Quantitative Study of Tea Industry in India: Market , Pricing and Organization

Marjit, Sugata and Kar, Saibal and Das, Nimai

Centre for Studies in Social Sciences (CSSSC), Manav Rachna International University (MRIU)

2018

Quantitative Study of Tea Industry in India: Market, Pricing and Organization

Sugata Marjit, Saibal Kar and Nimai Das

The study describes various aspects of the quantitative features of Indian tea industry based on secondary data from Tea Statistics for different years as published by the Tea Board of India, and primary survey in major tea producing regions of South and North India, namely in West Bengal, Assam and Tamil Nadu. The paper is organized in the following way: first part gives an overview of the quantitative study of Indian tea industry at national and international levels based on predictions of observed patterns for selected variables. The variables are critical for the growth of tea industry in India. The second part of the study discusses the basic findings from field survey of big growers, small growers and bought-leaf factories from North and South Indian tea producing regions. Several of the predictions and decompositions obtained in this study are both novel and robust and directly amenable to policy instruments.

1. Overview of the quantitative study of Indian tea industry

Overview of the pattern and long run trends as observed and as predicted for the selected variables is based on time series techniques. We use the previous 35 to 45 years of data commencing from 1961 (or later dates as per availability) all the way to 2007. We delicately measure and analyse the growth patterns of tea industry in terms of leading indicators like output, yield or area, export and auction sale for north-India, south-India and all-India levels. We emphasize the extent of internal demand for tea in India which seems extremely important for expansion and stability of small growers in the country. In addition, the predictions for each of these variables are over the next decade with ample time to plan and implement policies which the authorities might consider suitable given the trends. In other words, it means that if the tea exports for particular varieties tend to fall in certain regions of the world, corrective measures may be taken up by the producers/tea boards in the form of quality assurance, marketing innovations, market surveys, etc. While some of these policies are adopted by the authorities on piece meal basis, in general, there seems a lack of vision and direction in the nature of such interventions.

We identified several areas where timely interventions may lead to considerable turnaround in the performances. For purely scientific precision, we run a multivariate regression model and determine the effect of (as growth) tea yield, export and domestic demand on the growth of output for Indian tea. From an international perspective, however, both supply side and demand side analyses are employed for comments on the future of Indian tea relative to other exporting and importing countries/regions. The supply of tea in international market by countries like Sri Lanka, Bangladesh, Kenya, Indonesia, Malawi and China are compared to that by India alone. Likewise, the implications of regional factors affecting import demand for tea in different parts of the world, namely West and East Europe, North and Latin America, Asia, Australia, etc. is discussed within the demand side analysis. Finally, we offer long run estimates on this issue using a multivariate regression model.

1.1 Methodologies

In order to investigate various aspects of the quantitative study of tea industry we use following methodological treatments for the variables under consideration.

1.1.1 Growth and fluctuations

This section deals with the evidence on how (*i*) growth of tea output, (*ii*) growth of tea yield rate, (*iii*) growth of tea export and (*iv*) growth of tea auction sale at north-India, south-India and all-India levels, and (*v*) growth of Indian domestic demand for tea behave over the last thirty two years between 1976 to 2007. What we offer here a distinct methodological treatment of the variables considered – application of the well-known Hodrick-Prescott (1980) Filter. As an introduction to the larger issues that shall be taken up in the current project, including relating business cycles in India and that of the trade partners (in tea) with the cycles in the variables considered, we begin by identify the fluctuations around trend within each data series. This is manifested by separating the trend of the series (or by detrending) from the cyclical components through the Hodrick and Prescott (1980) filter (hereafter, the HP filter). For any given series y_t, the HP filter separates the trend (growth) component, τ_t, of the series from the cyclical component, c_t, by minimizing the following loss function:

$$\underset{g_t}{Min} \sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \left[(\tau_{t-1} - \tau_t) - (\tau_t - \tau_{t-1}) \right]^2 \qquad (1)$$

where, λ is a penalty parameter.

1.1.2 Prediction and forecasting

It provides prediction and forecasting of the following variables till 2015, based on the *observed* values of each variable between 1976 – 2007.

National level

All the variables deemed earlier in our analysis of growth and fluctuations at north, south and all-India levels are reconsidered here to predict their values till 2015. These include (*i*) output, (*ii*) yield rate, (*iii*) export and (*iv*) auction sale at north-India, south-India and all-India levels. Furthermore, we offer a separate section to study the price behaviours, namely export and auction market prices of tea. Apart from their prediction and forecasting, a simple correlation coefficient has also been considered to see the degree of association between domestic (auction) price and (external) export price. Subsequently, the export to auction price ratio is calculated as $\frac{Export\ price - Auction\ price}{Auction\ price}$ for all-India level and southern and northern regions. To end with, we examine the observed trend and prediction for different grades of tea, specifically the price-output of CTC and orthodox varieties in north, south and all-India levels.

International level

The variables covering in this part might be categorized into two broad heads: supply side analysis and demand side analysis. In supply side, we give light on the relative performance of major tea producing countries with respect to world production and export of tea vis-à-vis India. This section offers evidence on the performance of India with reference to other tea producing countries like Sri Lanka, Bangladesh, Kenya, Indonesia, Malawi and China about (i) tea output, (ii) tea export and (iii) tea export price. Here we make predictions of the relative share of each of the

producing countries with reference to India by estimating a ratio. The ratio is defined as the value of the variable under consideration for India to each of the other country. Our aim is to observe the variations in this ratio and forecast it for the next ten years on the basis of observed trends between 1971 and 2005. This should help to predict the performance of Indian tea as compared to other countries. It should be instructive to note that if the value of the ratio is greater than one, India's position is better than that of the reference country and increase in the ratio makes the situation even better for India. Pertaining to the demand side variables we offer a comprehensive analysis of the import demand across various regions of the world (West Europe, East Europe, North America & West Indies, West Asia, Other Asia, Africa, Australia & Oceania and Latin America) and some selected countries (UK, USSR, UAE, USA, Poland, Afghanistan and Australia) as well as the share of Indian tea in such places to meet their demand. It provides the region/country wise trend behaviour of (i) import demand for tea and (ii) Indian supply with forecasting till 2015 based on observed values of each of the variables from 1971 to 2005.

We predict the values of the above variables for the next eight years based on two relationships:

(*i*) A linear relationship between the values of the variables and the time path, such that, $Y = b_0 + b_1 t$, where Y is the dependent variable, t = time is the independent variable and b_i is the intercept and slope parameter to be estimated. The projection is referred to as the 'Linear Curve'.

(*ii*) Alternatively, one may use several other specifications, if the relationship is not linear to begin with. For example, if the scatter plot for the 'auction sale' adopts the pattern like following Figure 5 (see result section) then one may use the following equation to forecast the future values of auction sale: $Y = \exp(b_0 + b_1 t)$, where the expressions carry the same meaning as in (*i*). This equation is refereed to as the 'Growth Curve'.

1.1.3 Multivariate regression analysis

The study involves two regression analyses. At national level, it investigates factors like growth of export (GRX), domestic demand (GRD), auction price (GAP) and yield rate (GTY) affecting the growth of tea output (GTO) over the period in countryside. The model specified in the following way:

$$GTO_t = a + b_1 GRX_t + b_2 GRD_t + b_3 GAP_t + b_4 GTY_t + U_t \quad \ldots\ldots\ldots\ldots (1)$$

where the other symbols have their usual meaning such as t is time period; *a* and b's are the coefficients; and U is error term in the model.

Second, at international level, the effect of market demand in different regions of the world on nation's tea export performance is assessed by estimating a time series regression. Here, the share of our tea export (SQX) is regressed on some control variables at the domestic level and includes, the share of domestic demand (SDD), unit export price in USD (UPX) and exchange rate per USD (IER) as well as the demand for Indian tea in different regions (S) like West Europe, East Europe, North America & West Indies, West Asia, Other Asia, Africa, Australia & Oceania and Latin America. We estimate the following regression model:

$$SQX_t = a + b_1 SDD_t + b_2 PX_t + b_3 ER_t + c_1 S_{1t} + c_2 S_{2t} + c_3 S_{3t} + c_4 S_{4t} + c_5 S_{5t} + c_6 S_{6t} + c_7 S_{7t} + U_t \quad \ldots\ldots\ldots\ldots (2)$$

1.2 Fundamental Issues

1.2.1 National level

This part spreads out in four subsections. A distinct methodological treatment regarding the selected variables that affect tea industry is used to identify the cyclical fluctuations from the trend growth and it appears in the first subsection. What we predict and forecast from historically observed values of these variables are as well covered in this part. Next subsection provides an idea of long run behavioural trend of export price to domestic auction price. Third subsection offers the long run trends for domestic price and output of CTC and Orthodox varieties. Final subsection gives an idea about the intensity of explanatory power of export, internal demand, auction price and yield rate on the growth of tea output.

Growth and fluctuations, and prediction

While, we shall dwell on the issues of cyclaity (pro-cyclical/counter-cyclical/ acyclical vis-à-vis income or consumption share for example) of the variables considered in the later part of the project, here we de-trend the series in order to generate some graphic understanding of the trends and the cycles. The following figures represent the trend line in each variable as distinct from the cycles. The fluctuating curves represent the growth values of each variable as computed from the observed values between 1960 and 2007. In most cases the cyclical fluctuations are quite distinct from the trend line (after de-trending via H-P Filter), except for (i) growth of plantation area till 1990s (figures 2a-c); and (ii) growth of domestic demand at the all-India level (figure 4a) since 1975. In both these cases, fluctuations over times have been minimal for the better part of the period of observation.

Growth of Output (figures 1a-c) have remained around 5% annually, although there have been occasional surges up to 10-15% in some years for both north India and all-India figures. Growth of output reached 30% in south India around mid-1980s and although the average growth trend has remained around 1-2% the downward movements has also been temperate.

Figure: 1a

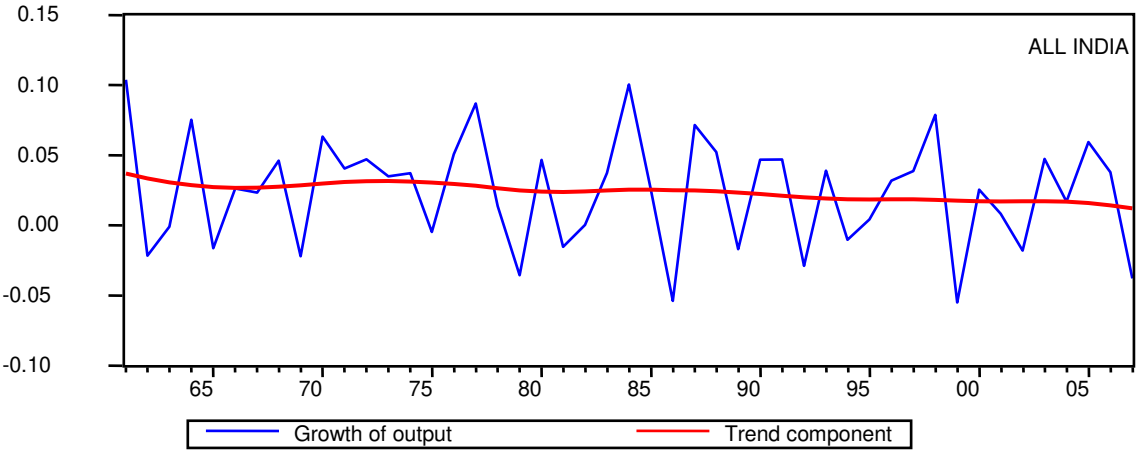


Figure: 1b

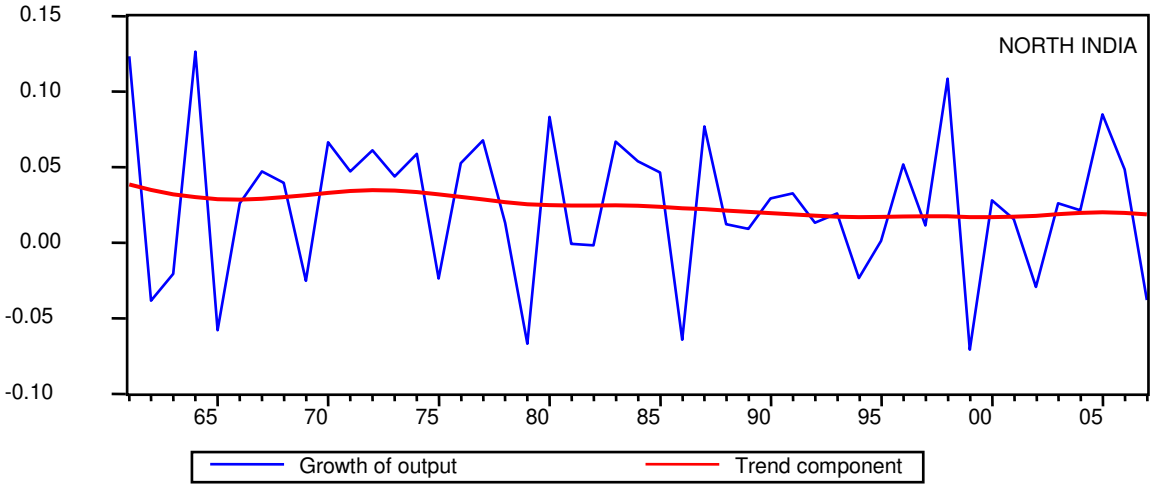
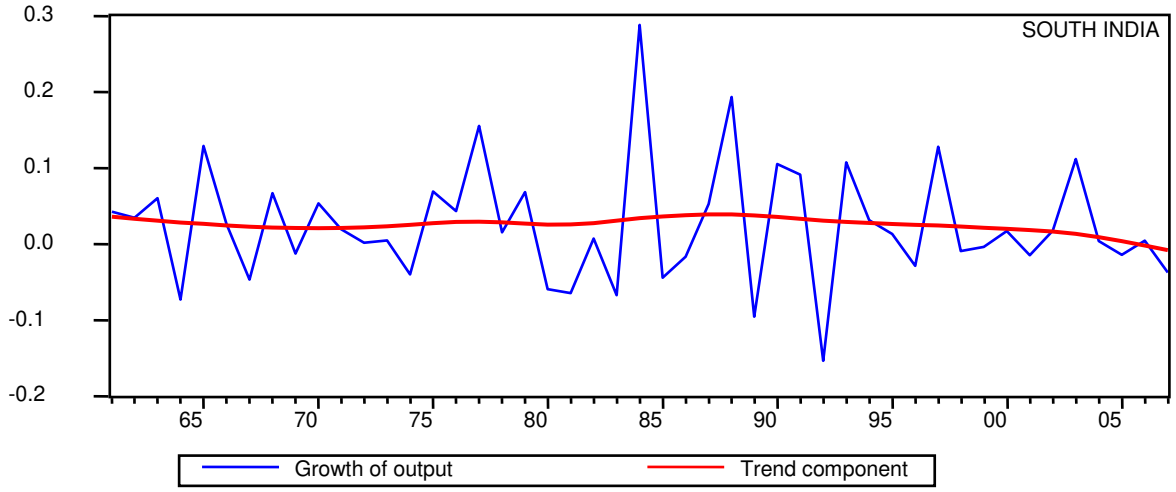


