labor	0.242*	0.013	18.74
Energy	0.066*	0.009	7.1
Material	0.621*	0.006	19.46
t	0.026*	0.003	2.85
cons	2.581*	0.052	29.16
R-Sq within	0.937		
R-Sq between	0.960		
R-Sq overall	0.960		
No. of obs.	2380		
No. of groups	1913		
Obs per group min	1		
Avg	1.2		
Max	4		
Wald chi2(5)	60887.92		
Prob > chi2	0.0000		

Note: *=statistically significant at 1 percent,

is, the 2000s. The possible reason behind this is that the new machinery (capital) has been brought into full use in the second phase. In other words the gestation period of capital investment is quite high. Material input is an important factor of production contributing to productivity growth during the 1990s and 2000s.

Table 3. Level of TFPG - Cobb-Douglas: 1994–95 to 2004–05

Year	TFPG
1994–95	1.78356
1996–97	-0.3815
1997–98	-1.6407
1998–99	-1.12
1999–00	-1.46
2000–01	2.52611
2001–02	-0.6325
2002–03	5.28758
2003–04	1.41828
2004–05	1.58596

Total Factor Productivity Growth, Cobb–Douglas: 1994–95 to 2004–05

The total factor productivity growth (Cobb–Douglas) during the 1990s has been negative except for 1994–95. TFPG has been positive during the 2000s except for 2001–02. A comparison of TFPG over time shows that it increased during the second phase of the reform period over the first. The TFPG has been recorded at 1.78 percent during the year 1994–95, and it has drastically declined to –1.64 percent in the year 1997–98. During 1998–99 to 1999–2000 the TFPG has improved but remain negative. On the other hand, in the following period (2000–01 to 2004–05) there has been a positive growth except for the year 2001–02. It has recorded 2.52 percent during the year 2000–01, while it decreased and recorded –0.63 during the year 2001–02. The highest rate of TFPG has been recorded during 2002–03 at 5.28 percent; in the later years it has declined but has remained positive.

Table 4. Level of TFPG - Multilateral and Cobb–Douglas 1984–85 to 2004–05

YEAR	Multilateral TFPG	Cobb–Douglas TFPG
84–85	0.853	
89–90	2.741	
93–94	–1.492	
94–95	0.179	1.784
96–97	–2.003	–0.382
97–98	–1.348	–1.641
98–99	–0.477	–1.122
99–00	–0.496	–1.463
00–01	0.92	2.526
2001–02	0.098	–0.632
2002–03	–0.204	5.288
2003–04	0.315	1.418
2004–05	0.148	1.586

Multilateral and Cobb–Douglas: Total Factor Productivity Growth

The total factor productivity growth (multilateral production function) for the period 1984–85 through 2004–05 has been either sluggish, if positive, or negative over the period. It has been broadly classified as pre-reform period (1980s) and post-reform period. The post-reform period is again classified into the first phase of the reform period (1990s)

and the second phase of the reform period (2000s). A comparison shows that during the pre-reform period the TFPG was positive, it then turned negative during the first phase of the reform period and became positive during the second phase of the reform period. The highest growth rate (2.74 percent) was recorded during the year 1989–90, while the lowest growth rate (–2.003) was recorded during the year 1996–97. During the initial phase of the reform period the TFPG was negative except for the year 1994–95. During the second phase of the reform period the TFPG was positive except for the year 2002–03. During the post-reform period, the overall sign of TFPG of Cobb–Douglas and Multilateral production function remains the same except for the years 2001–02 and 2002–03.

Economic reform has resulted in the growth of those firms which have comparative advantage to grow, while those firms whose cost of production is high are forced to exit the market. Our result shows that the TFPG was high during the pre-reform period, decreased during the first

Table 5. State level Multilateral TFPG

STATE LEVEL MULTILATERAL TFPG			
STATE	93–98	99–04	93–04
ANDHRA PRADESH	–11.34	–5.97	–8.66
DELHI	5.98	–9.95	–1.99
GOA	–9.84	4.73	–2.56
GUJARAT	4.53	–2.02	1.26
HARYANA	–16.11	–2.3	–9.21
HIMACHAL PRADESH	–9.75	7.18	–1.29
KARNATAKA	3.05	–2.29	0.38
KERALA	–13.08	7.31	–2.89
MADHYA PRADESH	–17.33	9.22	–4.06
MAHARASHTRA	4.79	–14.75	–4.98
PONDICHERRY	0.52	5.6	3.06
PUNJAB	–5.65	8.95	1.65
RAJASTHAN	–18.93	13.43	–2.75
TAMIL NADU	–18.83	10.4	–4.22
UTTAR PRADESH	–13.88	17.86	1.99
WEST BENGAL	–7.14	–6.34	–6.74
AVERAGE	–7.69	2.57	–2.56

phase of the reform period (1993–94 to 1998–99) and increased thereafter (1999–00 to 2004–05). The TFPG fall during the 1990s in comparison to the 1980s supports several studies (Srivastava, 2000; Goldar, 2000; Banga, 2003). During the interventionist regime firms were protected, and many of the firms belonged to the public sector. These firms' research and development base were quite strong, resulting in a higher TFPG during the pre-reform period. The shift from an interventionist regime to the liberalization of the economy resulted in private participation, but there was a spurt in investment activity despite high annual saving rate of about 20 percent (Patibandla and Phani, 2002). The second phase of the reform period encouraged MNCs either through equity share or establishing their own firms. Trade liberalization facilitates free flow of new ideas and technologies, and reduces the idea gap which is a major source of spillovers and growth (Romer, 1986). The participation of MNCs with local firms leads to spillover effect resulting in the improvement in productivity.

State Level Multilateral Total Factor Productivity Growth

A comparison of total factor productivity growth of the 1990s with the 2000s shows that it has increased across various states. A large number of states have experienced negative TFPG during the 1990s, and almost the same number of states have achieved positive TFPG during the 2000s. Five out of sixteen states had negative TFPG over the period 1993–94 to 2004–05. During the 1990s the TFPG has been positive in the states of Delhi, Gujarat, Karnataka,

Maharashtra, and Pondicherry recording 5.98, 4.53, 3.05, 4.79, and 0.52 percent, respectively. However, during the 2000s the TFPG has been positive in the states of Goa (4.73 percent), Himachal Pradesh (7.18 percent), Kerala (7.31 percent), Madhya Pradesh (9.22 percent), Pondicherry (5.6 percent), Punjab (8.95 percent), Rajasthan (13.43 percent), Tamil Nadu (10.4 percent), and Uttar Pradesh (17.86 percent). Andhra Pradesh, Haryana, and West Bengal have recorded negative TFPG but have improved during second phase of the reform period in comparison to the first phase of the reform period. Pondicherry has recorded positive TFPG in both the periods.

TFP growth improved in most of the states during the second phase of reform period in compare to the first phase of reform period. The reasons may be establishment of better infrastructure for Information Communication Technology viz. Special Economic Zone (SEZ), Export Processing Zone (EPZ), Hardware Technology Parks (HTP), etc. However some of the developed states have experienced negative TFP growth, better infrastructure facility and higher profit margin in software sector may have attracting electronics hardware firms to software production affecting negatively on electronics hardware production.

The estimate of emolument, contract labor, employees and workers at the unit level during pre-as well as post-reform period

Figure 1 explains the relation among emolument, contract labor by employees, and contract labor by workers. The

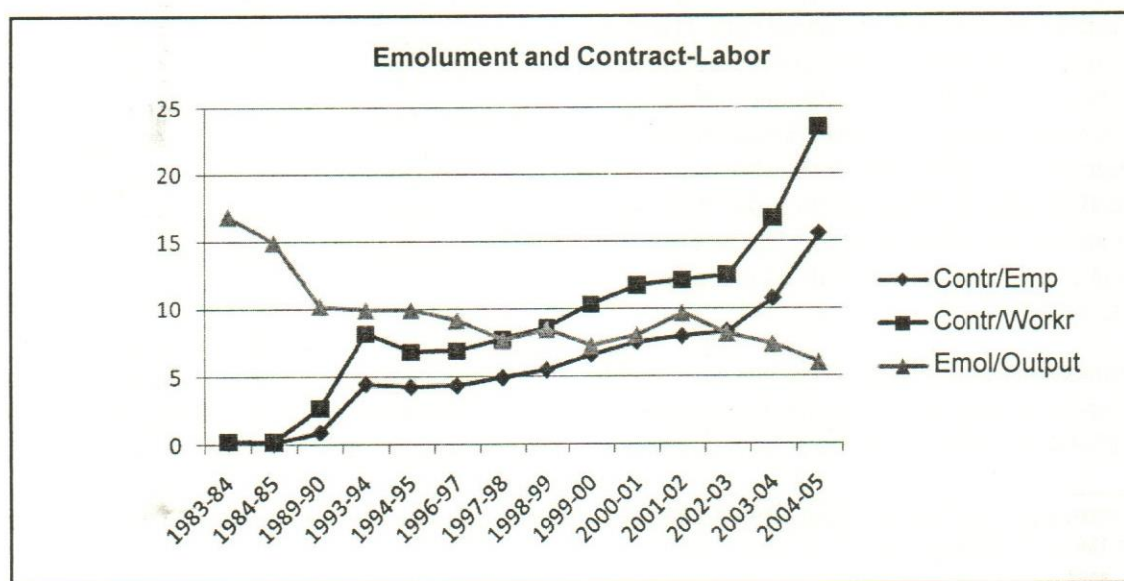


Figure 1. Relation between emolument and contract labour - 1983-84 to 2004-05

ultimate objective of management is to reduce the cost of production, increase the efficiency of labor, and increase the productivity by incorporating advanced technology. Management maintains labor according to its requirement. They retrench the unskilled labor and encourage capital intensive technique. In this process labor reform played a major role to attract multinational companies and their capital.

The economic reforms may be the reason for the decreasing trend of ratio of emolument to output and increasing trend of the ratio of contract labor.¹⁰ The reduced tariff rates and the removal of quantitative restrictions on imports and the other liberalization measures taken during the latter period of the reform regime may have influenced for the increase in productivity. Several Indian states have relaxed the provision of enforcement of labor laws which has resulted in flexible practices at the ground level (Sharma, 2006). There are other studies that support this view (Papola, 2008).¹¹ Contract labor is more preferable than the regular labor because of cost considerations in terms of expenditures like provident fund and other welfare expenditure. Therefore, the decline in the tariff rate, import quota and labor reform has affected increase in productivity during the second phase of reform period.

Summary

This article analyses total factor productivity and its growth during the reform period. The productivity study has also been done at regional level and to study this ASI unit level data has been used. At firm level regression function has been estimated for the panel data. The study uses both parametric and non-parametric methods to estimate production function. The ASI unit level data has been used to study the Cobb–Douglas production function and multilateral production function. The panel data (1993–94 to 1998–99 and 1999–2000 to 2004–05) analysis has been done in Cobb–Douglas production function. The main findings of the study are summarized in the following paragraphs.

In regression method output has been regressed on labor, capital, energy, and material. During the first phase (1993–94 to 1998–99) of the reform period, the

technical change or TFP has been recorded negative value (–0.122). Output elasticity of labor, capital, energy, and material have been recorded at 0.139, 0.316, 0.188, and 0.48, respectively. However during the second phase (1999–2000 to 2004–05) of the reform period the technical change or TFP has turned to be positive (0.026). The output elasticity have been determined by material (0.621), labor (0.242), capital (0.141), and energy (0.066). It depicts that the output growth during the second phase in compare to the first phase has been mainly contributed by material, capital, and technical change. The study from 1993–94 through 2004–05 shows that the TFPG increased during the second phase of reform period as compared to the first phase of the reform period. During the 1990s it has recorded negative except for 1994–95 and positive during 2000s except for 2001–02.

The total factor productivity growth (multilateral production function) for the period 1984–85 through 2004–05 has been either sluggish, if positive, or negative over the period. TFPG (multilateral production function) depicts the same result as that of Cobb–Douglas production function except some changes. During the pre-reform period TFPG was positive, it turned to be negative during the first phase of reform period and became positive during the second phase of the reform period.