Figure: 1c



Following figures 2a-c display the growth of plantation area at the all-India level, for north-India and south-India respectively. As noted above, there was little or no growth of the area under tea plantation till mid-1990s, after which there has been marked shifts in the total area, so much so that in the year 2000, there was close to 10% increase in the area under tea plantation. This has been a reflection of what was happening in both north-India and south-India – considerable expansion in the number of small growers in both regions.

Figure: 2a

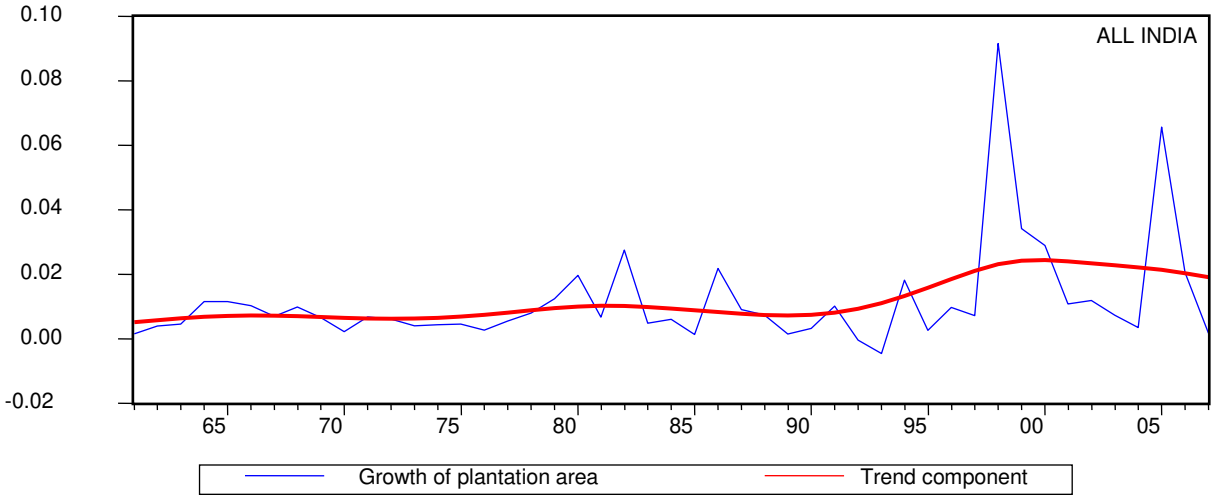


Figure: 2b

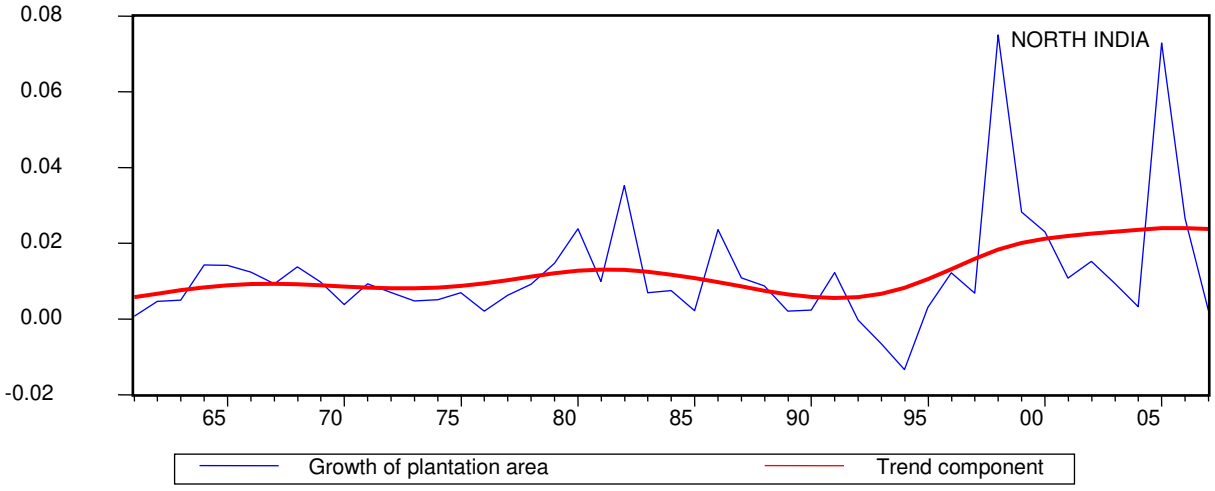
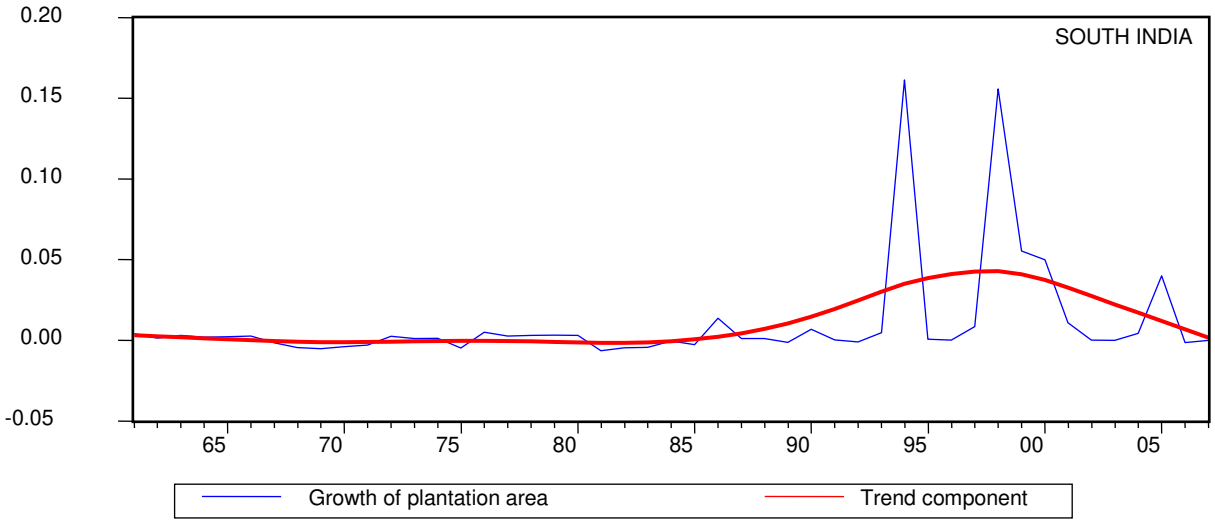


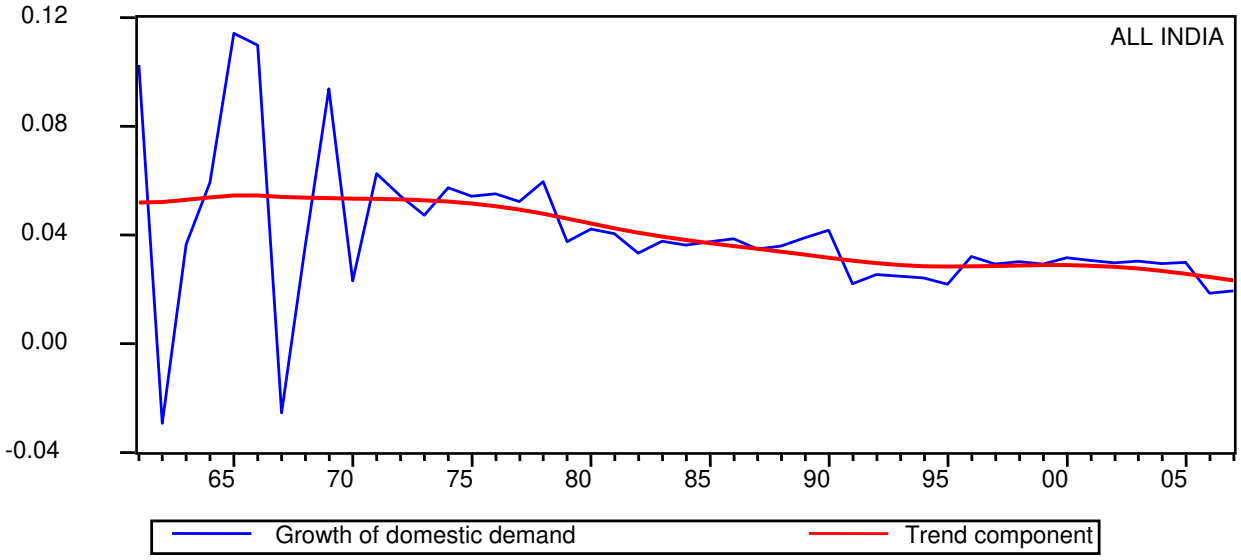
Figure: 2c



As noted above, figure 3a depicts the trend line and the fluctuations in domestic demand for tea in India. It is clearly seen that that the domestic demand follows a flat trend at around 4%

growth in demand annually all through the last four decades, following initial fluctuations in the same in the decade of the 60s.

Figure: 3a



We use auction sale at the regional levels as a proxy for domestic demand for tea from the north and the south. Of course, part of the auction sale caters to the export market. In our future reports we shall separate out the share of auction sale that is supplied in the domestic market.

Figure: 3b

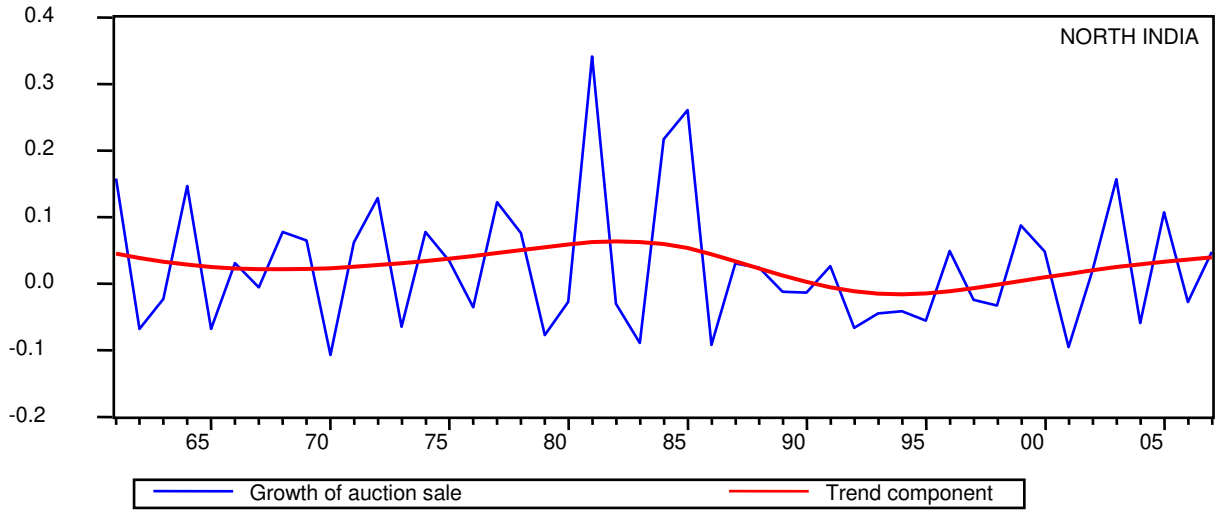
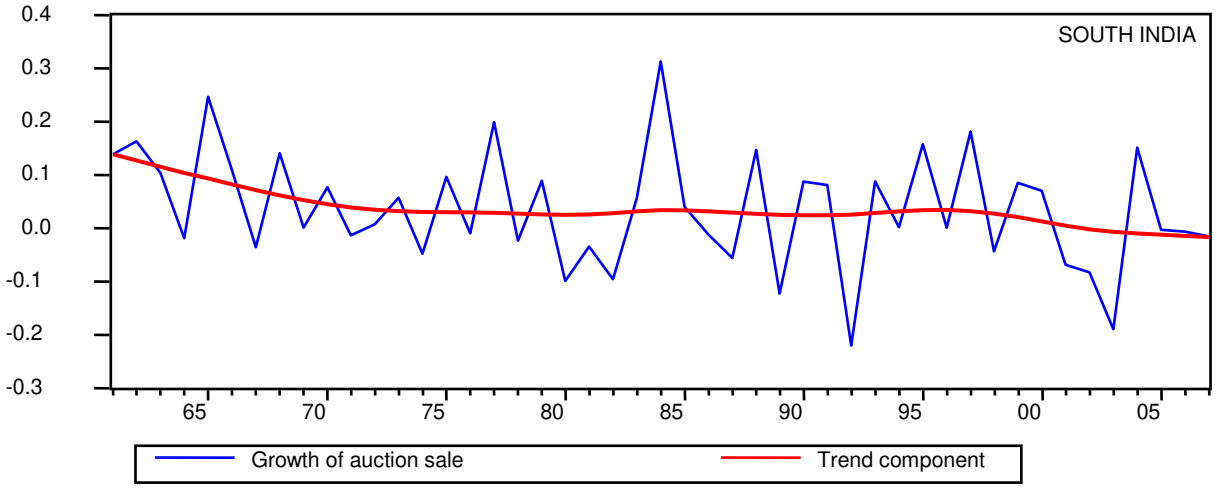


Figure: 3c



Figures 4a-c provide the export trend as against the annual fluctuations and the moderate growth rate at the all-India level may be systematically explained by similar patterns in north-India.