Regional level comparison of TFPG of the 1990s with that of the 2000s shows that it has increased across various states. A large number of regions experienced negative TFPG during 1990s and almost same number of states have turned positive during the 2000s. During 1990s TFPG has been recorded positive in the states of Delhi, Gujarat, Karnataka, Maharashtra, and Pondicherry. However, during the 2000s the TFPG has been recorded positive in the states of Tamil Nadu, Uttar Pradesh, Pondicherry, Punjab, etc. Andhra Pradesh, Haryana, and West Bengal have recorded negative TFPG but have improved during the second phase of the reform period as compared to the first phase of the reform period.

The relation among emolument, contract labor by employees and contract labor by workers shows that there is decreasing trend of ratio of emolument to output and increasing trend of the ratio of contract labor. The objective of labor reform is to reduce the cost of

¹⁰Sharma's (2006) study found that the share of contract workers in total number of workers in the manufacturing industries has increased from 12 percent in 1990 to 23 percent in 2002.

¹¹Asha and Pages (2007) "Less changes in labor laws, weakening law enforcement, increasing recourse to temporary workers, increasing use of casual and contract labor and a shifting stand of the judiciary may have increased flexibility in the labour market" (Datt, 2003, Goldar, 2009).

production, increase the efficiency of labor and increase the productivity. It has resulted unskilled labor retrenched and encouraged capital intensive technique. Contract labor replaced regular labor to reduce the cost of production. Decline in the tariff rate, import quota and the labor reform may have resulted to increase productivity.

The results of the study have some implications for productivity, employment, and economic reform in the Indian electronics industry. Growth has been more noticeable in the latter phase of reform period as compared to its earlier phase. Although economic reforms were initiated during the late 1980s and early 1990s, its impact on the electronics industry has been reflected only in the latter phase of the reform period due to the long gestation period of this industry. A large number of regions have experienced negative TFPG during the 1990s and almost same number of states has recorded positive TFPG during the 2000s. What is clear is that the use of advanced technology through improving domestic research and development, and import of foreign technology, or encouraging foreign participation results in increased productivity. With the electronics industry having experienced increased productivity, it can now turn its focus to manufacturing rather than kit assembling. However, kit assembling is important for employment generation as it can absorb unemployed skilled as well as semi-skilled labor. Better infrastructure in the form of SEZ, EPZ, Hardware Technology Parks, etc., plays an important role not only for domestic consumption but also for export, which leads to increases in GDP and employment opportunities. The diversification of firms to different regions of the country will result in optimum utilization of available resources. A share in the emolument in output has been gradually decreasing whereas the use of contract labor is on the increase. The private sector, which is being encouraged through labor reforms, prefer contract labor to permanent employment as this reduces the cost of production and increases the profit share. However, the reduction in employment will have a negative impact on production since permanent employees are the major consumers of society. What is needed therefore is increased production as well as enhanced employment opportunities.

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Only when the last tree has died and the last river been poisoned and the last fish been caught will we realise we cannot eat money.

— Cree Indian Proverb

Appendix 1A. Structure on IT products (effective July 06, 2009, Union Budget 2009)

S. No.		HSN	Basic Custom Duty	Excise/CVD	Additional Duty (Refundable for Finished goods)
1	Computers – Desktops, Notebooks	84.71	0%	8%	4%
2	Parts of 8471 (ADP machines)	8473.30	0%	8%	4%
3	HDDs/FDDs/CD-ROM Drives/DVDs/ Flash Drives/Combo Drives	8471.70	0%	0%	4%
4	Other Storage Devices	8471.70	0%	8%	4%
	MICROPROCESSORS	8473.30	0%	0%	4%
6	ICs	85.42	0%	8%	4%
7	Motherboard & Populated PCBs	8473.30	0%	8%	4%
8	Monitors (CRT & LCD)	8528.41 8528.51	0%	8%	4%
9	Parts & Accessories of 8471 related to Monitors and Projectors	8529.90	0%	8%	4%
10	Printers and Plotters	8443.31 8443.32	0%	8%	4%
11	Machines which perform two or more of the functions of printing, copying or facsimile transmission, capable of connecting to an automatic data processing machine or to a network	8443.31	0%	8%	4%
12	Parts & Accessories of 8471 related to Printers, Multifunctional devices and Plotters	8443.99.50 8443.99.51 8443.99.52	0%	8%	4%
13	Projectors* of a kind solely or principally used in an automatic data processing system of heading 8471	8528.61	0%	8%	4%
14	Other Apparatus for Carrier Current line System or for Digital Line System; Router, Modems and other apparatus	8517.50	0%	8%	4%
15	Other Finished Goods – Keyboards etc.	84.71	0%	8%	4%
16	Set-top boxes	8517.80 & 8528.71	0%	8%	4%
17	Colour Data Graphic Display tube	8529.9090	0%	8%	4%
18	MP3 & MPEG4 Players	8519.9940/ 8520.9090/	5%	4%	4%
19	Digital Camera (including still image video)	8525.80.20 8521.9090	0%	10%	4%
20	Cellular (Mobile) Phones	8517.12	0%	0%	4%
21	Parts and Accessories of Mobile phones*	8517.70	0%	0%	0%
22	UPS	85.04	NIL for EDP Machines (otherwise 7.5%)	8%	4%

Note: The above rates are exclusive of 3% cess over and above the Excise duty/CVD.

Appendix 2. ASI unit level data codes of electronics industry are as follows

Manufacture of office, accounting and computing machinery

30001, 30002, 30003, 30004, 30005, 30006, 30007, 30008, 30009.

Manufacture of electronic valves and tubes and other electronic components

32101, 32102, 32103, 32104, 32105, 32106, 32107, 32109.

Manufacture of television and radio transmitters and apparatus for line telephony and line Telegraphy

32201, 32202, 32203, 32204, 32205, 32209



Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods

32301, 32302, 32303, 32304, 32305, 32308, 32309.

Manufacture of medical and surgical equipment and orthopedic appliances

33111, 33112, 33113, 33114, 33115, 33116, 33119.

Manufacture of instruments and appliances for measuring, checking, testing, navigating and other purposes except industrial process control equipment

33121, 33122, 33125, 33126, 33127, 33129.

Manufacture of industrial process control equipment [apparatus used for automatic continuous measurement and control of variables such as temperature, pressure, viscosity and the like of materials or products as they are being manufactured or otherwise processed]

33130.

Manufacture of optical instruments and photographic equipment

33201, 33202, 33203, 33204, 33205, 33208, 33209.

Appendix 3. Electronics Production and its Growth (Rs crore)

Item	Electronics Production						Growth Rate				
	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2005-06	2006-07	2007-08	2008-09	2009-10
Consumer Electronics	16800	18000	20000	22600	25550	30150	7.1	11.1	13.0	13.1	18.0
Industrial Electronics	8300	8800	10400	11910	12740	13630	6.0	18.2	14.5	7.0	7.0
Computers	8800	10800	12800	15870	13490	14430	22.7	18.5	24.0	-15.0	7.0
Com & Broad.	4800	7000	9500	18700	26600	31390	45.8	35.7	96.8	42.2	18.0
Strategic Electronics	3000	3200	4500	5700	6840	6980	6.7	40.6	26.7	20.0	2.0
Components	8800	8800	8800	9630	12040	13360	0.0	0.0	9.4	25.0	11.0
Total	50500	56600	66000	84410	97260	109940	12.1	16.6	27.9	15.2	13.0

Electronics Export and Its Growth

Item	Electronics & IT Exports					Growth Rate			
	2004-05	2005-06	2006-07	2007-08	2008-09	2005-06	2006-07	2007-08	2008-09
Consumer Electronics	1150	2000	1500	1600	2600	73.9	-25.0	6.7	62.5
Industrial Electronics	1500	2300	3000	3885	4200	53.3	30.4	29.5	8.1
Computers	1200	1025	1500	990	1650	-14.6	46.3	-34.0	66.7
Com & Broad.	350	500	650	625	12280	42.9	30.0	-3.8	1864.8
Components	3800	3800	5850	6100	10500	0.0	53.9	4.3	72.1
Total	8000	9625	12500	13200	31230	20.3	29.9	5.6	136.6

Role of Consumer Behaviour in Present Marketing Management Scenario

Kailash Chandra Barmola and S. K. Srivastava

This article explores the role of consumer behavior in present marketing management scenario. The behavior that the consumers display in searching for, purchasing, using, evaluating, and disposing of products and services that they expect will satisfy their needs. Consumer behavior is influenced by various factors like individual, environmental, and decision making. And these factors may be helpful to marketers in their marketing. Marketing is all about understanding consumer needs and steering the customer toward your product by creating certain wants in the minds of the customer. To do this, marketers should be aware of the consumer buying behavior process. Consumer buying behavior process includes buyer recognition, information search, evaluation of alternatives, purchase decision, and post purchase decision. The first basic and general objective of this article is the analysis of the consumer behavior in relation to marketing management. It is examined through the origin and evolution of related studies. On the other hand, it also offers information relative to the influences perceived and detected in these developments. This article presents totally concept-based findings. This data allows us to offer an approximated picture of the consumer behavior in marketing management. As a result the role of a consumer behavior is pivotal to all strategies for marketing.

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Introduction

The last 25 years have shown an effective development of intensive efforts and research oriented toward a better understanding of human behavior concerning its consumption activity. The knowledge and understanding of consumer behavior has become a basic task both at the entrepreneurial and institutional levels. Firms have realized that since consumers have adopted a more aggressive and demanding role, they have to modify their attitudes. At an institutional level, every government has necessarily to be aware about the quality standards of living and welfare of the people, consumption being a major issue of this awareness. The emergence of the studies on consumer behavior as an autonomous discipline is a phenomenon that took place in 1960s. It can be asserted that ever since, a significant advance has been made out, from an obscure and sporadic research toward a comprehensive effort in the study of all those aspects relevant to the knowledge of consumer behavior. Whether from a scholar or business approach, theoretical or empirical, published or not, this cumulative effort has been a subject of different reviews. At present, there is a wide and varied literature on consumer behavior and, in addition, it has become a subject widely included in university teaching program.

Consumer behavior is a psychological part of an individual which makes the difference in purchasing any goods, services, and anything else. The behavior of any consumer depends on many factors which are very important for any marketing-management team in any business or any organization which deals in directly to consumers. The study of consumer behavior involves search, evaluation, purchase, consumption, and post-purchase behavior of the consumers and includes the disposal of purchased products keeping environment and personal characteristics in mind. It is the body of knowledge which studies various aspects of purchase and consumption of products and services by individual. The

American Marketing Association (AMA) defines consumer behavior as the dynamic interaction of cognition, behavior and environmental events by which human beings conduct the exchange aspect of their lives with various social and psychological variables at play.

The global marketplace is a study in diversity, diversity among consumers, producers, marketers, retailers, advertising media, cultures, and customs and of course the individual or psychological behavior. However, despite prevailing diversity, there also are many similarities. The object of the study of consumer behavior is to provide conceptual and technical tools to enable the marketer to apply them to marketing practice, both profit and non-profit. The study of consumer behavior (CB) is very important to the marketers because it enables them to understand and predict buying behavior of consumers in the marketplace; it is concerned not only with what consumers buy, but also with why they buy it, when and where and how they buy it, and how often they buy it, and also how they consume it and dispose it. Consumer research is the methodology used to study consumer behavior; it takes place at every phase of the consumption process: before the purchase, during the purchase, and after the purchase. Research shows that two different buyers buying the same product may have done it for different reasons, paid different prices, used in different ways, have different emotional attachments toward the things, and so on. According to Professor Theodore Levitt of the Harvard Business School, the study of consumer behavior is one of the most important in business education, because the purpose of a business is to create and keep customers. Customers are created and maintained through marketing strategies. And the quality of marketing strategies depends on knowing, serving, and influencing consumers. In other words, the success of a business is to achieve organizational objectives, which can be done by the above two methods. This suggests that the knowledge and information about consumers is critical for developing successful marketing strategies because it challenges the marketers to think about and analyze the relationship between the consumers and marketers, and the consumer behavior and the marketing strategy.