Figure: 4a

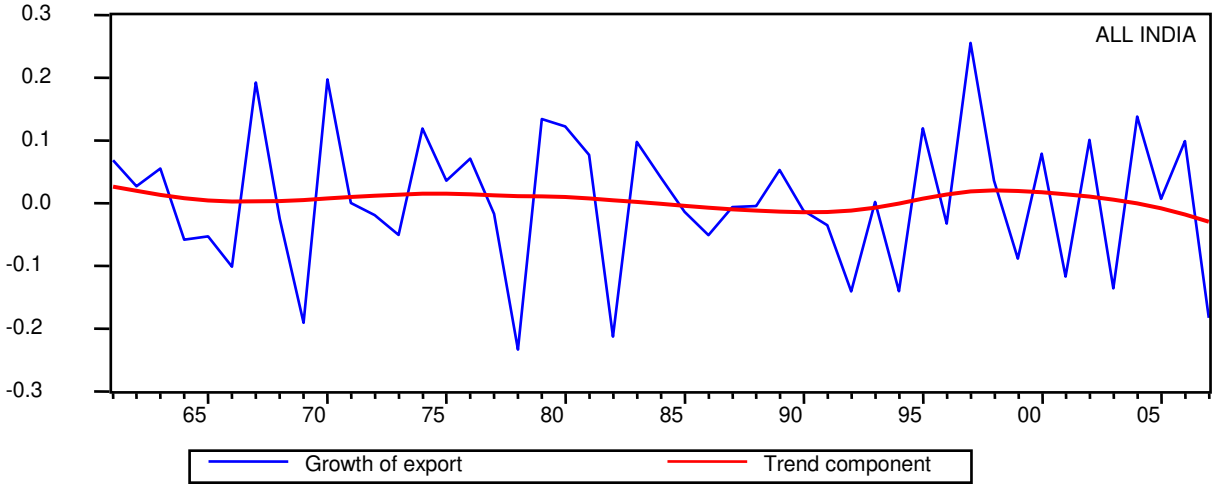


Figure: 4b

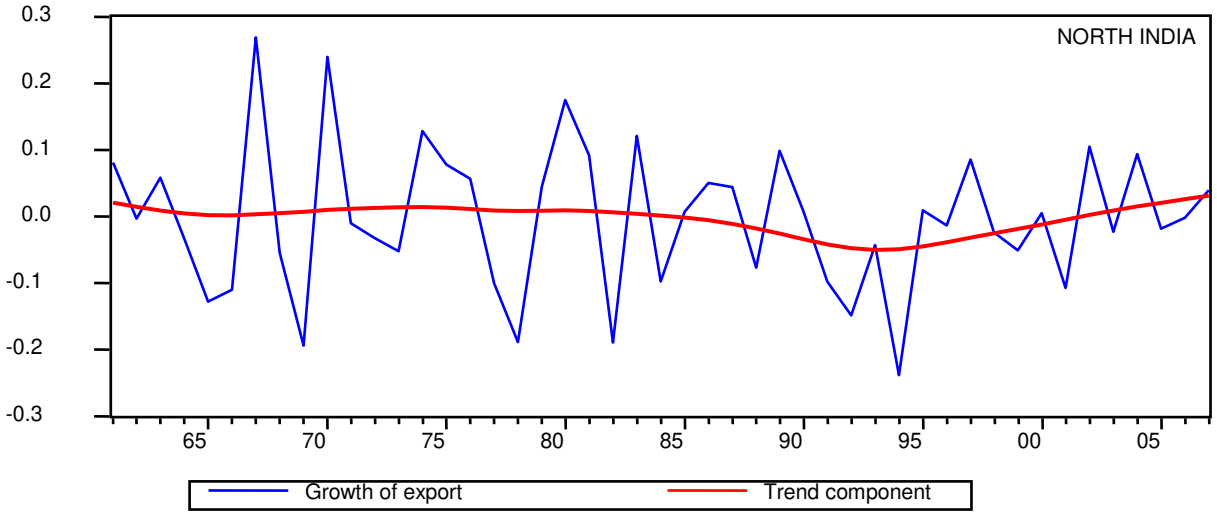
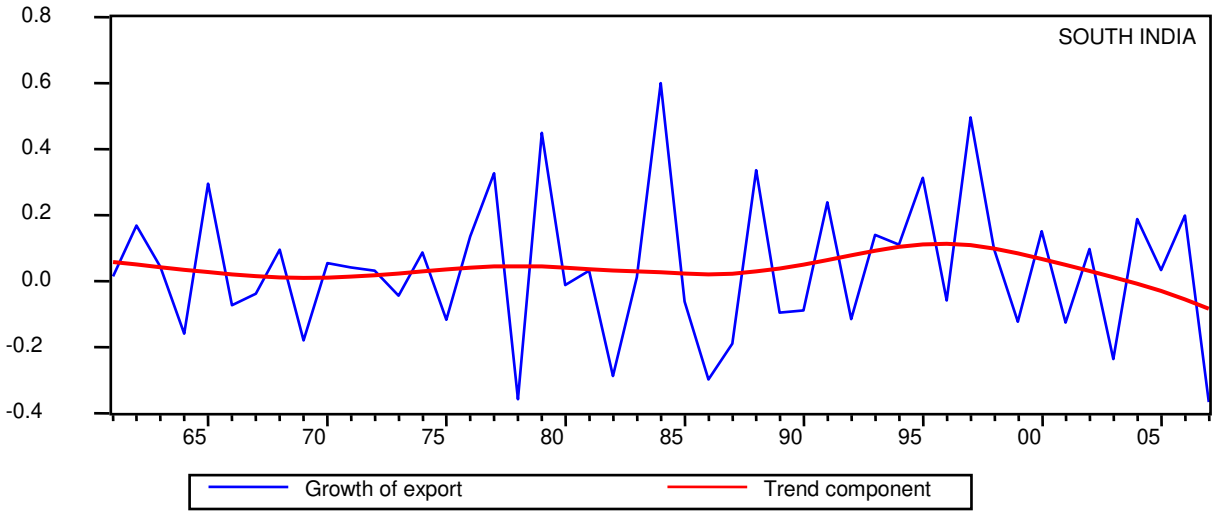
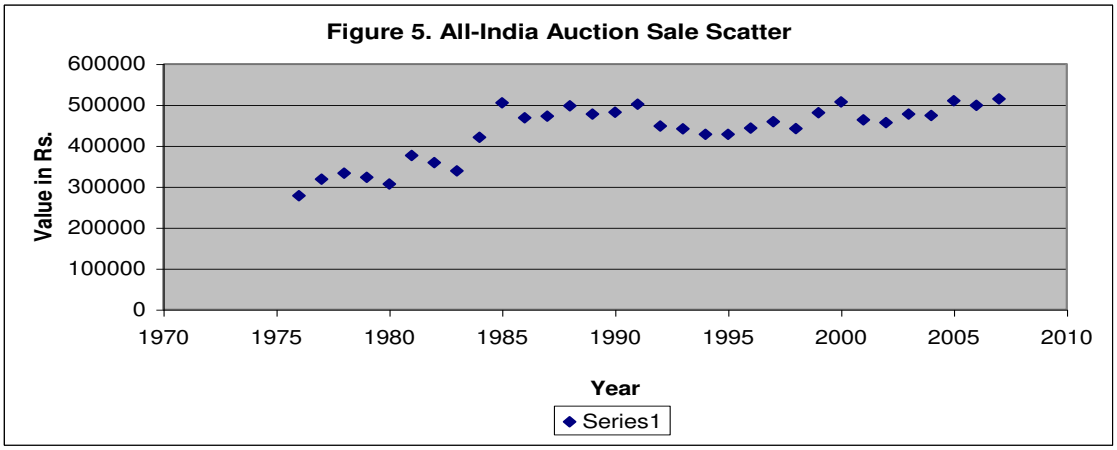


Figure: 4c



The study now turns to prediction of the above specified variables. Based on the specifications of relationship between the values of the variables and the time path, discussed in the methodology, we obtained the forecasted values of all the variables beyond 2008 and up to 2017 (10 years) and these are represented in the following figures, alongside the observed values, which run between 1976 and 2007. While, these predictions are based on the observed values, in subsequent analysis we intend to refine these predictions by bringing in aspects that we expect to occur in the near future, including changes in world demand-supply of tea (country-wise).



The following figures (6a, 6b and 6c) show the patterns for Tea Production (all India, north India and south India) and forecasts beyond 2008 till 2017. As argued above, if the relationship is linear in nature, then the predicted output is about 100, 050 thousand Kg by 2017, whereas, if the relationship follows the equation specified in equation (i) above in section 1.1.2, then the total production at the all India level would go up to, 120,00,00 thousand Kg by 2017. Also, given the

test statistic for these regression models, we claim that the linear fit is a better predictor of the total production (F-value for equation (i) is 1025.89 vis-à-vis the F-value for equation (ii) at 947.55; similarly, $R^2(a) = 0.972 > R^2(b) = 0.969$.

Figure 6a. Observed curve, Predicted Linear curve and Predicted Growth curve for All India Tea production

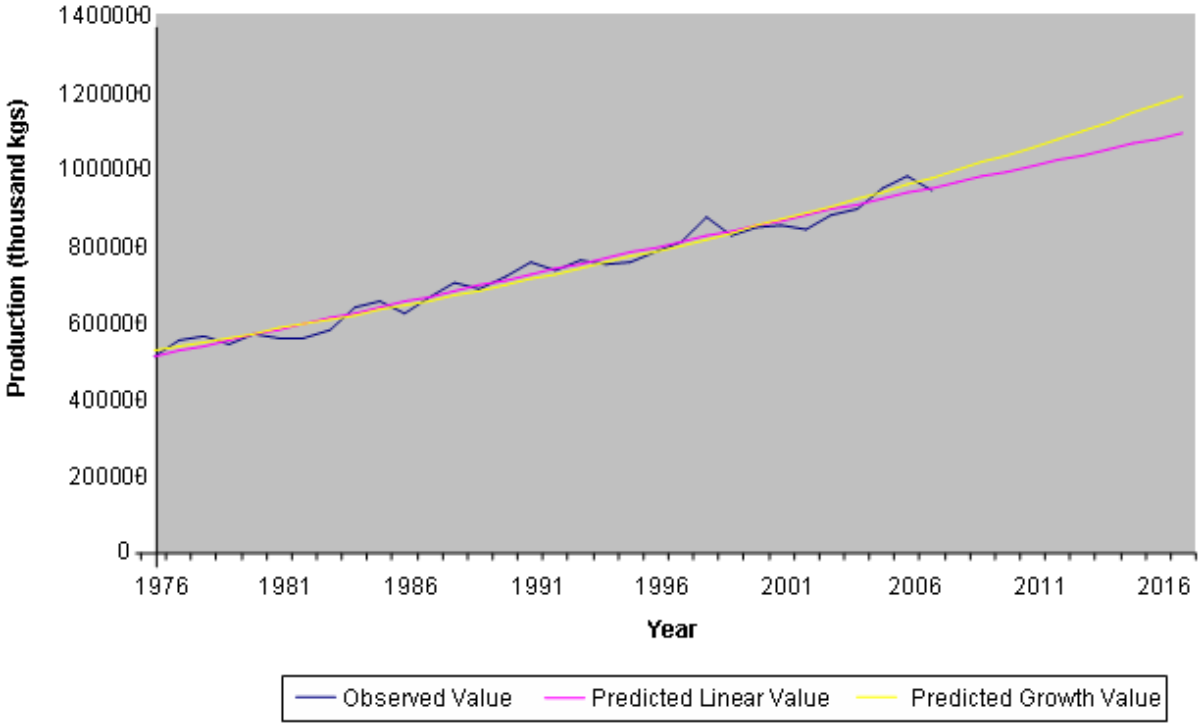


Figure 6b. Observed curve, Predicted Linear curve and Predicted Growth curve for North India Tea production