Consumer behavior is interdisciplinary; that it is based on concepts and theories about people that have been developed by scientists, philosophers and researchers in such diverse disciplines as psychology, sociology, social psychology, cultural anthropology, and economics. The main objective of the study of consumer behavior is to provide marketers with the knowledge and skills that are

necessary to carry out detailed consumer analyzes which could be used for understanding markets and developing marketing strategies. Thus, consumer behavior researchers with their skills for the naturalistic settings of the market are trying to make a major contribution to our understanding of human thinking in general. The study of consumer behavior helps the management understand consumers' needs so as to recognize the potential for the trend of development of change in consumer requirements and new technology. And also to articulate the new thing in terms of the consumers' needs so that it will be accepted in the market well. The following are a few examples of the benefits of the study of consumer behavior derived by the different categories of people.

A marketing manager would like to know how consumer behavior will help him to design better marketing plans to get those plans accepted within the company. In a non-profit service organization, such as a hospital, an individual in the marketing department would like to know the patients' needs and how best to serve those needs. Universities and colleges now recognize that they need to know about consumer behavior to aid in recruiting students. Marketing admissions have become an accepted term to mean marketing to potential students. Consumer behavior has become an integral part of strategic market planning. It is also the basis of the approach to the concept of Holistic marketing. The belief that ethics and social responsibility should also be integral components of every marketing decision is embodied in a revised marketing concept—the societal marketing concept—which calls on marketers to fulfil the needs of their target markets in ways that improve society as a whole. The study of consumers helps firms and organizations improve their marketing strategies by understanding issues such as the psychology of how consumers think, feel, reason, and select between different alternatives (for example, brands, products), the psychology of how the consumer is influenced by his or her environment (for example, culture, family, signs, media), the behavior of consumers while shopping or making other marketing decisions. Limitations in consumer knowledge or information processing abilities influence decisions and marketing outcome. How consumer motivation and decision strategies differ between products that differ in their level of importance or interest that they entail for the consumer; and How marketers can adapt and improve their marketing campaigns and marketing strategies to more effectively reach the consumer. One "official" definition of consumer behavior is "The study of individuals, groups, or organizations and the processes they use to select, secure, use, and dispose of products, services, experiences, or ideas to

satisfy needs and the impacts that these processes have on the consumer and society." Although it is not necessary to memorize this definition, it brings up some useful points: Behavior occurs either for the individual, or in the context of a group (for example, friends influence what kinds of clothes a person wears) or an organization (people on the job make decisions as to which products the firm should use).

Consumer behavior involves the use and disposal of products as well as the study of how they are purchased. Product use is often of great interest to the marketer, because this may influence how a product is best positioned or how we can encourage increased consumption. Since many environmental problems are a result of product disposal (for example, motor oil being sent into sewage systems to save the recycling fee, or garbage piling up at landfills) this is also an area of interest. Consumer behavior involves services and ideas as well as tangible products. The impact of consumer behavior on society is also of relevance. For example, aggressive marketing of high fat foods, or aggressive marketing of easy credit, may have serious repercussions for the national health and economy.

Factors Influencing the Consumers' Behavior

Next we are talking about the factors which are very important in relation to influences on consumer behavior. We find the study of consumer behavior is quite complex because of many variables involved and their tendency to interact with and influence one another. These variables are divided into three major sections that have been identified as the most important general influences on consumer behavior. Imagine three concentric circles, one at the outer most, one in the middle and one at the inner most, and they represent the following.

External Environmental Variables Influencing Behavior

These are the factors controlled by external environments like the following form the basis of external influences over the mind of a customer (outer circle): culture, and sub-culture, social class, and social group, family, and inter-personal influences, other influences (which are not categorised by any of the above six, like geographical, political, economical, religious environment, etc.)

Individual Determinants Of Behavior

Major individual determinants of consumer behavior are portrayed in the middle ring. These are the human mind and its attributes. These variables are personal in nature

and they are influenced by the above set of external factors and in turn influence the way consumers proceed through a decision making process regarding products and services. They are: personality and self-concept, motivation and involvement, perception and information processing, learning and memory, attitudes.

The Consumer Decision-making Process

The buying decision comes as a product of the complex interaction of the external factors and the personal attributes. The innermost circle denotes the consumer decision-making process regarding products and services, whose major steps are: problem recognition, information search, evaluation of application, purchase decision, post-purchase behavior. Once we are aware about the factors which directly or indirectly influence the shopping behavior of any consumer then it is better to know about marketing and its related activities. Next heading which we are going to discuss is introduction of marketing and marketing management.

Marketing

Marketing is the process associated with promoting for sale goods or services. It is considered a social and managerial process by which individuals and groups obtain what they need and want through creating and exchanging products and values with others. It is an integrated process through which companies create value for customers and build strong customer relationships in marketing is used to create the customer, to keep the customer and to satisfy the customer. With the customer as the focus of its activities, marketing management is important in all businesses. It is the highly specialized study of business management, business administration or just management today, marketing management function plays a very critical role. This is because this functional area of management earns the revenue, and works in the close proximity with the public or persons outside the organization. Controlling these two attributes to have the desired benefits that are the most difficult part of the management, because none of these two are within the direct control of the marketers. This does not mean that the other functional areas are not useful, but they are not directly involved in the activities mentioned above. Similarly, within the study of marketing management, the consumers or the customers play a very critical role as these are the people who finally buy the goods and services of the organization, and the firm is always on the move to make them buy so as to earn revenue. It's crucial from both the points of view as given below:

From the Customers' Point of View

Customers today are in a tough spot. Today, in the highly developed and technologically advanced society, the customers have a great deal of choices and options (and often very close and competing) to decide on. They have the products of an extreme range of attributes (the 1st P—Product), they have a wide range of cost and payment choices (the 2nd P—Price), they can order them to be supplied to their door step or anywhere else (the 3rd P—Place), and finally they are bombarded with more communications from more channels than ever before (the 4th P—Promotion). How can they possibly decide where to spend their time and money, and where they should give their loyalty?

From the Marketers' Point of View

The purpose of marketing is to sell more stuff to more people more often for more money in order to make more profit. This is the basic principle of requirement for the marketers in earlier days where aggressive selling was the aim. Now it cannot be achieved by force, aggression or plain alluring. For the customers are today more informed, more knowledgeable, more demanding, more discerning. And above all there is no dearth of marketers to buy from. The marketers have to earn them or win them over.

Marketing management, according to the marketing guru Phillip Kotler, a human need is defined as a state of felt deprivation. A human want on the other hand is a need shaped by the individual's culture and society. Understanding what consumers need and how these needs can be made into wants is what effective marketing is all about. For instance a customer need may be thirst, and any drink such as a bottle of water could satisfy this need. However at the point of purchase effective marketing determines what the customer will want to purchase in order to quench their thirst. For example a good advertisement for coke could steer the customer away from the bottled water section and towards the fizzy drinks. On the other hand an effective ad for ice lollies, an indirect competitor, could steer the consumer away from the fizzy drinks. Therefore the more effective the marketing, the easier it will be to get the cash out of the customers hand. It is then obvious that marketing is all about understanding consumer needs and steering the customer toward Your product by creating certain wants in the minds of the customer. To do this marketers should be aware of the consumer buying behavior process.

The Consumer Buying Behavior Process

Buyer Recognition

The consumer has to realize there is a problem or need that needs to be fulfilled. The effective marketer will identify there is a difference between the actual state of the consumer and the desired state, and try to fulfill this state of deprivation.

Information Search

In this stage the buyer considers all the alternatives present. For instance, according to the example above, the customer would look at all thirst quenchers such as fizzy drinks, bottled water, juices and ice lollies. The most information a customer gains about alternatives is through commercial sources, such as advertisements and campaigns. However information about intangible products in the service industry would mostly come from personal experience or experience from others.

Evaluation of Alternatives

This is where all the information is gathered and evaluated to help make the purchasing decision. These three stages are important, for marketers to understand consumer behavior and what influences purchasing of a certain product category and brand.

Purchase Decision

This is the stage where purchasing of the most preferred alternative takes place. However the product category, brand, reseller, timing and quantity all play a role in the purchase decision.

Post Purchase Decision

Good marketers maintain a good relationship with the customer even after the purchase has been made. This is to reduce any chance of cognitive dissonance that the customer may experience with the product. To reduce the negative effects of customer cognitive dissonance, good after sales services could be provided along with effective advertising. This will attract more customers via word of mouth and generate repeat purchases. To be cost effective marketers should remember to target the potential customers of the company's marketing mix. There is no point in wasting time targeting those who will never purchase your product. Therefore effective market segmentation is extremely crucial.

Market segmenting involves dividing the market into groups that share similar needs and wants. This can be

done through market segmenting variables such as, geographic, demographic, psycho-graphic and behavioral groups. For instance the main market segment, based on these main variables, for a fizzy drink such as coke would be those mainly in dry and hot climate regions, within the age group 12 to 21, those who are relatively social and can afford a drink such as coke, and those who are aware a drink such as coke exists and are aware of its image around the world. The buying behavior of consumers and identifying the segments to which they belong are two critical elements for effective and efficient marketing.

Marketing management is one of the major components of business management. The evolution of marketing was caused due to mature markets and overcapacities in the last decades. Companies then shifted the focus from order to capture value from customers in return and to stay profitable. The term marketing concept holds that achieving organizational goals depends on knowing the needs and wants of target markets and delivering the desired satisfactions. It proposes that in order to satisfy its organizational objectives, an organization should anticipate the needs and wants of consumers and satisfy these more effectively than competitors. Now next question arises that how can we study the market. There are following methods which are illustrated in brief may help us.

Consumer Research Methods

Market research is often needed to ensure that we produce what customers really want and not what we think they want. There are two main approaches to marketing.

Primary Research

This is research that you design and conduct yourself. For example, you may need to find out whether consumers would prefer that your soft drinks be sweeter or tarter. Research will often help us reduce risks associated with a new product, but it cannot take the risk away entirely. It is also important to ascertain whether the research has been complete. For example, Coca Cola did a great deal of research prior to releasing the New Coke, and consumers seemed to prefer the taste. However, consumers were not prepared to have this drink replace traditional Coke.

Secondary Research

This involves using information that others have already put together. For example, if you are thinking about starting a business making clothes for tall people, you don't need to question people about how tall they are to find out how

many tall people exist—that information has already been published by the U.S.

There are Four Main Applications of Consumer Behavior

Marketing Strategy

It is for making better marketing campaigns. For example, by understanding that consumers are more receptive to food advertising when they are hungry, we learn to schedule snack advertisements late in the afternoon. By understanding that new products are usually initially adopted by a few consumers and only spread later, and then only gradually, to the rest of the population, we learn that companies that introduce new products must be well financed so that they can stay afloat until their products become a commercial success and it is important to please initial customers, since they will in turn influence many subsequent customers' brand choices.

Public Policy

In the 1980s, Accutane, a near miracle cure for acne, was introduced. Unfortunately, Accutane resulted in severe birth defects if taken by pregnant women. Although physicians were instructed to warn their female patients of this, a number still became pregnant while taking the drug. To get consumers' attention, the Federal Drug Administration (FDA) took the step of requiring that very graphic pictures of deformed babies be shown on the medicine containers.

Social Marketing

It involves getting ideas across to consumers rather than selling something. Marty Fishbein, a marketing professor, went on sabbatical to work for the Centers for Disease Control trying to reduce the incidence of transmission of diseases through illegal drug use. The best solution, obviously, would be if we could get illegal drug users to stop. This, however, was deemed to be infeasible. It was also determined that the practice of sharing needles was too ingrained in the drug culture to be stopped. As a result, using knowledge of consumer attitudes, Dr Fishbein created a campaign that encouraged the cleaning of needles in bleach before sharing them, a goal that was believed to be more realistic.

Studying Consumer Behavior Makes Us Better Consumers

Common sense suggests, for example, that if you buy a 64 liquid ounce bottle of laundry detergent, you should pay less per ounce than if you bought two 32 ounce bottles. In practice, however, you often pay a size premium by buying

the larger quantity. In other words, in this case, knowing this fact will sensitize you to the need to check the unit cost labels to determine if you are really getting a bargain.