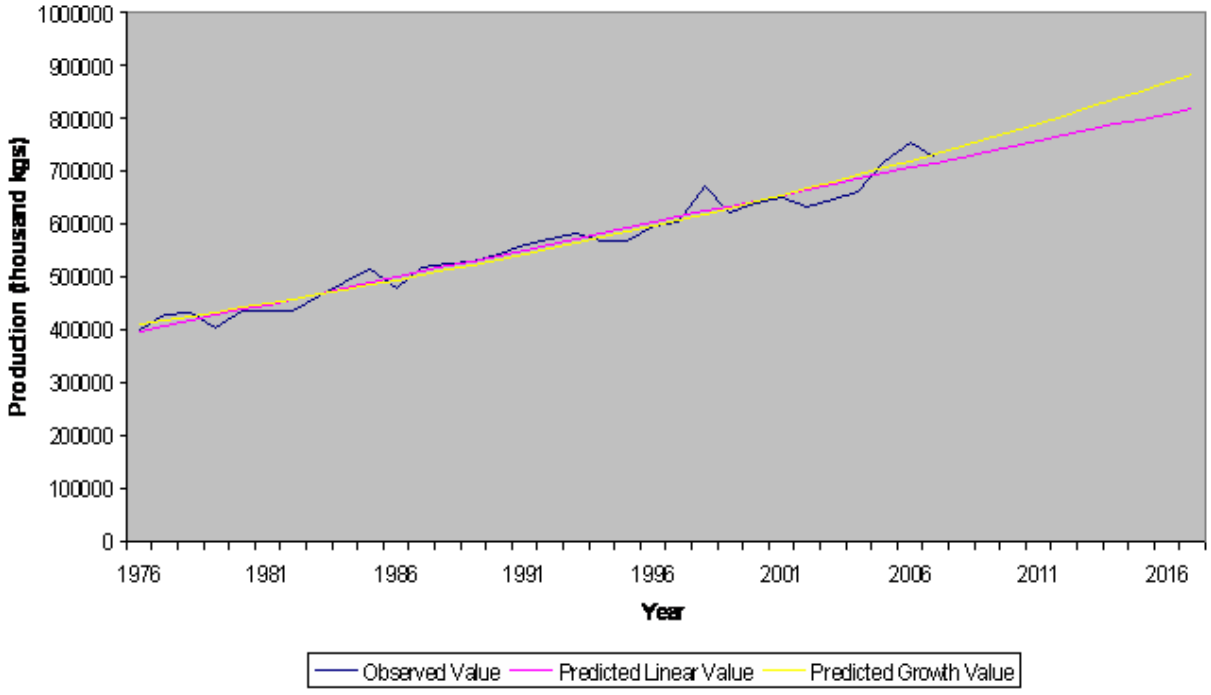
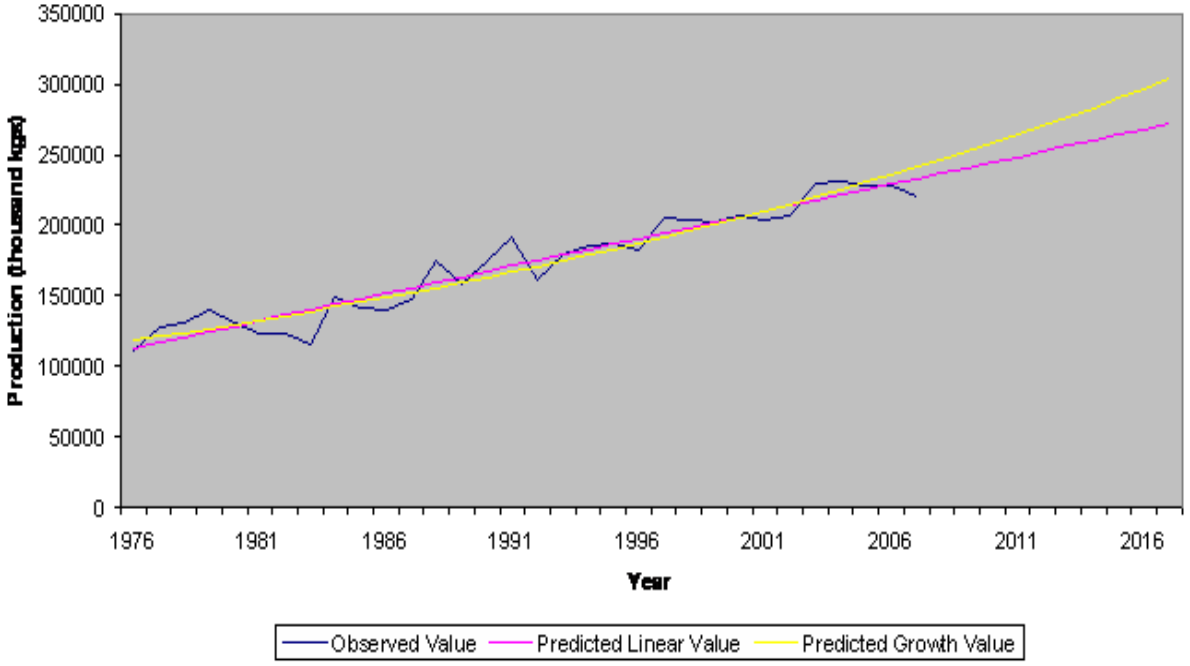


Figure 6c. Observed curve, Predicted Linear curve and Predicted Growth curve for South India Tea production



The following figures offer the tea Yield Rate/per hectare for all India, north India and south India.

Figure 7a. Observed curve, Predicted Linear curve and Predicted Growth curve for All India Tea Yield Rate

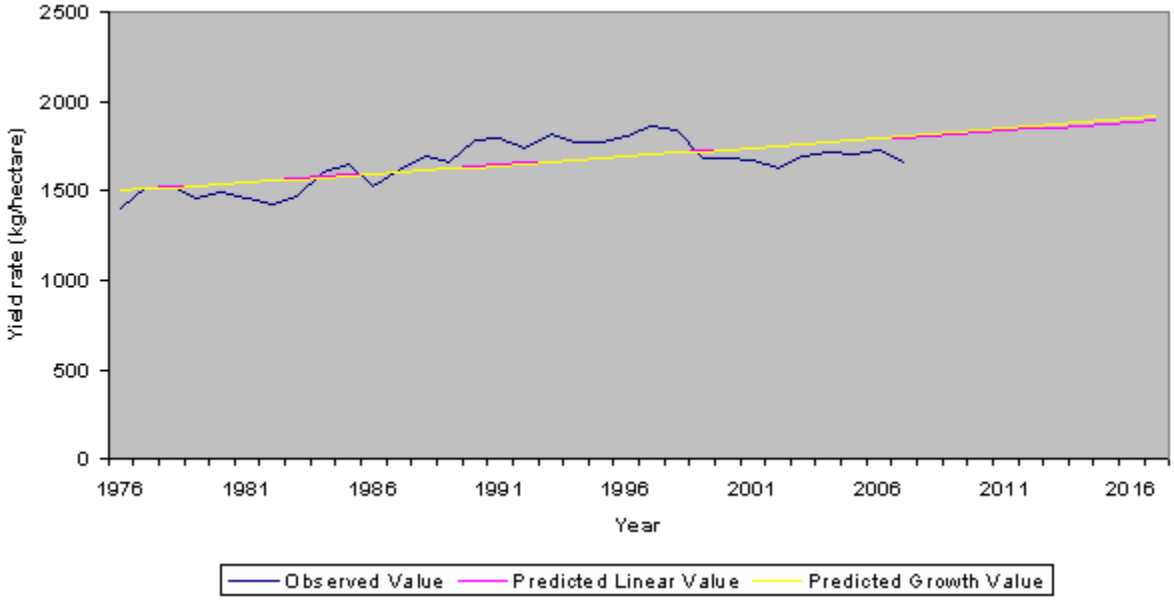


Figure 7b. Observed curve, Predicted Linear curve and Predicted Growth curve for North India Tea Yield Rate

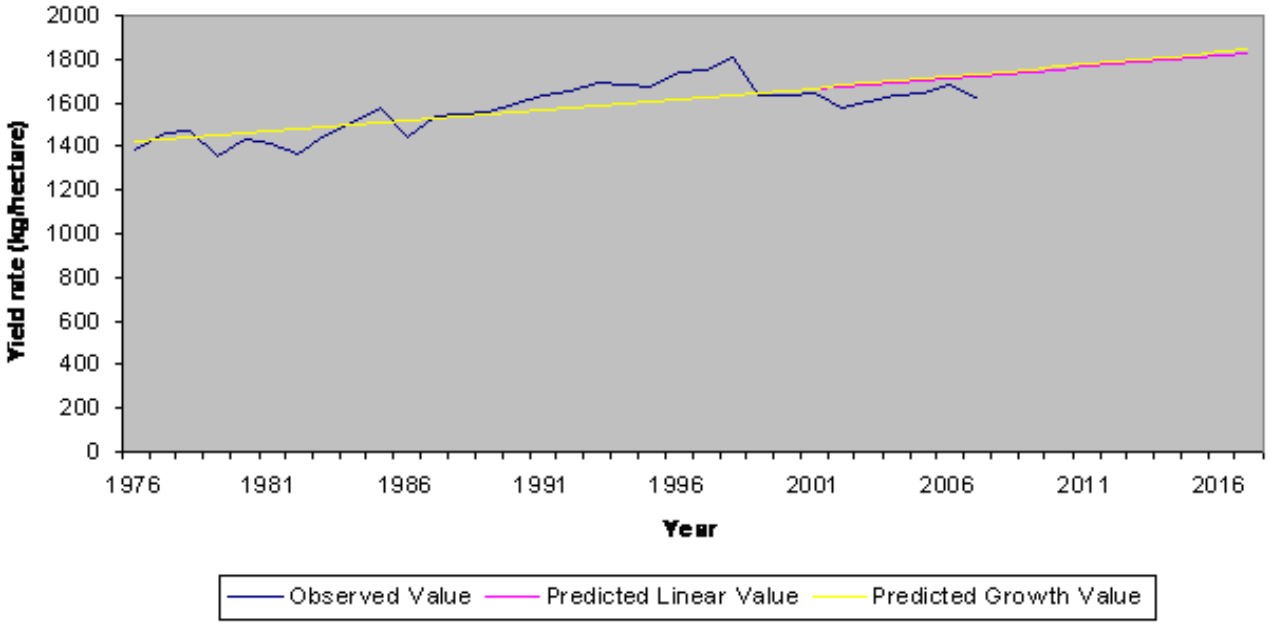
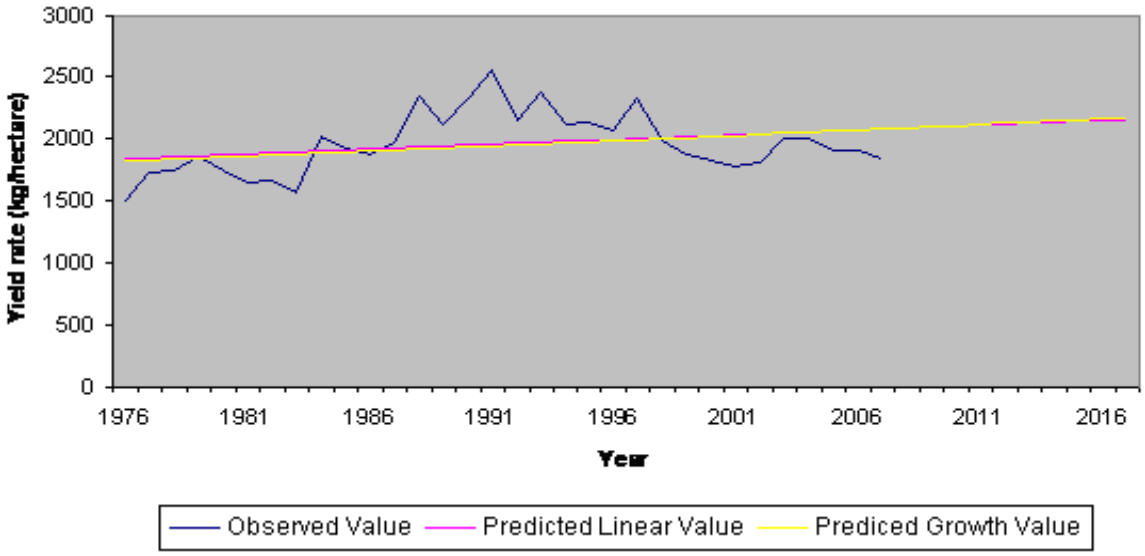


Figure 7c. Observed curve, Predicted Linear curve and Predicted Growth curve for South India Tea Yield Rate



The following figures offer the predicted movements in Auction Prices and Sales for all India and north and south India in that order. Figure 8a shows that given the existing trend the auction sale at the all-India level should reach a total of 500,500 thousand kg by 2017 if the progression is linear. It is expected to reach a total of 600,000 kg by the same period, if the progression follows equation (ii) in section 1.1.2. It is also claimed from the regression results that the 'growth' fit is a better prediction for the observed values.