Objective

There are following objectives:

1. To analyze the role of consumers' behavior in marketing management.
2. To analyze various research reviews related to consumers' behavior in present marketing management.
3. To analyze influence and related information of consumers' behavior in present marketing management.

Current Studies on Consumer Behavior

Babakus et al. (2004), have studied reactions to unethical consumer behavior across six countries. In this study, consumer reactions to 11 unethical consumer behavior scenarios are investigated using sample data from Austria, Brunei, France, Hong Kong, the UK, and the USA. Nationality is found to be a significant predictor of how consumers view various questionable behaviors. Gender is not a significant predictor, while age and religious affiliation are found to be significant predictors of consumer ethical perceptions.

Scrivens (2007) has studied the role of social marketing in influencing consumer behavior commercial marketers have turned their attention to the social welfare sector and are considering ways in which marketing techniques can be used to promote service use, improvements in life-style, and changing public attitudes. This article examines the concept of what is termed "social marketing," and looks at the difficulties it faces, and finally discusses the need for social policy analysts to become more aware of the uses of and the issues relating to the increased use of social marketing by governments.

Gordon et al. (2006), examined the consumer behavior analysis and social marketing: The case of environmental conservation Consumer behavior analysis represents one development within the behavior-analytic tradition of interpreting complex behavior, in which a specific conceptual framework has been proposed (that is, the Behavioral Perspective Model). According to this model, consumer behavior occurs at the intersection of a consumer-behavior setting and an individual's learning

history of consumption and is a function of utilitarian (mediated by the product) and informational (mediated by other persons) consequences. This application pointed to specific marketing strategies that should be adopted to modify each of these operant classes.

Kapoor and Kulshrestha (2004) studied the effect of perception on Indian urban female consumer buying behavior introduction products convey different meanings to different people, consumers form differing attachments to them. The study was conducted with an objective to address the role of the fashion involvement of affluent female consumers and their apparel purchase behavior, retailers and marketers will be able to accurately target this market segment. Additionally, the research will broaden our understanding of consumer behavior. It can thus definitely contribute to larger studies concerned with the enhancement of the domestic market for exotic apparel and accessories.

Shahina (2004) has studied a cross-cultural comparative study of female consumer behavior with regards to the purchase of cosmetics by females in the UK and Bangladesh. Understanding consumer behavior in a cross-cultural environment is an essential part of marketing activities in a world that is becoming more consumer-centric. This paper attempts to explain how consumer behavior is influenced by cultural factors in Bangladesh. It is conceptual in nature and attempts to uncover the key facets of culture involved in shaping decisions on cosmetics purchase by female consumers in the Bangladeshi cross-cultural environment

Dennis et al. (2007) have asserted the e-consumer behavior purpose—the primary purpose of this article is to bring together apparently disparate and yet interconnected strands of research and present an integrated model of e-consumer behavior. It has a secondary objective of stimulating more research in areas identified as still being underexplored.

Newman and Chansarkar (2006), examined the consumer behavior of luxury automobiles: A comparative study between Thai and UK Customers' Perceptions : The luxury car market overall is currently undertaking a social change with luxury brands seeming less remote, less different, and less exclusive with the quality of life improving. As a result, increasing competition between makes has intensified the importance of brand identity. As product standards continue to rise, the perceived image of a car make plays a key role in the buying decision. The premium marques such as BMW, Lexus, and Mercedes-Benz must develop attributes and values that reflect changing social

values which influence buyers emotionally.

Harris (2009) studied the survey of GB online consumer behavior: The 3rd annual survey of online consumer behavior, highlights the importance of online customer experience. The survey sheds light on forces driving this accelerated online customer experience focus, including increased consumer power due to experience-sharing via social media. It also examines consumer behavior when transacting online, call centre behavior related to online issues and mobile commerce. Verticals represented in the findings include retail, insurance, travel and financial services.

Andersson et al. (2006) have examined the Coca-Cola or Pepsi; that is the question—A study about different factors affecting consumer preferences: The overall purpose of this article is to gain a deeper understanding of different international and local factors affecting consumer preferences on a local market. International advertising and international sponsorship respectively influence the local target group in different ways, but they also affect international brand.

Ali et al. (2006) studied an empirical study of consumer impulse buying behavior in local markets: The major findings of the study demonstrated an overall weak association of the set of independent variables with the dependent variable but, the in-depth analysis found that pre-decision stage of consumer purchase behavior is the only variable that resulted into strong association with the impulse buying behavior. It is true that young people more often get attracted to products displayed on store shelves and has greater tendency of impulse buying behavior but results of this paper showed no association of impulse buying in higher income group of young people having prevalent impulse buying tendencies. This study reported new evidences in the field of impulse buying behavior of consumers pertaining to the local markets of the twin cities.

Magid (2008) asserted the study reveals consumer behavior and preferences in online video: This research is part of the Magid Media Futures TM Practice, which surveys consumers annually to identify trends and help clients implement product and marketing strategies that address them. The online video portion of this year's study was sponsored by Metacafe. "Short-form video is an emerging entertainment genre – distinct from online TV – that consistently proves popular with people of widely varying backgrounds and tastes," as demonstrated. "Online TV, or traditional networks distributing their shows on the Internet, is really just the same long-form programs, with the same

audience, supported by the same advertisements – only the delivery platform is different."

Munich (2008) has studied a new study on German consumer behavior: The study's findings indicate a long-term shift in consumer behavior rather than a short-term trend. In some traditionally firmly brand-based sectors women's cosmetics, automobiles or soft drinks, for example, consumer preferences show a complete turnabout. In the past, it was the brand that clinched the deal; nowadays, more often than not, it's price. But that doesn't mean that brands have had their day and products will only be sold on the basis of price in future.

Conclusions

Present study concludes as what are the factors related to consumer's behavior which play significant role in marketing management. The various researches which are discussed above give us result that to all business institution should not take consumer behavior in a light way. All marketing management team must give importance to consumer behavior and its related research for their better marketing strategy and to be successful in their management. There are several units in the market that can be analyzed. Our main thrust in this paper is the consumer. However, we will also need to analyze our own firm's strengths and weaknesses and those of competing firms. Suppose, for example, that we make a product aimed at older consumers, a growing segment. A competing firm that targets babies, a shrinking market, is likely to consider repositioning toward our market. To assess a competing firm's potential threat, we need to examine its assets (for example, technology, patents, market knowledge, awareness of its brands) against pressures it faces from the market. Finally, we need to assess conditions (the marketing environment). For example, although we may have developed a product that offers great appeal for consumers, a recession may cut demand dramatically.

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Today, there are three kinds of people: the haves, the have not and the have not paid for what they haves.

— Earl Wilson

PhD Fellowships in the Area of Basic and Engineering Sciences—An Analysis of CSIR Senior Research Fellowships

S. A. Hasan, Sushila Khilnani, and Rajesh Luthra

Research students play a critical role in scientific inventions and innovations and emphasis is being laid world-over to produce more PhDs in Science and Engineering. During 2006, India's share in science PhDs was 5.5 percent of the world and in engineering it was less than 2 percent. Efforts are being made to encourage more students to do PhD in science and engineering by providing Senior Research Fellowships (SRF).

During 2004–05 to 2008–09, 4,117 students from 376 institutions appeared in interview for award of SRF offered by Council of Scientific and Industrial Research (CSIR). About 50 percent of the students appeared/selected for SRF were from Chemical and Biological sciences, and 14 percent were from engineering sciences. Majority (87 percent) of the total fellowships (1790) have gone to the students from institutions located in the 11 states/Union Territories(UT) viz. Tamil Nadu, West Bengal, Andhra Pradesh, Maharashtra, Uttar Pradesh, Delhi, Karnataka, Kerala, Madhya Pradesh, Gujarat, and Goa.

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Introduction

Knowledge is the most important factor determining market competitiveness and today's most advanced economies are beyond doubt knowledge-based (Canipisi and Costa, 2008). Knowledge base refers to the abilities, competences and know-how of the human resources. Emphasis is being laid to strengthen R&D which in turn is linked to strengthening of human capital in science and technology (S and T). The developed world has been witnessing a phenomenal growth in number of science and engineering doctorates, whereas in India, it is estimated that only about 4 percent of postgraduates in science enroll for doctoral research in India (Hasan et al., 2009). The lower follow through for higher education may preclude knowledge creation which may lead to loss of advantage in an ever-competitive market and economy (Chan and Klimsoki, 2007).

"National Knowledge Commission (NKC)" has recently come up with a plan to augment doctoral studies in S&T sector and to replenish the desired infrastructure. NKC's thrust is on massive investment in education and research at all levels, together with a renovation and reform of the university system, and fostering of a global outlook in research.

It is a well-known fact that highly qualified S&T personnel are more likely to be successful in exploring and/or exploiting innovative ideas to meet identified gaps or to identify, assimilate and exploit externally available knowledge (Piva and Vivarelli, 2009). Therefore, appropriate

Human Resource Management (HRM) strategies are required to increase the likelihood of successful innovation (Piva and Vivarelli, 2009).

World-over PhDs produced and India's share thereon

During 2006, a total of 173891 PhDs were produced in Science and Engineering (S&E) in the world. Out of these, 55579 (32 percent) PhDs were produced in engineering and technology (<http://www.nsf.gov/seind10>). Maximum (23050) science PhDs were produced by USA followed by Russia (13693), China (10823), Germany (8056), UK (7560), and India (6569). France (5747), Japan (3927), Italy (3866), Brazil (3802), Spain (2899), Australia (2094), Ukraine (2071), South Korea (1512), and Sweden (1192) were some of the other leading countries. Maximum PhDs in engineering and technology were produced by China (12130) followed by USA (7402), Russia (6032), Japan (4195), South Korea (2267), UK (2200), Germany (2187), Italy (1827), Ukraine (1391), Brazil (1192), France (1023), and India (968).

India's share in science PhDs is 5.5 percent of the world whereas in engineering it is less than 2 percent. In contrast to this, China's share in science PhDs was about 9 percent, and in engineering and technology it is 22

percent. By the year 1996, India was producing more number of PhDs in S&E compared to China but in 1997 China surpassed India and by the year 2006, China has been producing triple the number of PhDs produced by India in S&E. Though India's performance in terms of PhDs produced in S&E was comparable to most developing and developed nations, it is not enough if we take its population into consideration. In-depth and meticulous efforts are required to enlarge the pool of doctorates in science and engineering and thereby expanding its wings in the knowledge-driven economy.

World-over S&E research papers published in all fields and India's share thereon

A total of 758,142 research papers were published in all fields of S&E by all the countries put together during the year 2007 (www.nsf.gov/seind10). Maximum research papers were published by USA followed by China and Japan. India published 18193 research papers in SCI journals during that period which are 2.4 percent of the world's total papers, and is positioned at 11th place amongst the leading S&E paper publishing countries. In contrast to this, China's share in research publication was 7.5 percent of the world. Leading countries in terms of S&E research publications are shown in Figure 1.