Figure 8a. Observed curve, Predicted Linear curve and Predicted Growth curve for All India Tea Auction Sale

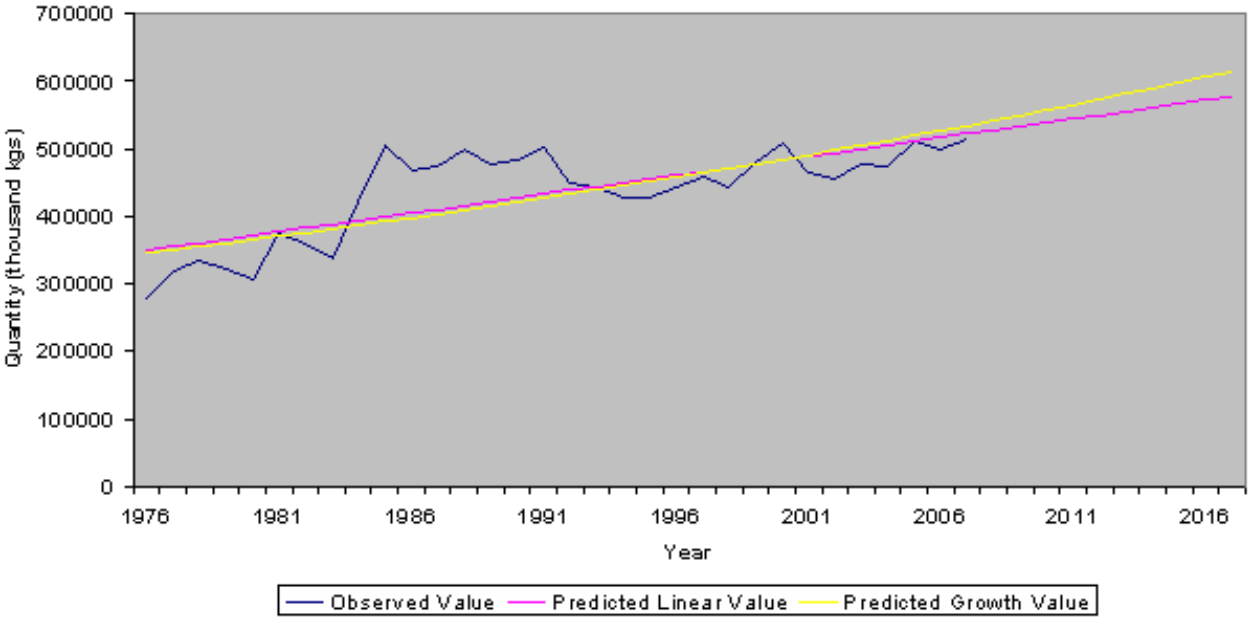
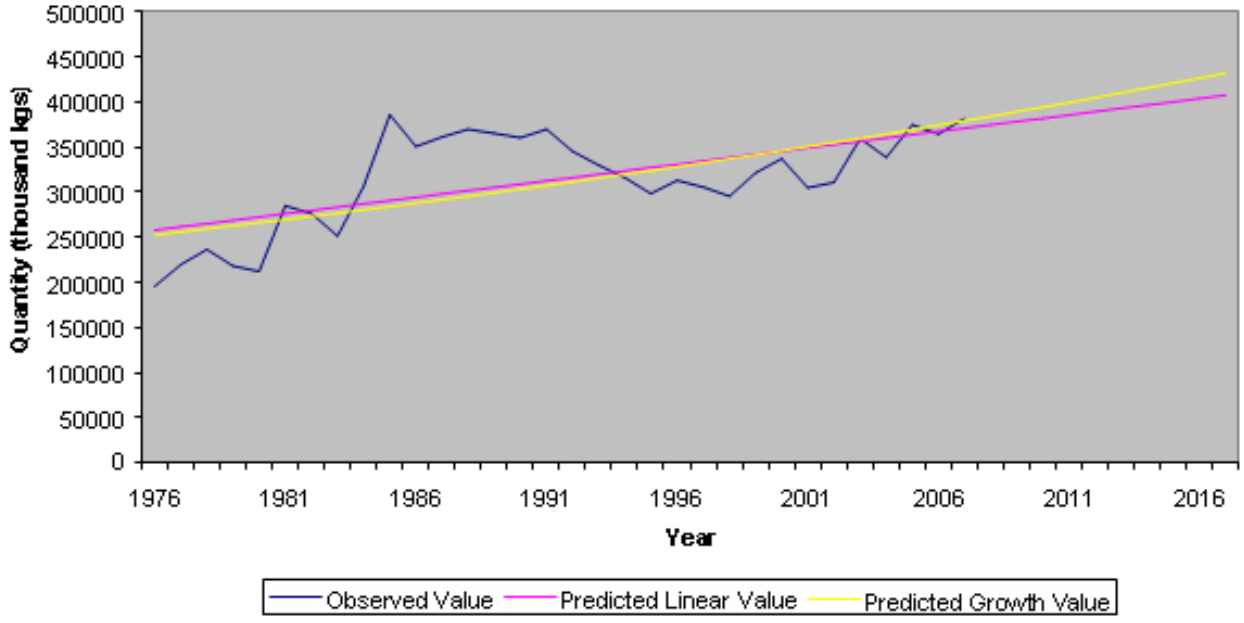
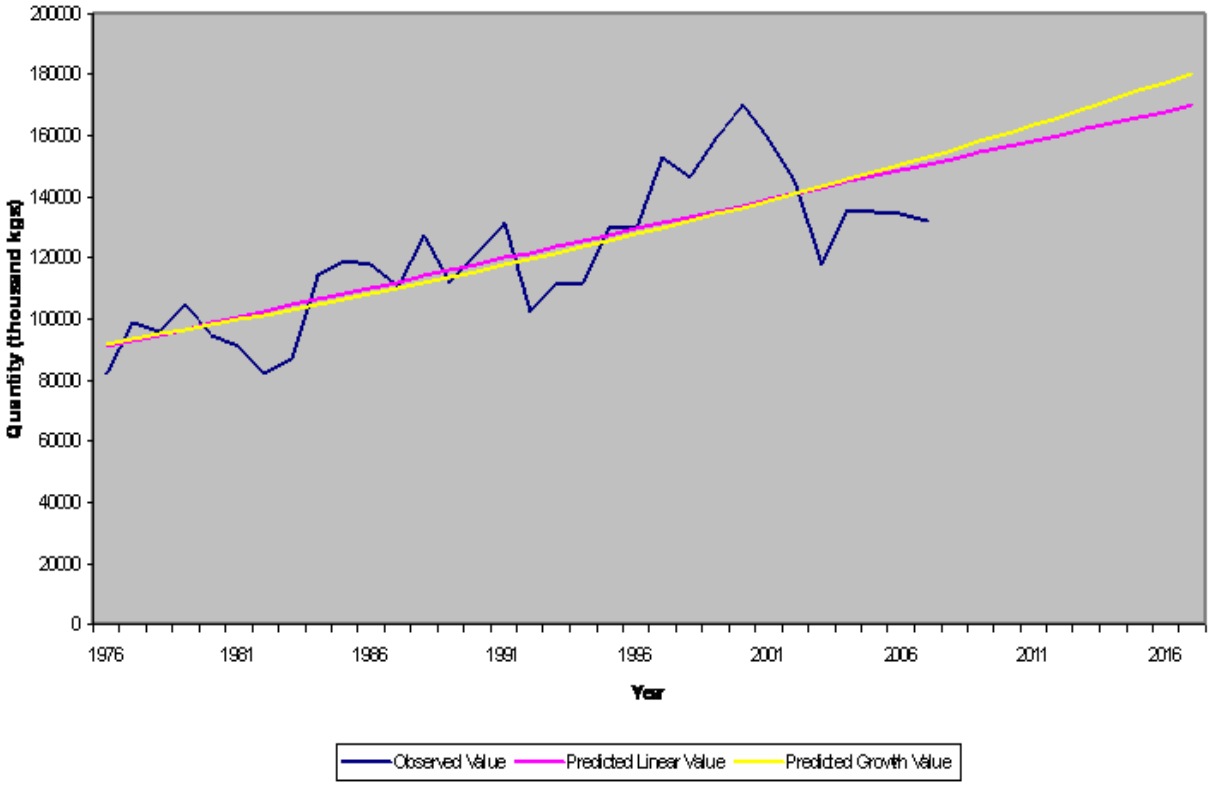


Figure 8b. Observed curve, Predicted Linear curve and Predicted Growth curve for North India Tea Auction Sale



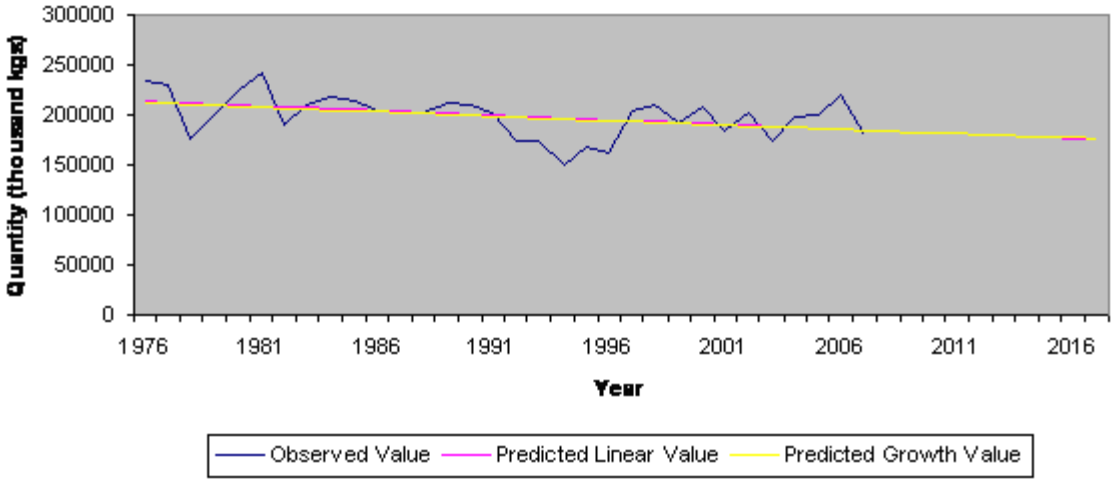
In case of both north-India and south-India, it is observed that the growth fit is a better predictor.

8c. Observed curve, Predicted Linear curve, Predicted Growth curve for South India Tea Auction Sale



Next, we provide evidence and projections on the export of tea from India as a whole, as also from regions within. Here we not only forecast the export quantities, but also the export prices that may prevail in the next decade.

9a. Observed curve, Predicted Linear curve, Predicted Growth curve for All India Tea Export Quantity



It appears that both the linear trend of export and the growth curve follow almost similar paths between the periods under consideration. In fact, both equations predict a slightly decreasing trend in the volume of export over the next ten years. However, once again, we need to reemphasize that the above predictions are based on the historic paths and do not consider future changes. Once possible future shocks are considered, the predictions may adopt different paths. At the same time, it is also clear from our region-specific analysis that the observed and predicted drop in the export performance of Northern tea is countered by the rapidly growing export performance in the South. Although, the current analysis do not offer any evidence in favour of either a change in the taste pattern, or income levels or composition of the countries that are major importers of tea from the North and the South (fall of the USSR is often cited as one major reason for drop in tea exports, vis-à-vis growth in tea bag exports that largely use CTC type tea), yet the present global economic scenario indicates that the projected patterns might be close reflections of the true conditions.

9b. Observed curve, Predicted Linear curve, Predicted Growth curve for North India Tea Export Quantity

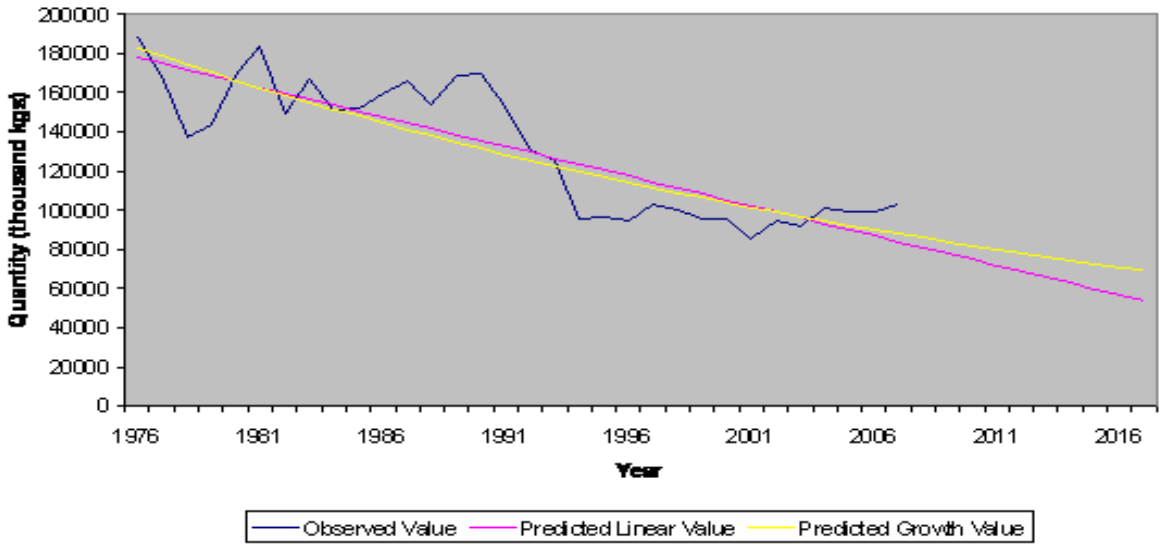
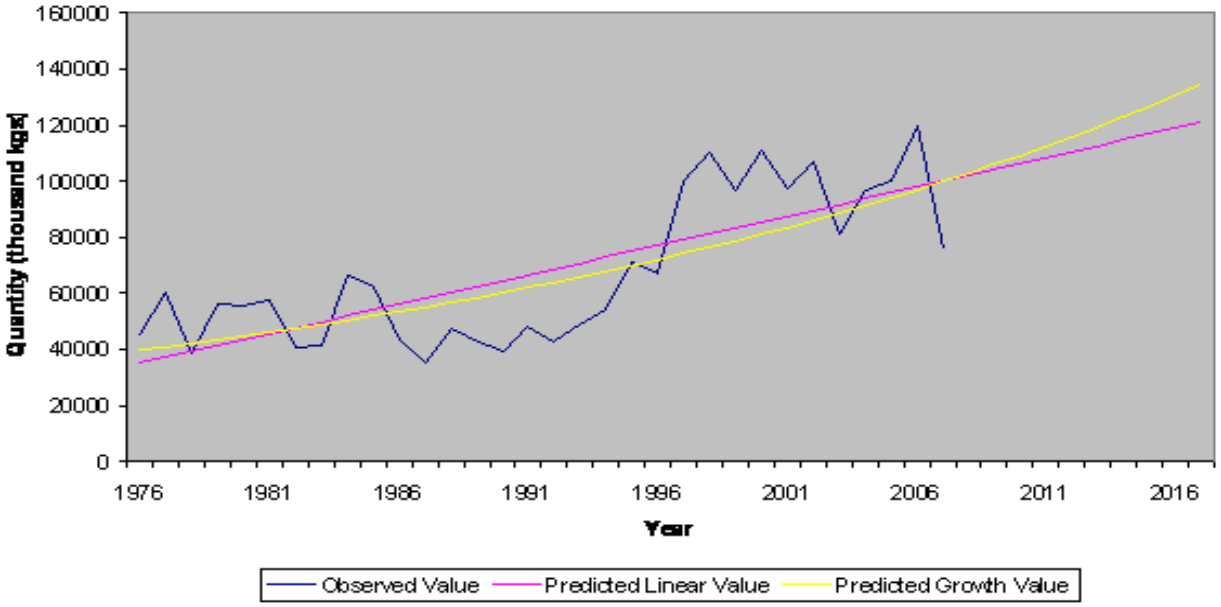


Figure 9c. Observed curve, Predicted Linear curve, Predicted Growth Curve for South India Tea Export Quantity

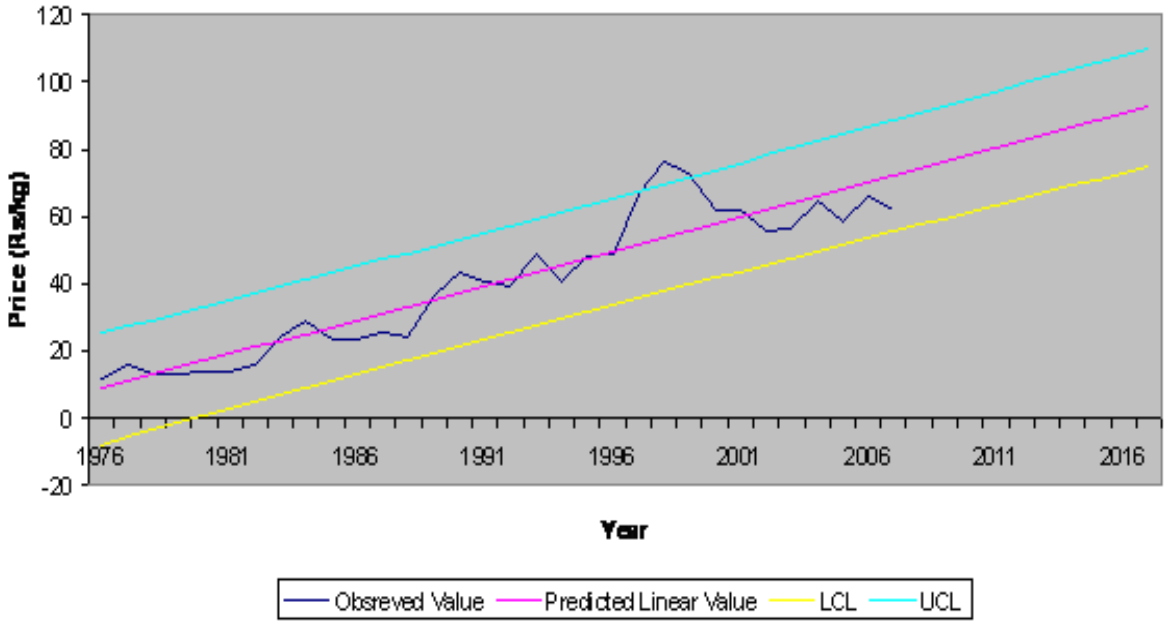


The export patterns in the north and the south are presented below in figures 9a and 9b respectively. It should further be noted that for north India, the growth curve is a better fit compared to south India, where the linear prediction offers a better fit. On the whole, for all-India tea export, the linear prediction offers a more accurate reflection on what the export quantity might be by 2017.

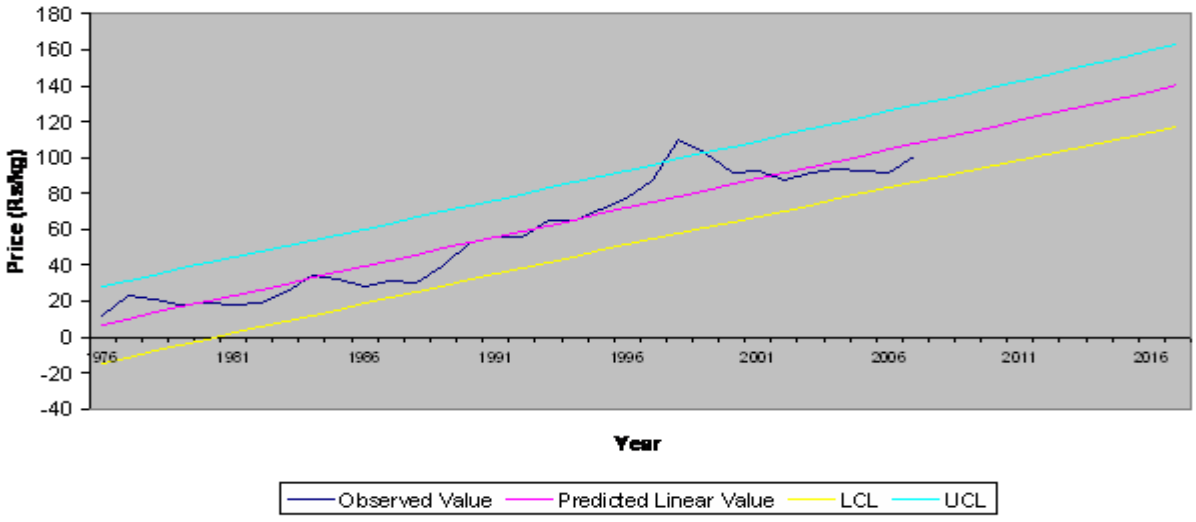
Export to auction price ratio

At the outset we now provide the upper and lower confidence intervals within which the auction price exists during the period under consideration as well over the period of forecast. We observe here that the equation (ii) of section 1.1.2 offers a better fit for the predicted values of the auction price in India. In fact, it is seen that during 1999, the auction price moves outside the predicted confidence interval.

10a. Observed curve, Predicted Linear curve with upper and lower confidence level of predicted linear value for All India Tea Auction Price



10b. Observed curve, Predicted Linear curve with upper and lower confidence level of predicted linear value for All India Tea Export Price



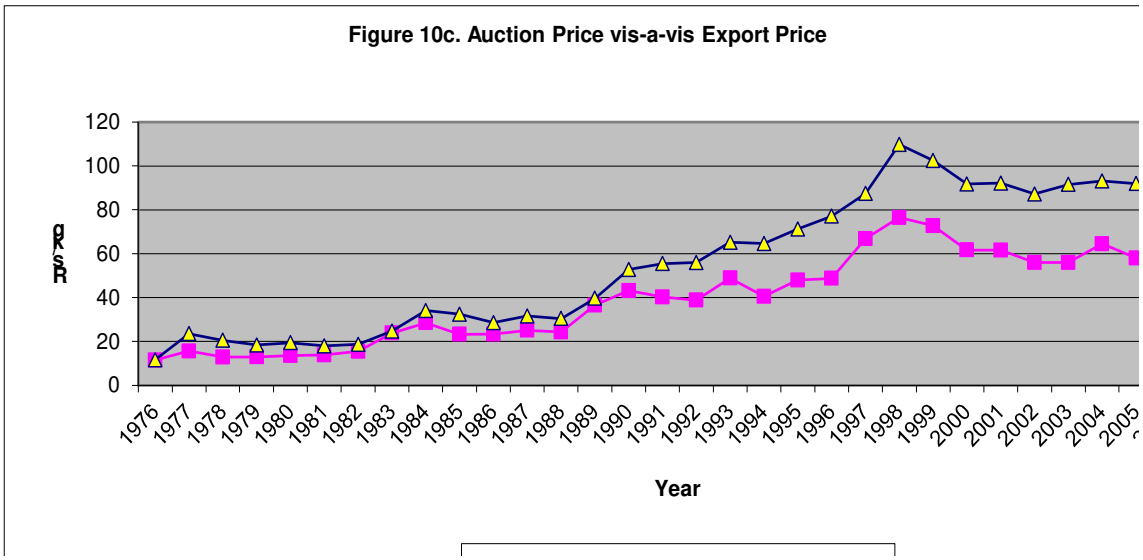
Given that the linear trend is a better fit statistically, let us finally offer (figure 10b) the upper and lower confidence intervals within which the observed path exists. Albeit, the path lies within the confidence intervals, and therefore implies a stable movement, around 1998 the export price displays an upward shock.

There is also a clear correspondence between the export price and the auction price as seen from figure 10c below. The correlation between the two variables is available in table 1, where the coefficient is both high (0.98) and significant at 99 % confidence level.

Table 1. Correlation Coefficient between Export Price and Auction Price

		Auction Price	Export Price
Auction Price	Pearson Correlation	1.000	.984**
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	13121.280	20086.752
	Covariance	423.267	647.960
	N	32	32
Export Price	Pearson Correlation	.984**	1.000
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	20086.752	31772.333
	Covariance	647.960	1024.914
	N	32	32

**. Correlation is significant at the 0.01 level (2-tailed).



Following figures 10d-f display the trend lines and the fluctuations in export price to domestic auction price ratio for tea at the all-India level, for north India and south India together as

well as in isolated graphs for trends and fluctuations. It appeared from the figures that such ratio for all-India and south India follow a flat trend at around 5 % growth annually all through the last decade while for north India it is over 7 % since 2003.