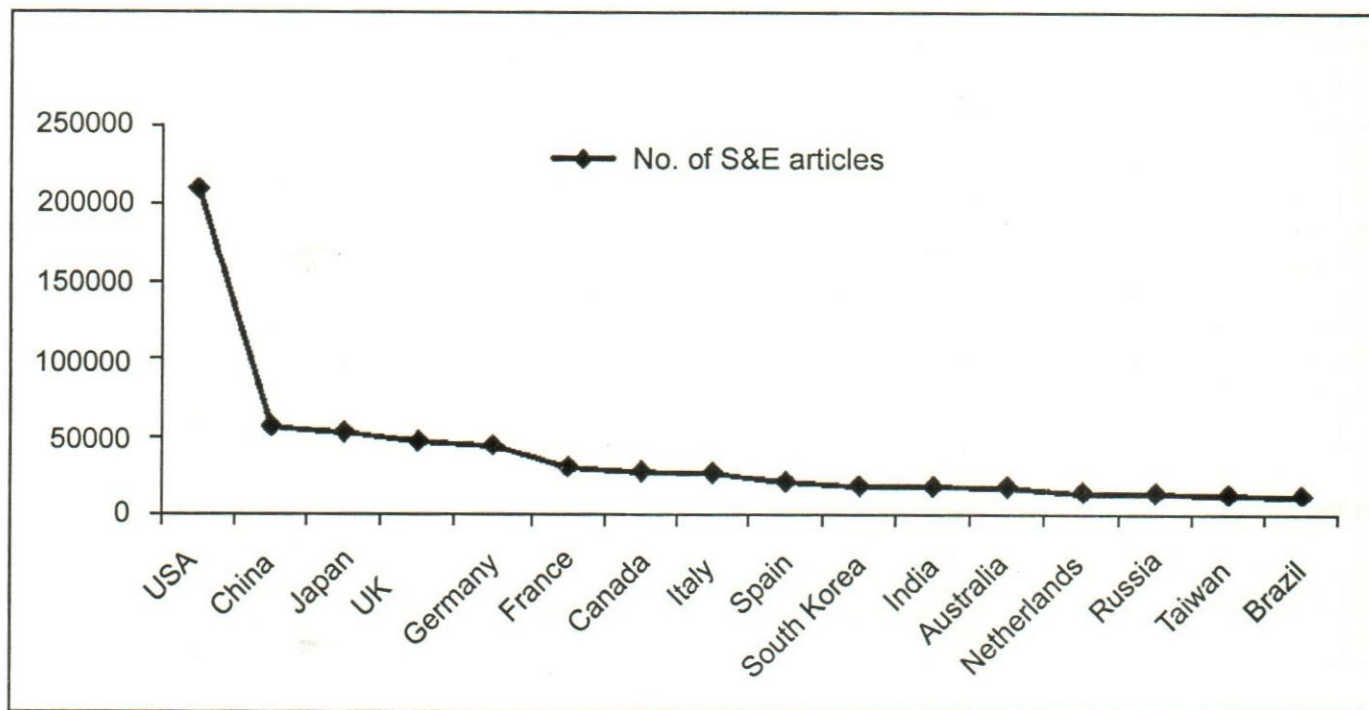


Figure 1. Leading countries in terms of Science & Engineering research articles published in 2007 in SCI journals

Table 1a. State-wise population, literacy rate, drop-out rate, gross enrollment ratio (GER)

S. No.	State/Union Territory	Population (as per 2001 Census) in crore	Literacy rate (%)	Drop-out rate (%) from at class -1 st to 10 th level during 2005-06	GER in 2005-06 (Class IX-XII)
1	Andhra Pradesh	7.621	60.47	63.67	48.93
2	Arunachal Pradesh	0.110	54.34	70.25	42.55
3	Assam	2.666	63.25	76.66	32.08
4	Bihar	8.300	47.00	83.07	16.02
5	Chhattisgarh	2.083	64.66	NA	31.47
6	Goa	0.135	82.01	42.84	56.52
7	Gujarat	5.067	69.14	60.27	39.50
8	Haryana	2.114	67.91	42.37	42.22
9	Himachal Pradesh	0.608	78.48	0.00	131.51
10	Jammu & Kashmir	1.014	55.52	63.88	35.74
11	Jharkhand	2.694	53.56	NA	15.54
12	Karnataka	5.285	66.64	60.86	45.19
13	Kerala	3.184	90.86	4.98	64.63
14	Madhya Pradesh	6.035	63.74	65.01	37.64
15	Maharashtra	9.688	76.88	51.36	56.78
16	Manipur	0.217	70.53	41.91	49.43
17	Meghalaya	0.232	62.56	78.09	35.71
18	Mizoram	0.089	88.80	73.73	41.91
19	Nagaland	0.199	66.59	65.51	24.07
20	Orissa	3.680	63.08	65.03	42.82
21	Punjab	2.436	69.65	46.02	39.76
22	Rajasthan	5.651	60.41	75.73	34.32
23	Sikkim	0.054	68.81	82.63	34.76
24	Tamil Nadu	6.206	73.45	42.45	63.79
25	Tripura	0.320	73.19	74.89	39.86
26	Uttar Pradesh	18.620	56.27	43.02	35.90
27	Uttarakhand	0.850	71.62	NA	62.03
28	West Bengal	8.018	68.64	75.12	35.46
29	A&N Islands	0.036	81.30	33.24	51.42
30	Chandigarh	0.090	81.94	17.09	56.52
31	D&N Haveli	0.022	57.63	59.39	42.14
32	Daman & Diu	0.016	78.18	34.87	79.88
33	Delhi	1.385	81.67	46.26	52.52
34	Lakshdweep	0.006	86.66	21.17	47.69
35	Pondicherry	0.098	81.24	13.69	79.25
	Total	104.629	69.62	47.86	47.01

Source: Selected Educational Statistics (2005-06). Department of Higher Education, Statistics Division, Ministry of Human Resource Development, Government of India, New Delhi.

Table 1b. State-wise number of institutions for tertiary education and number of students enrolled for PhD, M.Sc., B.Sc., and appeared for CSIR SRF and finally awarded SRF during 2004-05 to 2008-09

S. No.	State/Union Territory	No. of institutions (Tertiary Education)	2004-05			2006-07			%of MSc students to BSc students during 2004-05	%of MSc students to BSc students during 2005-06	No. of students during 2004-05 to 2008-09	
			PhD*	MSc	BSc	PhD*	MSc	BSc			Appeared	Selected as SRF
1	Uttar Pradesh	1887	1835	34683	233852	1502	42770	253077	14.8	16.9	476	192
2	Tamil Nadu	1196	3346	29324	188486	3500	35341	211689	15.6	16.7	650	252
3	Andhra Pradesh	2218	4752	17053	219501	6129	21129	243961	7.8	8.7	566	213
4	West Bengal	535	1872	18958	100027	398	18958	100027	19.0	19.0	364	214
5	Karnataka	1511	3107	13270	48392	3107	13270	48392	27.4	27.4	266	130
6	Bihar	865	2082	11455	106566	1506	11871	102586	10.7	11.6	2	0
7	Maharashtra	1651	3948	14282	106473	2058	11321	109498	13.4	10.3	402	200
8	Kerala	424	417	8192	65905	338	10663	64170	12.4	16.6	131	68
9	Gujarat	648	2501	6018	35334	1286	6426	64720	17.0	9.9	97	44
10	Madhya Pradesh	900	12656	6999	52168	2357	5862	43447	13.4	13.5	133	62
11	Uttarakhand	139	398	4782	22245	584	5269	24319	21.5	21.7	88	32
12	Rajasthan	860	327	4343	41237	435	5207	46260	10.5	11.3	59	17
13	Punjab	354	475	4234	21453	537	4631	21289	19.7	21.8	88	37
14	Haryana	256	1371	3238	20513	1925	4294	20867	15.8	20.6	60	22
15	Jharkhand	139	524	2274	39908	640	4212	50803	5.7	8.3	43	16
16	Orissa	819	400	3207	35391	549	3400	36935	9.1	9.2	72	18
17	Delhi	130	6103	2589	28152	4167	2870	20869	9.2	13.8	307	139
18	Chhattisgarh	368	5217	3554	31297	248	2793	25138	11.4	11.1	11	1
19	Assam	369	746	3832	28743	437	2099	26030	13.3	8.1	74	31
20	Jammu & Kashmir	82	373	1677	23862	426	2038	23777	7.0	8.6	36	20
21	Chandigarh	20	256	1332	5089	269	1332	5099	26.2	26.1	14	3
22	Himachal Pradesh	120	1655	698	16447	1973	754	16643	4.2	4.5	52	20
23	Pondicherry	32	299	837	3051	474	725	3145	27.4	23.1	27	11
24	Manipur	62	192	621	5650	755	640	4850	11.0	13.2	1	1
25	Goa	36	68	493	2776	68	493	2776	17.8	17.8	80	42
26	Meghalaya	56	387	337	2826	311	382	2841	11.9	13.4	7	4
27	Tripura	20	8	221	2992	11	285	2871	7.4	9.9	1	0
28	Sikkim	8	0	38	313	0	82	429	12.1	19.1	0	0
29	Nagaland	42	0	78	751	0	78	751	10.4	10.4	0	0
30	Arunachal Pradesh	17	35	55	368	29	58	391	14.9	14.8	10	1
31	A&N Islands	4	2	45	333	0	32	346	13.5	9.2	0	0
32	Mizoram	28	0	0	615	0	0	605	0.0	0.0	0	0
33	D&N Haveli	-	0	0	0	0	0	0	0.0	0.0	0	0
34	Daman & Diu	1	0	0	69	0	0	51	0.0	0.0	0	0
35	Lakshdweep	-	0	0	0	0	0	0	0.0	0.0	0	0
	Total	15797	55352	198719	1490785	36019	219285	1578652	13.3	16.4	4117	1790

*PhD includes all subject areas such as Natural Sciences, Arts & Social Sciences and Commerce. According to India Science Report, 2005, one third (1/3) pursuing PhD in 2004-05 were from science stream.

*a: Educational Statistics, Department of Education, Ministry of Human Resource Development, Government of India, New Delhi.

&&: Tertiary education includes the institutions such as Universities (Central/State), Deemed Universities, Institutions of National Importance, Research Institutes, College for General Education, Engg. Tech. & Arch. Colleges, and Medical Colleges (Allo./Ayur/Homeo/Unani). Educational Statistics, Department of Education, Ministry of Human Resource Development, Government of India, New Delhi (2005-06).

State-wise literacy rate, drop-out rate, Gross Enrollment Ratio (GER) and students enrollment for BSc and MSc courses

The highest literacy rate (90.86 percent) is reported from Kerala and the least (47.0 percent) from the state of Bihar, where the drop-out rate from class 1st to Class 10th level during 2005-06 was the highest (83.07 percent). Gross Enrollment Ratio (GER) during 2005-06 for class 11th and 12th was highest in Himachal Pradesh (131.51 percent) and the minimum in Bihar (16.02 percent) (Table 1a). Bihar, however, has 865 such institutions for tertiary education and research, and is placed at 6th position amongst the states in terms of number of such institutions (Table 1b). The average postgraduate (MSc) enrollment was about 15 percent of the BSc enrollment during 2005-06. Karnataka witnessed the highest (27 percent) enrollment for MSc during the period whereas, Haryana witnessed the lowest (about 4-5 percent) (Table 1b).

State-wise educational institutions for tertiary education in India

Highest number of institutions (2,218) for tertiary education and research are in the state of Andhra Pradesh, followed by Uttar Pradesh (1887), Maharashtra (1651), Karnataka (1511), Tamil Nadu (1196), Kerala (900), Bihar (865), Rajasthan (860), Gujarat (648), Delhi (535) and least in Daman and Diu (1) whereas Lakshdweep and Dadar and Nagar Haveli have no institution(s) for tertiary education and research (Table 1b).

Role of CSIR in developing S&T human resource in India

CSIR has been awarding research fellowships for pursuing doctoral and postdoctoral research in universities and R&D institutions through a number of fellowship schemes. The Junior Research Fellowship (JRF) through CSIR-UGC National Eligibility Test (NET) is considered to be the most prestigious and sought after fellowship to pursue doctoral research. About 1.25 lakh students register for each exam and towards the end, around 2500 fellowships are given. A JRF-NET qualified fellow becomes eligible for Senior Research Fellowship (SRF-NET) on completion of two years tenure. CSIR also offers Shyama Prasad Mukherjee Fellowships (SPMF) to toppers of CSIR-UGC JRF-NET and top ranking GATE qualified candidates through two tier interview process. JRF-GATE fellowship scheme was introduced to promote research leading to PhD in the area of engineering and pharmaceutical sciences.

Senior Research Fellowship Scheme (SRF-Direct) was introduced with the objective to foster students with proven track record of research and two or more years of post MSc research experience in basic sciences, and fresh ME/MTech in engineering sciences (www.csirhrdg.res.in). Fellowships are awarded through a stringent interviewing process. Successful students are awarded SRF-Direct for a period of three years in the area of basic sciences and four years in the area of engineering, medical and pharmaceutical sciences. At any given time more than 1200 SRF-Direct Fellows are being supported by CSIR across the country to do state-of-art R&D leading to the award of PhD in basic, engineering, medical and pharmaceutical sciences. The research fellows, under the expert guidance of their mentors, attain specialized training and contribute directly to the R&D and publication output of their host institutions. The present study aims at analyzing regional and subject specific variations amongst students in securing CSIR Senior Research Fellowship to do PhD in basic and engineering sciences.