Figure 10d

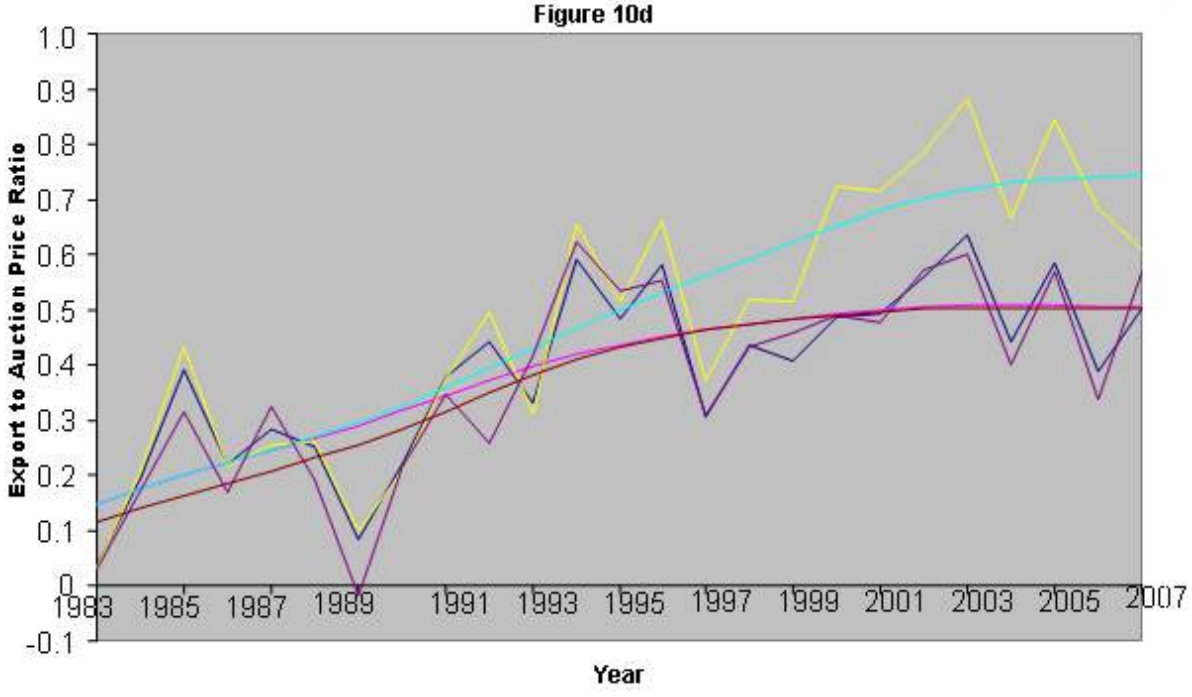
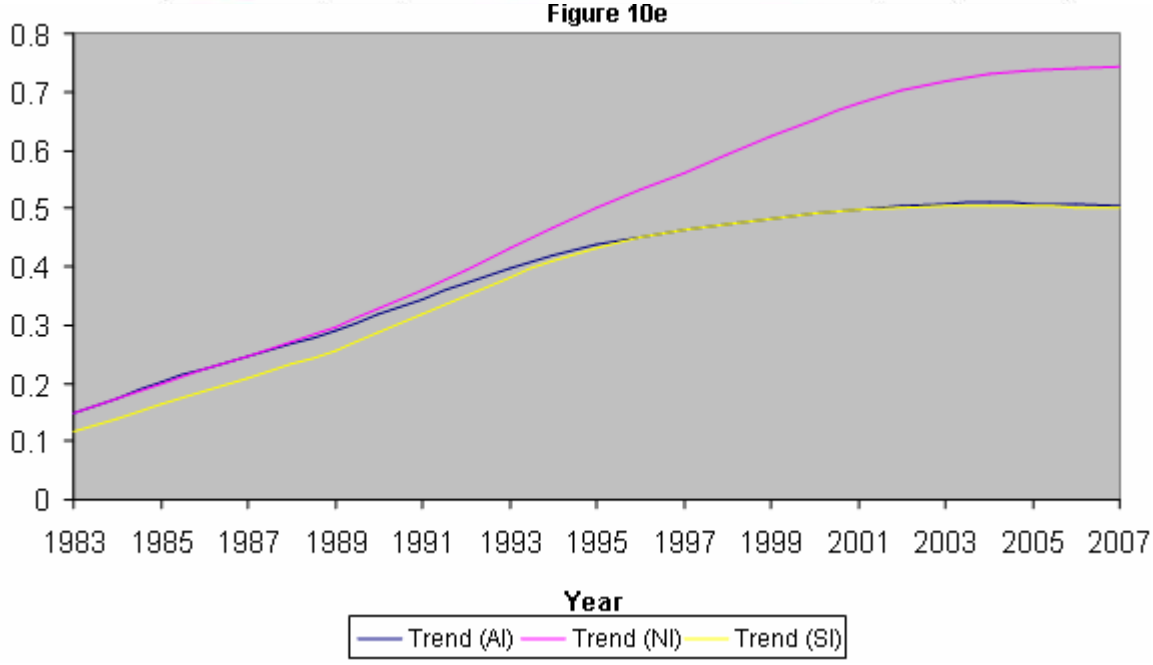
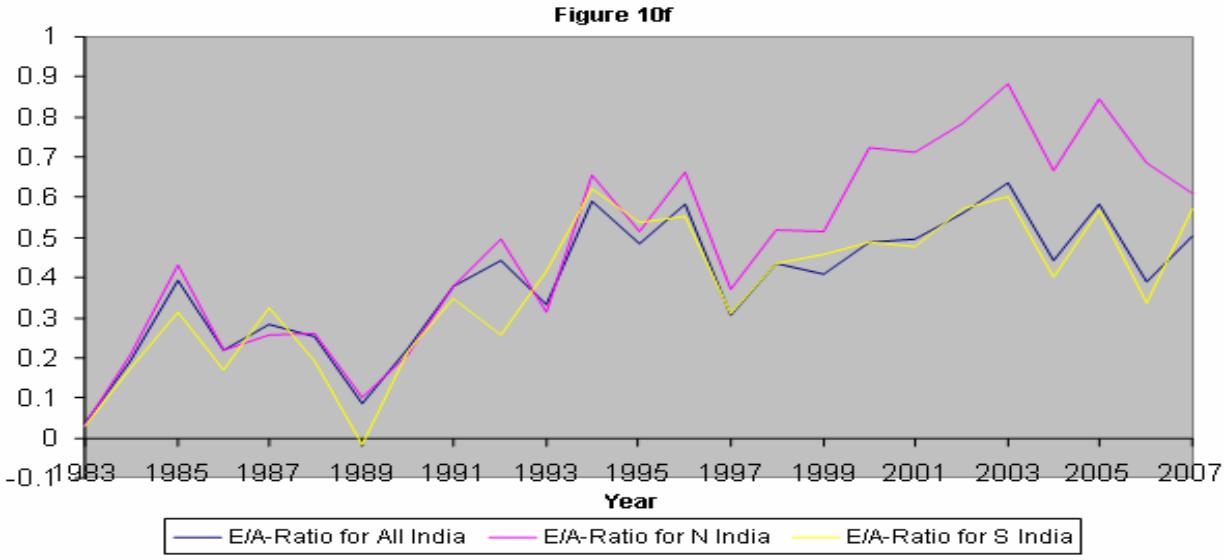


Figure 10e



Annual fluctuations of export to auction price ratio follows more or less same cyclical movements up to year 2000 with an observed disparity in 1992. But during the last decade the gap

between north and south India widens all the way till 2006. After that it converges at around 6 % level.



Price-quantity behaviour of CTC and orthodox tea

The study now turns to focus on the price-quantity behaviour of different grades of tea, namely, CTC and Orthodox tea at domestic level. As argued, our aim here is to predict the behaviour of the said variables, given their observed behaviour during last twenty five years.

Output of CTC and orthodox

North India

The observed pattern for north India is that there is a sharp increase in the quantity of CTC output while the Orthodox output decreases over time. Although our predictions are good fitted with the data, the best fitted predicted curves give us the estimates that CTC output to be increased at the level virtually 800000 thousand kg and the Orthodox to be declined at around 20000 thousand kg respectively by 2015.

Figure 11a: Observed curve, predicted linear curve, and predicted growth curve of CTC output in North India

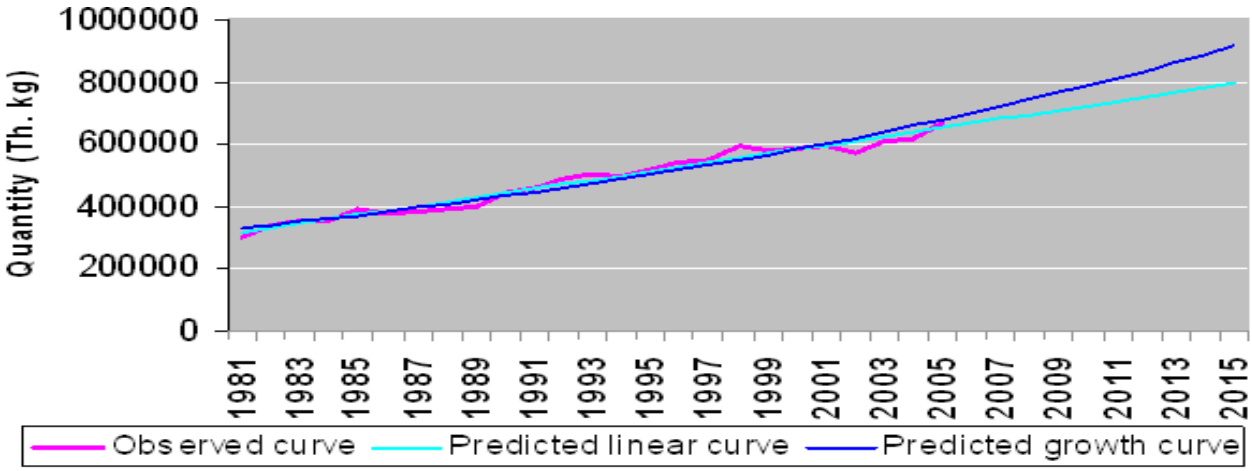
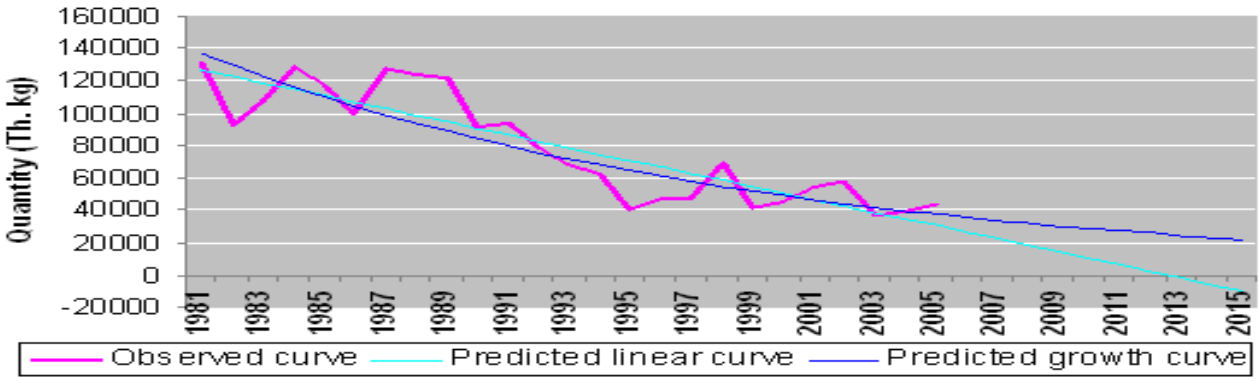


Figure 11b: Observed curve, predicted linear curve, and predicted growth curve of Orthodox output in North India



South India

South India follows the same pattern in terms of CTC and Orthodox tea output as we observe for north India. Our estimate from forecasting shows that the CTC to be about 250000 thousand kg but the Orthodox output to be decreased at the range between 25000 to 19000 thousand kg by 2015.

Figure 12a: Observed curve, predicted linear curve, and predicted growth curve of CTC output in South India

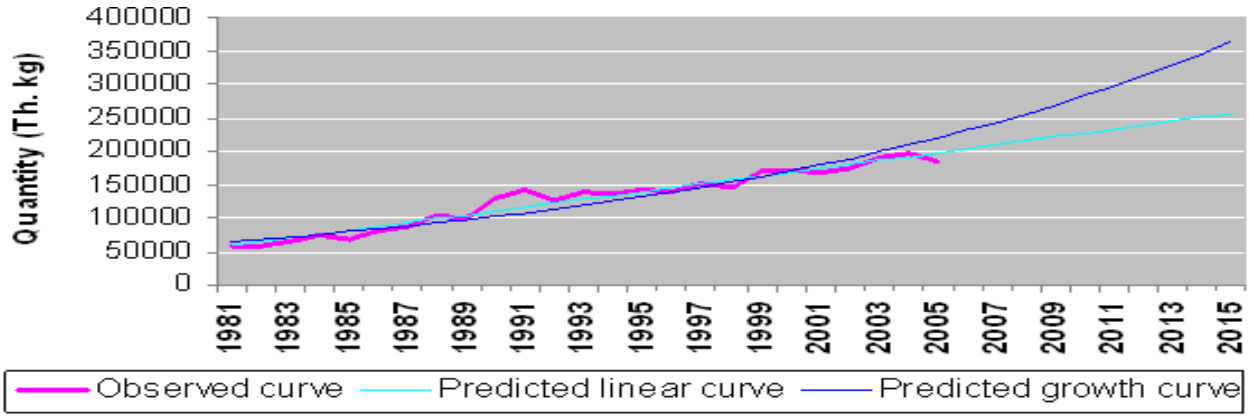
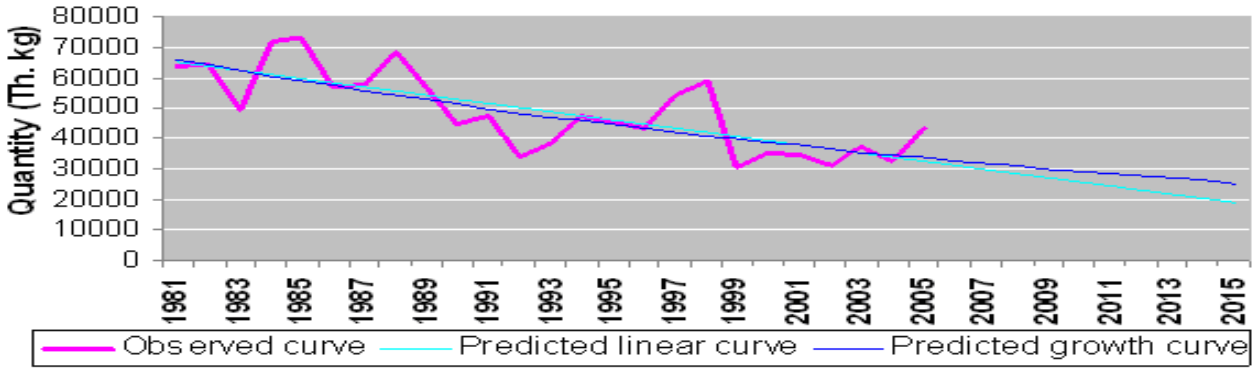


Figure 12b: Observed curve, predicted linear curve, and predicted growth curve of Orthodox output in South India



All India

As expected, the CTC output of Indian tea is smoothly rising while the same for Orthodox output is rigorously falling over the period. Our prediction reveals that the CTC output to be around 1050000 thousand kg and Orthodox output about 50000 thousand kg by 2015.