Methodology

Data pertaining to the Senior Research Fellows (SRF) was obtained from the proceedings of the selection committee meetings held during the period 2004-05 to 2008-09. Data in respect of number of institutions for tertiary education, literacy rate, drop-out rate, gross enrollment ratio (GER), etc. has been collected from the document "State Profile 2005-06, Selected Education Statistics" prepared by the Department of Higher Education, Ministry of Human Resource Development, Government of India.

Results and Discussion

State- and zone-wise distribution of students appeared and awarded CSIR-SRF

Maximum students (650) appeared in interview were from Tamilnadu, followed by Andhra Pradesh (566), Uttar Pradesh (476), Maharashtra (402), West Bengal (364), Delhi (307), Karnataka (266), Madhya Pradesh (133), and Kerala (131), whereas no student appeared in interview from the states/union territories of Mizoram, Nagaland, Sikkim, Andaman and Nicobar Islands, Dadar and Nagar Haveli, Daman and Diu, and Lakshdweep. Thus, students from only 28 states/union territories appeared in interview for the award of CSIR SRF in basic, engineering and medical sciences. There were only nine states/union territories from where more than one hundred (100) students appeared in interview for the award of CSIR SRF, constituting 80 percent

of the total students appeared in interview during the period 2004–05 to 2008–09.

Maximum number (252) of students awarded CSIR SRF were from the institutions located in Tamil Nadu, followed by West Bengal (214), Andhra Pradesh (213), Maharashtra (200), Uttar Pradesh (192), Delhi (139), and Karnataka (130).

The performance of various regions/zones in terms of number of institutions for tertiary education and research, students appeared in interview for the award of CSIR SRF and finally selected for SRF is shown in Figure 2. The zones are defined based on the information available on <http://www.mapsofindia.com/maps/india/india-political-map.htm>

The maximum number of institutions (5,385) for tertiary education and research are located in the southern zone followed by western zone (3,196), northern zone (2,988), eastern zone (2,358), central zone (1,298) and north-east zone (602). Maximum students (1,640) from southern zone appeared in interview followed by northern zone (1121), western zone (638), eastern zone (481), central zone (144) and north-east zone (93). Zone-wise selection for the award of CSIR-SRF was in the same order as that of appearance in the interview.

The study revealed that the South Indian States comprises of Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu and the Union Territories of Andaman and Nicobar Islands and Pondicherry have about 34 percent of the total

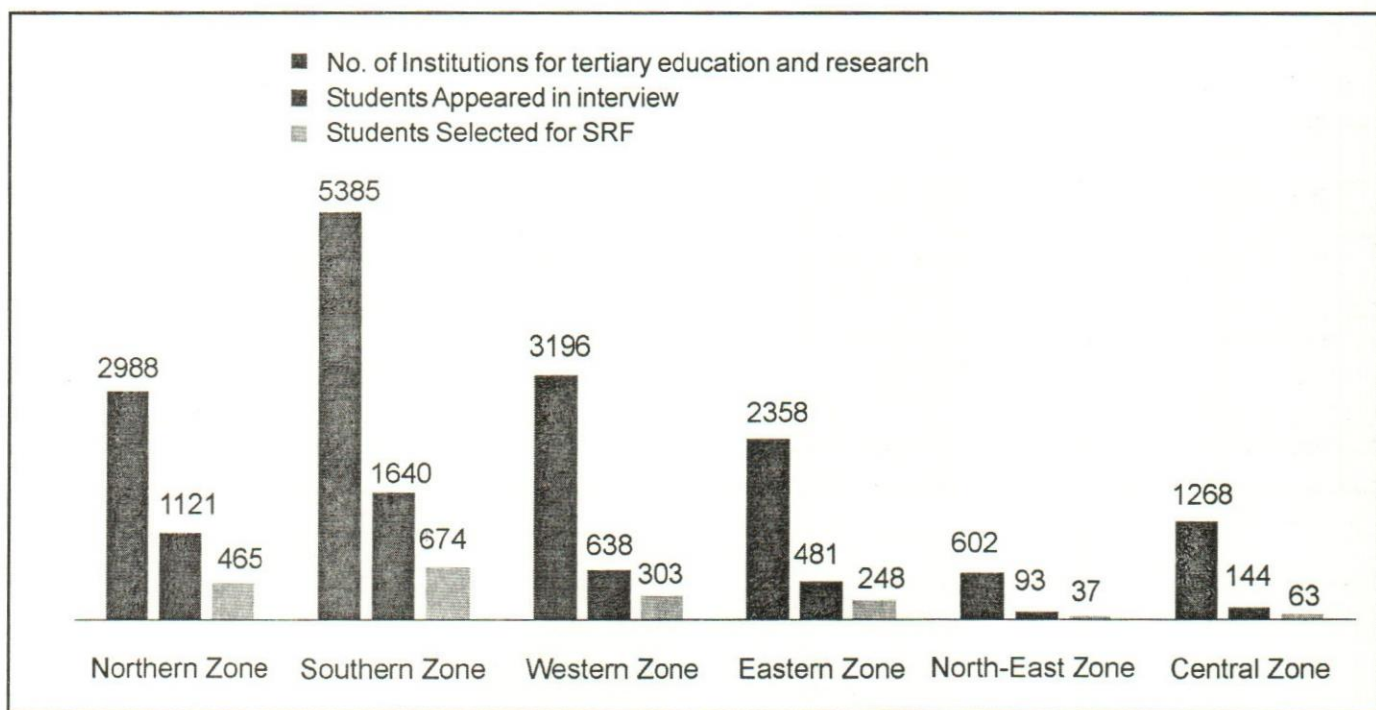


Figure 2. Zone-wise number of institutions for tertiary education and research, students appeared in interview for award of CSIR SRF and finally awarded CSIR SRF during 2004-05 to 2008-09

institutions in India and their share in CSIR's Senior Research Fellowships during 2004-05 to 2008-09 was more than 37 percent. Institutions located in the states of Maharashtra, West Bengal, Uttar Pradesh and Delhi, however, have more than 41 percent share in total awarded fellowships. Furthermore, 84 percent of students appeared in interview and 87 percent of the selected for CSIR SRF during 2004–05 to 2008–09 were from eleven states viz. Tamil Nadu, West Bengal, Andhra Pradesh, Maharashtra,

Uttar Pradesh, Delhi, Karnataka, Kerala, Madhya Pradesh, Gujarat, and Goa.

Institution-wise analysis of students appeared in interview and awarded CSIR SRFs

Data pertaining to CSIR SRF revealed that students from 376 institutions had applied for CSIR SRF during 2004–05 to 2008–09. About 46 percent of the students who appeared in interview were from only 23 institutions with a minimum

of 50 students from each institution, whereas students from 46 institutions grabbed 68 percent of the total fellowships (1790) awarded during the period with a minimum of 10 fellowships to each institute, suggesting thereby that a greater emphasis is required to be laid on strengthening the R&D base for inclusive growth.

Subject-wise analysis of the students appeared in interview and awarded the CSIR SRFs

Subjects under which the candidates applied and called for interview for the award of CSIR SRF are listed in table-2. Maximum students appeared in interview for award of SRF were from Chemical Sciences, followed by

Table 2. Subjects and Subject areas under which students had applied for the award of CSIR SRF during 2004-05 to 2008-09

S. No.	Subject	Subject areas
1	Chemical Sciences	Organic Chemistry, Inorganic & Analytical Chemistry, Physical Chemistry and Material Sciences
2	Earth Sciences	Earth, Ocean, Environmental, Atmosphere & Planetary Sciences and Global Change Science
3	Engineering & Technology	Aeronautical, Civil, Mechanical, Chemical & Metallurgical Engineering Sciences; Agro-, Bio-, Physico-Chemico-, Food-Textile Technology; Electrical, Electronics, Instrumentation & Computer Engineering Sciences
4	Biological Sciences	Biochemistry, Biophysics, Immunology, Microbiology & Physiology of living Systems; General Biology, Genetics & Molecular Biology
5	Mathematical Sciences	Mathematics, Operations Research and Statistics
6	Medical Sciences	Medical and Pharmaceutical Sciences
7	Physical Sciences	Astronomy, Astrophysics, Atomic Physics, Molecular Physics, Nuclear Physics, Particle Physics, Solid State Physics, Material Sciences, Electronics and Applied Physics
8	S& T Studies	R&D Management & planning, MIS, Manpower planning etc., IPR laws, policies, management & evaluation etc.; Technology Forecasting, Assessment & Management, S&T Policies S&T interface with society, polity and productions sector
9	Trans-disciplinary Research	Trans-disciplinary Research

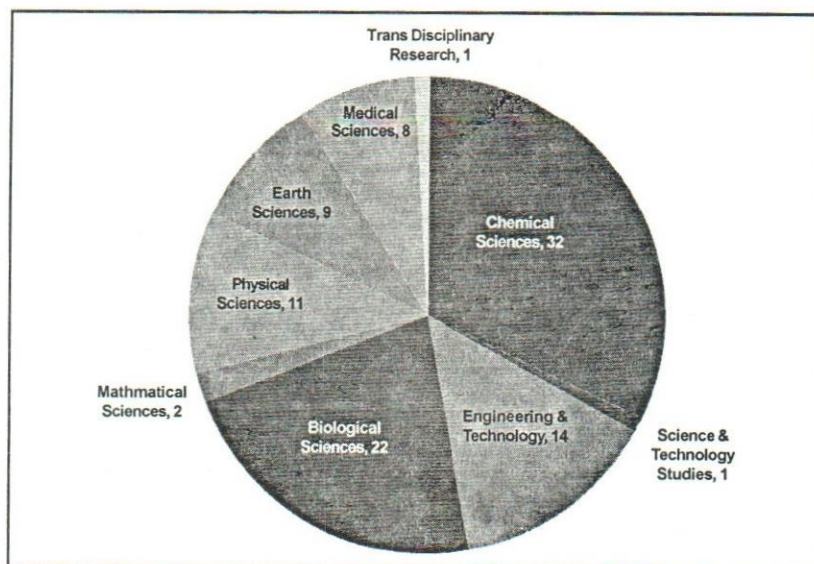


Figure 3a: Relative percentage of appeared students in interview for the award of CSIR SRF in different subjects during 2004-05 to 2008-09

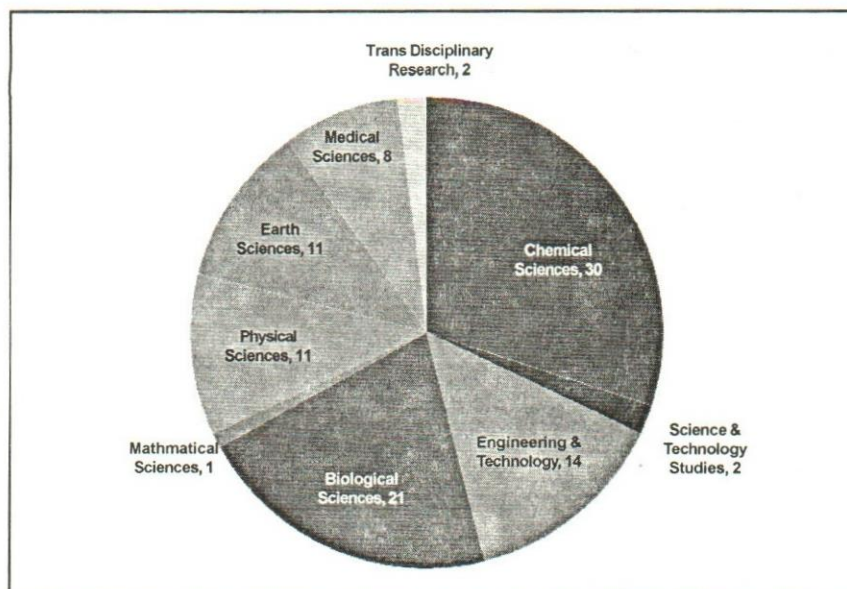


Figure 3b. Relative percentage of selected students for CSIR SRF in different subjects during 2004-05 to 2008-09

Biological Sciences, Engineering and Technology, Physical Sciences, Earth Sciences, Medical Sciences, Mathematical Sciences, Science and Technology Studies and Trans-disciplinary Research. The proportion of students selected for SRF was essentially the same as that of the appearance

(Figure 3a and 3b). The percent (percent) selection was however highest in TDR followed by Earth Sciences, SandT Studies Engineering and Technology, Biological, Chemical and Medical Sciences, Physical Sciences and least in Mathematical Sciences (Table 3).

Table 3. Subject and year-wise number of students appeared in interview and selected for the award of CSIR SRF

Subject Area	2004-05 No. of students		2005-06 No. of students		2006-07 No. of students		2007-08 No. of students		2008-09 No. of students		Total No. of students		% of Selection
	Appeared in interview	Selected for SRF	Appeared in interview	Selected for SRF	Appeared in interview	Selected for SRF	Appeared in interview	Selected for SRF	Appeared in interview	Selected for SRF	Appeared in interview	Selected for SRF	
Chemical Sciences	318	97	251	82	268	114	246	109	199	132	1282	534	42
Engineering & Technology	164	57	128	47	112	50	105	50	86	51	595	255	43
Biological Sciences	140	53	165	46	202	75	190	84	181	111	878	369	42
Physical Sciences	76	22	84	30	88	30	104	45	118	61	470	188	40
Earth Sciences	62	23	64	34	93	47	73	38	72	55	364	197	54
Medical Sciences	115	44	64	24	62	24	51	24	55	30	347	146	42
Trans-Disciplinary Research	0	0	0	0	12	8	20	18	24	22	56	48	86
Science & Technology Studies	17	7	21	8	8	6	8	6	4	3	58	30	52
Mathematical Sciences	15	3	16	7	5	1	16	3	15	9	67	23	34
Total	907	306	793	278	850	355	813	377	754	474	4117	1790	

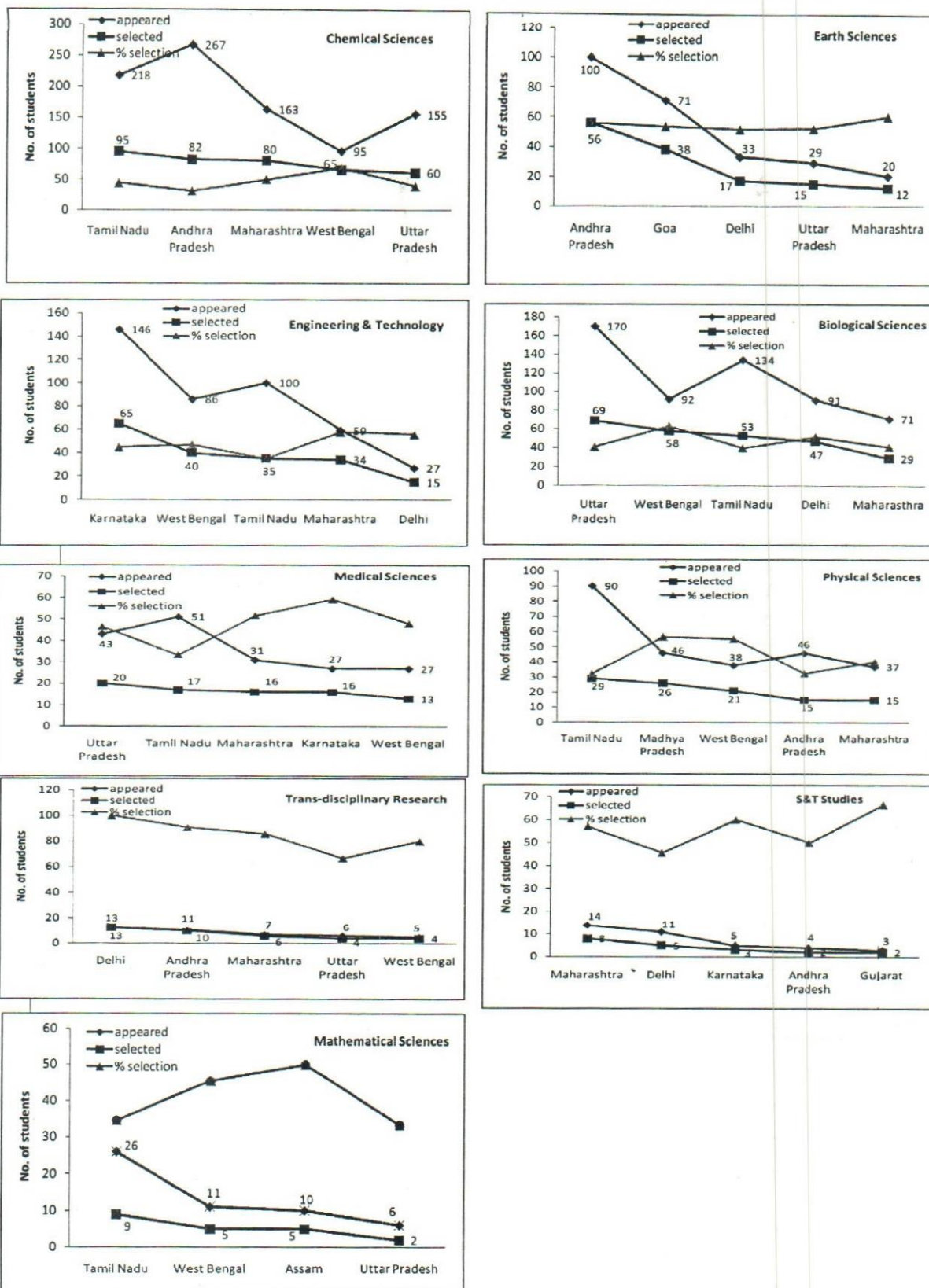


Figure 4. Top 5 states in terms of number of CSIR SRF awarded in each subject area

Table 4. Subject- and State-wise number of students appeared in interview for the award of CSIR SRF and finally awarded SRF during 2004-05 to 2008-09.

State/Union Territory	Chemical Sciences		Earth Sciences		Engineering & Technology		Biological Sciences		Math. Sciences		Medical Sciences		Phys. Sciences		S & T Studies		Trans-disciplinary		Gross Total	
	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected	Appeared	Selected
Tamil Nadu	218	95	25	10	100	35	134	53	26	9	51	17	90	29	2	1	4	3	650	252
West Bengal	95	65	9	7	86	40	92	58	11	5	27	13	38	21	1	1	5	4	364	214
Andhra Pradesh	267	82	100	56	59	13	55	26	1	0	23	9	46	15	4	2	11	10	566	213
Maharashtra	163	80	20	12	59	34	71	29	0	0	31	16	37	15	14	8	7	6	402	200
Uttar Pradesh	155	60	29	15	16	7	170	69	6	2	43	20	45	14	6	1	6	4	476	192
Delhi	58	17	33	17	27	15	91	47	3	1	34	12	37	12	11	5	13	13	307	139
Karnataka	25	15	3	2	146	65	45	21	1	0	27	16	13	8	5	3	1	0	266	130
Kerala	47	23	14	7	18	11	19	5	0	0	19	11	12	9	0	0	2	2	131	68
Madhya Pradesh	29	12	6	3	9	6	13	5	0	0	26	8	46	26	3	1	1	1	133	62
Gujarat	39	21	7	5	3	1	22	6	0	0	13	6	10	3	3	2	0	0	97	44
Goa	4	1	71	38	0	0	2	0	0	0	0	0	1	1	0	0	2	2	80	42
Punjab	21	11	1	0	5	3	14	4	0	0	32	12	14	6	0	0	1	1	88	37
Uttaranchal	21	6	12	9	18	8	14	1	1	0	1	0	17	5	2	2	2	1	88	32
Assam	31	13	4	3	3	2	10	2	10	5	0	0	15	6	1	0	0	0	74	31
Haryana	10	1	5	3	9	1	17	6	2	0	3	2	11	7	3	2	0	0	60	22
Himachal Pradesh	9	5	0	0	3	0	37	14	0	0	0	0	3	1	0	0	0	0	52	20
J&K	7	5	1	1	3	2	21	10	0	0	3	2	1	0	0	0	0	0	36	20
Orissa	31	9	8	2	8	1	16	3	2	1	1	0	5	1	0	0	1	1	72	18
Rajasthan	25	6	4	3	3	2	7	2	1	0	9	2	8	1	2	1	0	0	59	17
Jharkhand	8	1	9	2	16	9	1	0	1	0	0	0	8	4	0	0	0	0	43	16
Pondicherry	10	4	3	2	2	0	4	2	0	0	1	0	7	3	0	0	0	0	27	11
Meghalaya	3	2	0	0	0	0	4	2	0	0	0	0	0	0	0	0	0	0	7	4
Chandigarh	3	0	0	0	0	0	8	3	0	0	1	0	2	0	0	0	0	0	14	3
Arunachal Pradesh	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	0	10	1
Chhattisgarh	2	0	0	0	2	0	1	0	2	0	0	0	3	0	1	0	0	0	11	1
Manipur	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
Bihar	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0
Tripura	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	1282	534	364	197	595	255	878	369	67	23	347	146	470	188	58	30	56	48	4117	1790

Data analysis revealed that out of 4,117 students who had appeared in interview for award of SRF, 52 percent were from Chemical and Biological sciences and similarly 50 percent of the total awardees (1,790) were from Chemical and Biological Sciences (Table 3). The trend is essentially the same as that reported for JRF-NET (Inderpal et al., 2009). Fourteen percent (14 percent) of the total students who appeared in interview and awarded CSIR SRF were from the Engineering Sciences.

Top five (5) states/union territories in terms of selection in each subject are depicted in Figure 4, and the details are given in Table 4.

Subject-wise activity index of the students appeared in interview and awarded CSIR SRF awardees from top eleven states in terms of cumulative selection for CSIR SRF

The Activity Index (AI) characterizes the relative impact of the student appeared and selected from top 11 states in a given subject. AI was first proposed by Frame (Frame, 1977) and has been elaborated by Schubert and Braun (Schubert and Braun, 1986) and is mathematically defined as:

$$AI(A) = \{(Nij/Nio)/(Noj/Noo)\} \times 100$$

where Nij is the total number of students appeared for interview from a state i in j subject, Nio is the total number

of students from a state in all subject areas; Noj the total number of students appeared in interview for the award of SRF from all states in a subject area j, and Noo the total number of students appeared in interview for SRF in all subject areas from all states.

$$AI(S) = \{(Mij/Mio)/(Moj/Moo)\} \times 100$$

where Mij is the total number of students awarded SRF from a state i in j subject, Mio is the total number of students from a state in all subject areas; Moj is the total number of students awarded the SRF from all states in subject area j, and Moo the total number of students awarded SRF in all subject areas from all states.

AI(A)=100 indicates that the appearance in interview for award of SRF from a state in a given subject area corresponds precisely to the average of different states; AI(A)>100 reflects higher than average activity and AI(A)<100, lower than average appearance in the subject area.

AI(S)=100 indicates that the selection for award of SRF from a state in a given subject area corresponds precisely to the average of different states; AI(S)>100 reflects higher than average activity and AI(S)<100, lower than average selection in the subject area.

$$AI(A) < 100 \text{ and } AI(S) < 100$$

Table 5. Subject-wise activity index of students appeared in interview for the award of CSIR SRF vis-à-vis selected from top eleven states (in terms of cumulative selection during 2004–05 to 2008–09)

State/UT	Chemical Sciences	Earth Sciences	Engineering & Technology	Biological Sciences	Math. Sciences	Medical Sciences	Physical Sciences	S&T Studies	Trans-disciplinary Research
Tamil Nadu	106/125	42/36	102/95	100/103	289/327	93/82	128/117	22/26	41/41
West Bengal	82/100	27/30	157/168	123/132	219/214	88/74	97/100	19/30	92/65
Andhra Pradesh	149/127	194/238	69/35	47/60	13/0	48/51	75/72	50/61	130/162
Maharashtra	128/132	54/54	97/129	86/71	0/0	91/97	85/76	247/259	116/104
Uttar Pradesh	103/103	67/71	22/22	174/175	91/95	107/127	88/74	89/34	84/72
Delhi	60/40	118/111	58/75	144/165	71/66	131/105	112/88	254/233	283/323
Karnataka	30/38	12/14	364/374	82/79	27/0	120/150	45/63	133/150	25/0
Kerala	113/112	117/93	91/128	71/36	0/0	171/197	85/135	0/0	102/102
Madhya Pradesh	69/64	49/44	45/69	48/39	0/0	231/157	320/426	160/105	50/56
Gujarat	127/158	79/103	21/16	110/67	0/0	158/166	95/69	219/295	0/0
Goa	16/8	972/818	0/0	12/0	0/0	0/0	12/24	0/0	167/165

states with less than average appearance for interview and selection for award of fellowship

$$AI(A) < 100 \text{ and } AI(S) > 100$$

states with less than average appearance for interview but more than average selection for award of fellowship

$$AI(A) > 100 \text{ and } AI(S) > 100$$

states with more than average appearance for interview and more than average selection for award of fellowship

$$AI(A) > 100 \text{ and } AI(S) < 100$$

states with more than average appearance for interview but less than average selection for award of fellowship

Subject-wise activity index $\{AI(A)\}$ of students appeared in interview for the award of CSIR SRF and those

awarded CSIR SRF $\{AI(S)\}$ from top eleven states in terms of cumulative selection for CSIR SRF are given in table-5.

States with $AI(A) < 100$ and $AI(S) > 100$; and $AI(A) > 100$ and $AI(S) > 100$ indicate better performance in a subject area and the results of activity index estimations are presented in table-6

In Chemical Sciences, states such as Tamil Nadu, Andhra Pradesh, Maharashtra, Uttar Pradesh, Kerala, and Gujarat fared well whereas in the area of Biological Sciences, states such as Gujarat, Tamil Nadu, West Bengal, Uttar Pradesh and Delhi indicated better performance. In Engineering and Technology, states such as Tamil Nadu, West Bengal and Karnataka performed comparatively better, whereas, in the area of Medical Sciences, states such as Uttar Pradesh, Delhi, Karnataka, Kerala, Madhya

Table 6. Subject-wise activity index profile of top eleven states in terms of cumulative selection for CSIR SRF during 2004–05 to 2008–09

Subject	$AI(A) < 100$ and $AI(S) < 100$	$AI(A) < 100$ and $AI(S) > 100$	$AI(A) > 100$ and $AI(S) < 100$	$AI(A) > 100$ and $AI(S) > 100$
Chemical Sciences	Delhi, Karnataka, Madhya Pradesh, Goa	West Bengal	-	Tamil Nadu, Andhra Pradesh, Maharashtra, Uttar Pradesh, Kerala, Gujarat
Earth Sciences	Tamil Nadu, West Bengal, Maharashtra, Uttar Pradesh, Karnataka, Madhya Pradesh	Gujarat	Kerala	Andhra Pradesh, Delhi, Goa
Engineering & Technology	Andhra Pradesh, Uttar Pradesh, Delhi, Madhya Pradesh, Gujarat, Goa	Maharashtra, Kerala	Tamil Nadu	West Bengal, Karnataka
Biological Sciences	Andhra Pradesh, Maharashtra, Karnataka, Kerala, Madhya Pradesh, Goa	-	Gujarat	Tamil Nadu, West Bengal, Uttar Pradesh, Delhi
Mathematical Sciences	Andhra Pradesh, Maharashtra, Uttar Pradesh, Delhi, Karnataka, Kerala, Madhya Pradesh, Gujarat, Goa	-	-	Tamil Nadu, West Bengal
Medical Sciences	Tamil Nadu, West Bengal, Andhra Pradesh, Maharashtra, Goa	-	-	Uttar Pradesh, Delhi, Karnataka, Kerala, Madhya Pradesh, Gujarat
Physical Sciences	Andhra Pradesh, Maharashtra, Uttar Pradesh, Karnataka, Gujarat, Goa	Kerala, West Bengal	Delhi	Tamil Nadu, Madhya Pradesh
S&T Studies	Tamil Nadu, West Bengal, Andhra Pradesh, Uttar Pradesh, Kerala, Goa	-	-	Maharashtra, Delhi, Karnataka, Madhya Pradesh, Gujarat
Trans-Disciplinary Research	Tamil Nadu, West Bengal, Uttar Pradesh, Karnataka, Madhya Pradesh, Gujarat	-	-	Andhra Pradesh, Maharashtra, Delhi, Kerala, Goa

Pradesh and Gujarat indicated better performance. In Physical Sciences, Delhi, Tamil Nadu and Madhya Pradesh exhibited a better performance, whereas, in Earth Sciences, Kerala, Andhra Pradesh, Delhi and Goa were better placed. In Mathematical Sciences only two states viz. Tamil Nadu and West Bengal had shown good results.

Concluding Remarks

The analysis revealed that only 14 percent of the total SRF awarded (1790) during 2004–05 to 2008–09 were in the area of Engineering and Technology and the remaining 86 percent in the area of basic sciences. Most of the SRF awarded in the basic sciences were in the area of chemical and biological sciences. The percent (percent) selection was maximum (58.8 percent) from the state of West Bengal whereas it was only 38.8 percent in case of Tamil Nadu from where maximum students had appeared (650) in interview and awarded (252) CSIR SRF. Students from the state of Maharashtra had a better relative percentage (49.7 percent) in terms of selection compared to the state of Andhra Pradesh (37.6 percent). The study further revealed that only two students appeared in interview from the state of Bihar which has 865 institutions for tertiary education and research, and is placed at 6th position amongst the states in terms of number of such institutions. Students from the state of Jammu and Kashmir which has lesser number of institutions for tertiary education and research compared to other states of India, however, performed better both in terms of students appeared and relative percent selection (55.6 percent). Amongst the North-Eastern states, maximum students appeared in interview and awarded CSIR SRF were from the state of Assam. As the number of PhDs produced in India are meager compared to the students enrolling for MSc (Hasan, Khilnani and Luthra, 2010), and BE/BTech, prolific measures are required to motivate students to pursue doctoral research and to opt career in science and engineering (S&E).

As per the statistics available, a total of 127610 students completed their graduate programme in engineering and technology during 2003 whereas only 12370 students completed their postgraduate programme in the field of engineering and technology during the same period (SES, 2004-05). Furthermore, during 2005-06, the statistics showed that a total of 1671006 students were enrolled for BE/BTech courses (SES, 2005-06). Further, during 2005-06, a total of 239285 students were enrolled for MSc (Hasan, Khilnani and Luthra, 2010) in basic sciences. In comparison to number of students enrolled for BE/BTech and MSc, the number of PhDs produced during 2006 were 6569 in science

and 968 in engineering (www.nsf.gov/seind10). Efforts are being made to produce more number of PhDs in science and engineering (Hasan, Khilnani and Luthra, 2009, 2010).

Over the years, a phenomenal growth has been observed in job opportunities the world over for knowledge workers. In USA alone, only 1.5 percent of all jobs in the year 1900 were knowledge-based, the number has increased to 25 percent by 1950 and 78 percent in 2000 (Jim, 2008). In India, during 2005-06, 74.1 percent of the total R and D expenditure was met from Government sources and 25.9 percent came from private sources (RDSDG, 2007-08). Further, the private sector spent 0.66 percent only of its sales turnover on Research and Development (Research and Development Statistics at a Glance, 2007-08). Majority of the doctorates in S and E are engaged by Government institutions whereas the hiring by private sector industry is low. To encourage development and commercialization of inventions and innovations, researchers working in scientific establishments have been encouraged to move between industry and scientific establishment and also permitted to have an equity stake in scientific enterprises/spin off while in professional employment with their research and academic organizations. Scientific establishments have also been encouraged to set-up incubation centres/venture centres with the objective to nucleate and nurture technology and knowledge-based enterprises (CSIR OM No. 34/ENT/2009-PPD). Creating jobs and enhancing the job prospects for scientific personnel is a daunting task. As per Department of Science and Technology, Government of India report on "Assessment of Emerging Opportunities and Prospects of Careers in Science and Technology" published in 2008, an increase of 16.5 percent in 2006 over 2005 in overall vacancies for S and T jobs has been witnessed (Nangia, 2008).

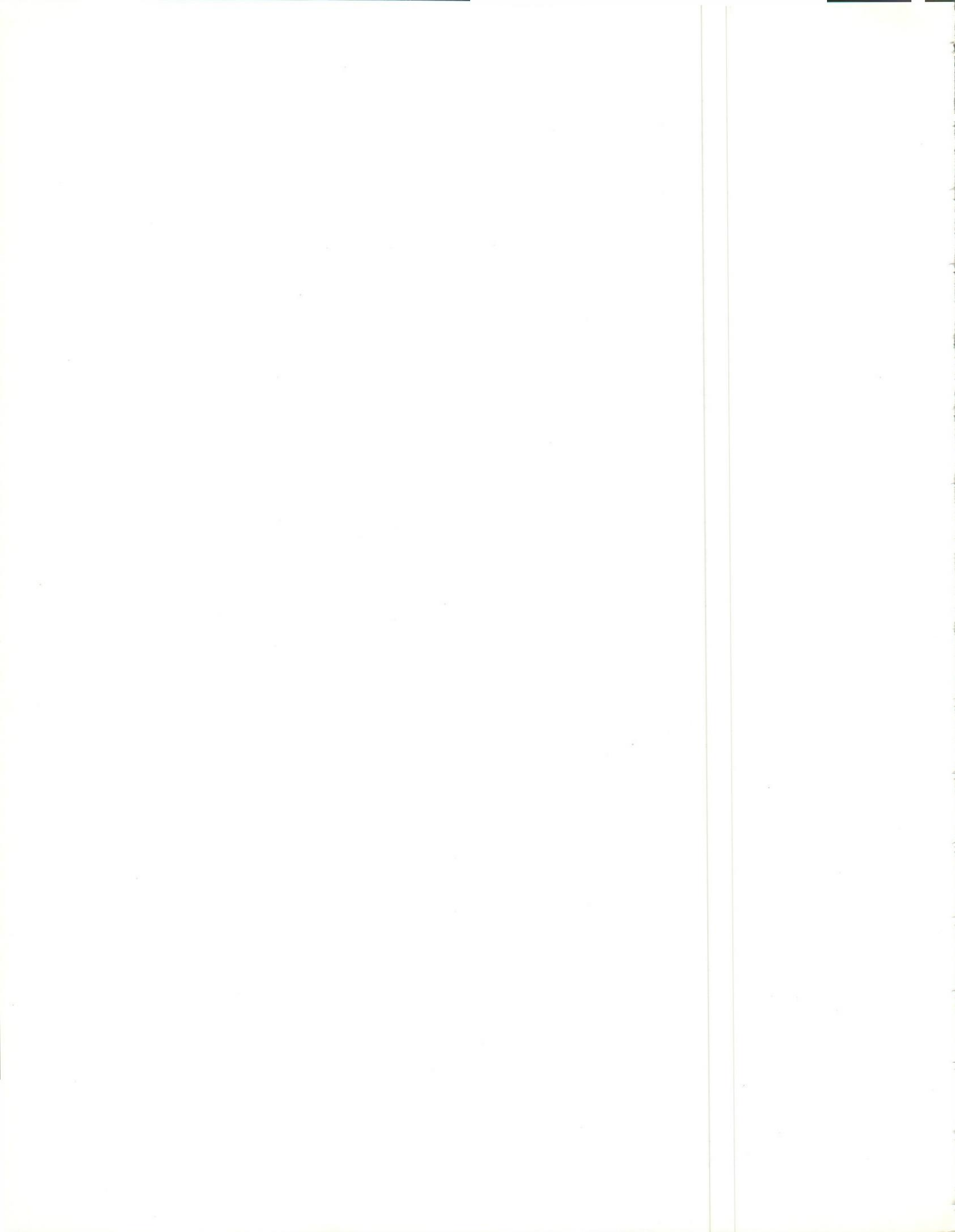
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People are pretty much alike. It is only that our differences are more susceptible to definition than our similarities.

— Linda Ellerbee







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