Figure 13a: Observed curve, predicted linear curve, and predicted growth curve of CTC output in All India

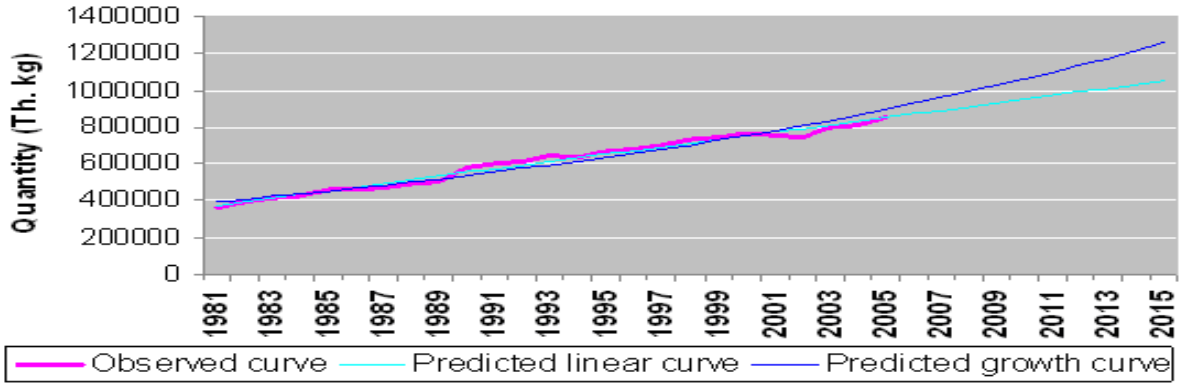
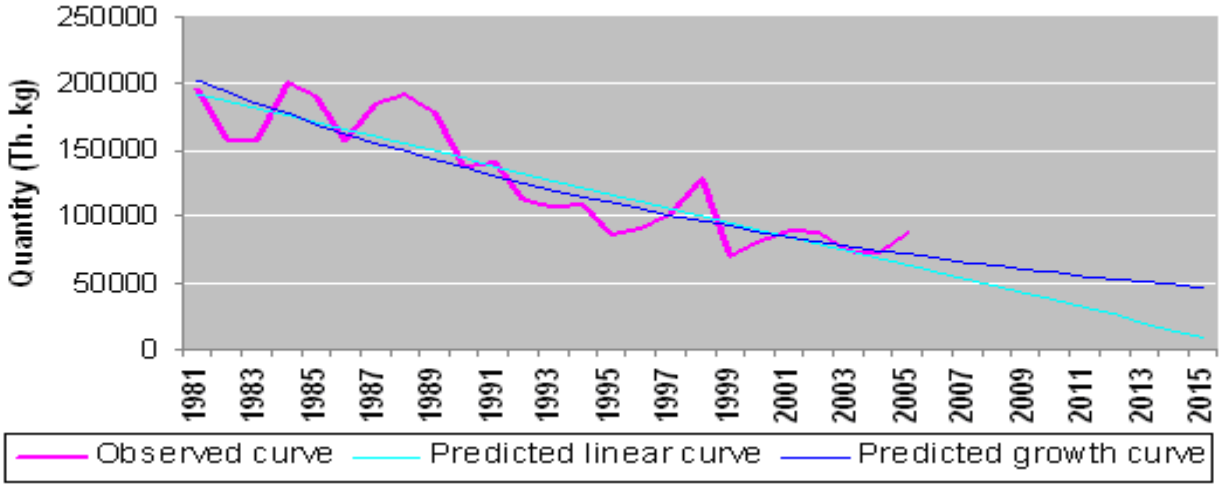


Figure 13b: Observed curve, predicted linear curve, and predicted growth curve of Orthodox output in All India



Price of CTC and Orthodox

North India

We observed that the price trends for both CTC and Orthodox tea not only follow same patterns over the period, but also faces similar projected growth trajectories up to 2015. This prediction is unambiguous and it shows that as per the best fit growth curves the range of price for CTC and Orthodox are expected to be around Rs. 168 and Rs. 215 per kg, respectively, in 2015.

Figure 14a: Observed curve, predicted linear curve, and predicted growth curve of CTC price in North India

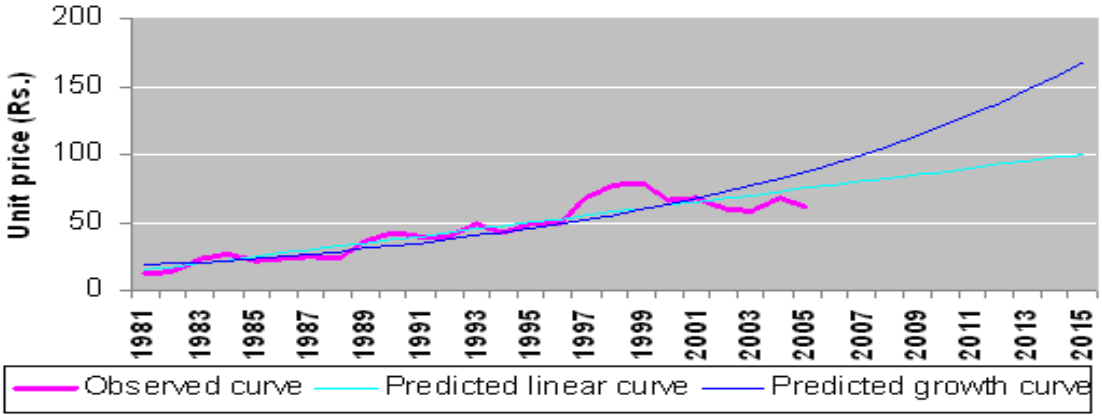
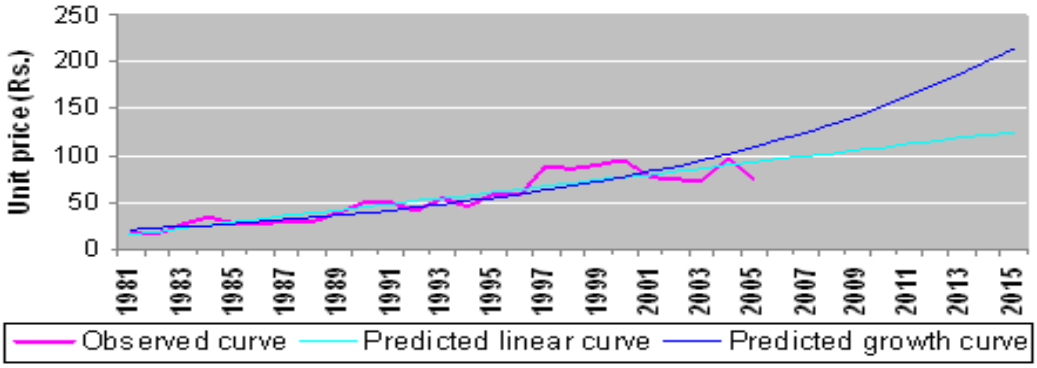


Figure14b. Observed curve, predicted linear curve and predicted growth curve of Orthodox price in North India



South India

There is hardly any observed difference in the behaviour of price between CTC and Orthodox tea; and it does not show perceptible difference through predictions. There is only a difference between CTC and Orthodox which relates to the value of range of price between predicted linear and growth curve for these two grades of tea. The price range lies between Rs. 70-90 for CTC and between Rs. 80-100 for Orthodox by 2015.

Figure15a. Observed curve, predicted linear curve and predicted growth curve of CTC price in South India

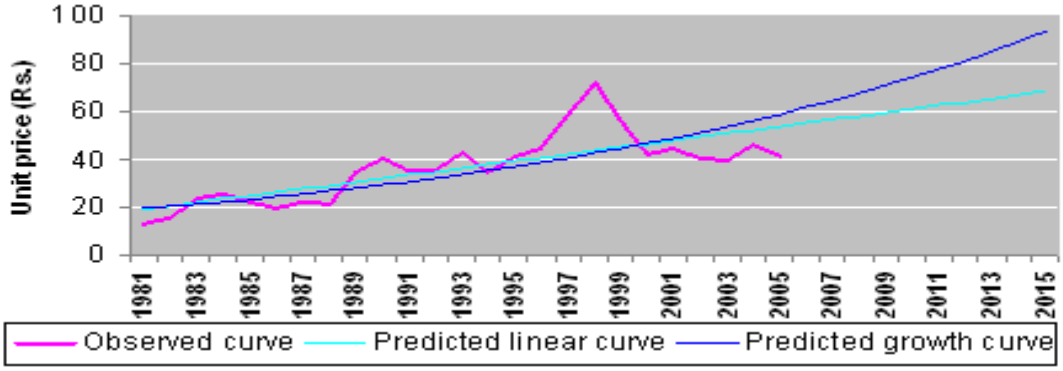
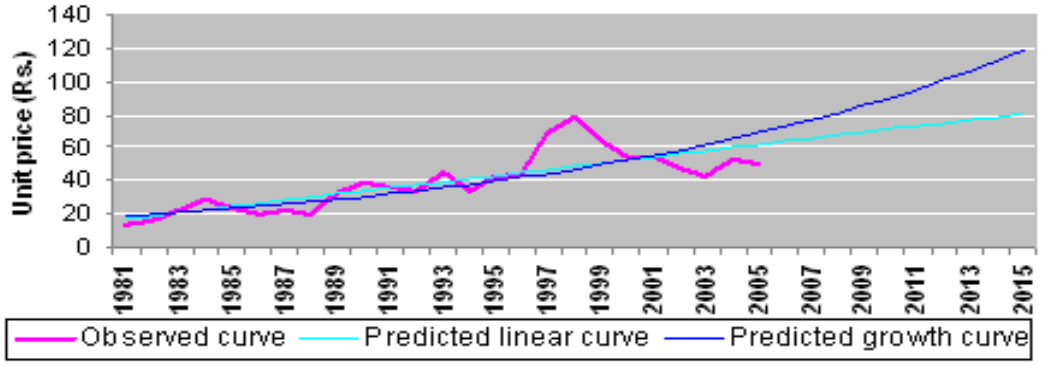


Figure15b. Observed curve, predicted linear curve and predicted growth curve of Orthodox price in South India



All India

As the price behaviours in north and south are more or less same, as expected, the all India figure also follows the same pattern of behaviour. At all India level the CTC price will be vary between Rs. 92-146 and Orthodox price between Rs. 100-160 by 2015.

Figure16a. Observed curve, predicted linear curve and predicted growth curve of CTC price in All India

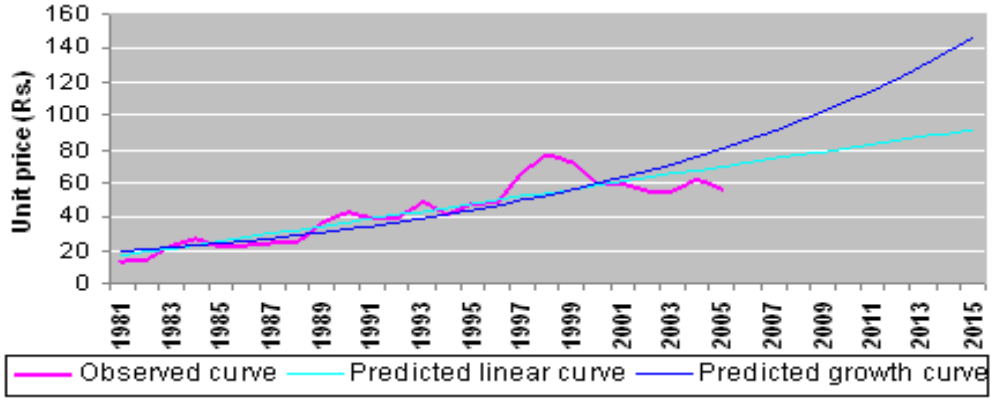
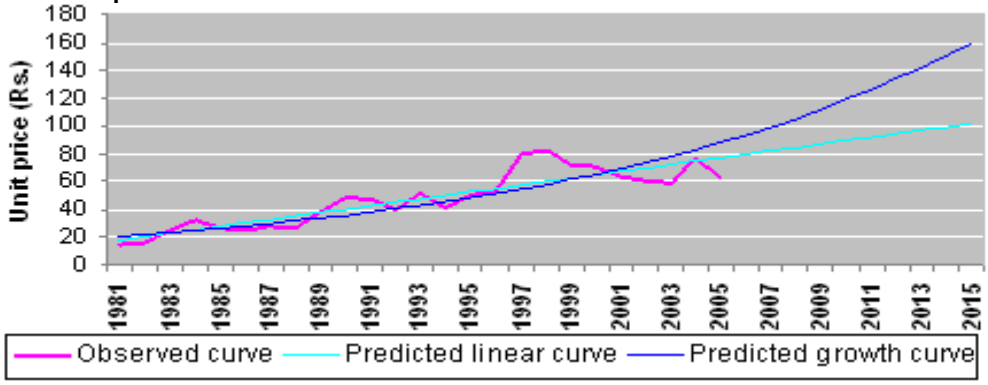


Figure16b. Observed curve, predicted linear curve and predicted growth curve of Orthodox price in All India



Multivariate regression analysis

A Technical Note

The following table (1.2a) depicts the results obtained from the regression model specified in equation 1 earlier and table 1.2b provides the basic properties of residuals obtained from estimating the time series model. Before we interpret the regression results of table 1.2a, it is essential to deal with the estimated residuals of regression model. If the residuals, particularly for time series data, do not follow the desirable properties the regression result itself may be deemed spurious. For the time series regression models it is essential that each of the series has to be stationary in the same order of integration. A usual way to deal with the problem of stationarity is to test the unit roots of estimated residuals. In the literature it is well-known as the test of Cointegration (see table 1.2b). The estimated test statistic (theoretically known as tau statistic) for both the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) models tells us that there is no unit root at the 95 percent confidence level. Therefore, we can say that a long-run regression is feasible and shall bring out the effects of explanatory variables in a meaningful way. Our basic regression is best fitted (R^2=0.81) and the observed and estimated values move in the same way (figure 17a). Consequently, the residuals follow the desirable normal distribution (figure 17b).

Figure 17a. Actual and fitted values of the growth of tea output

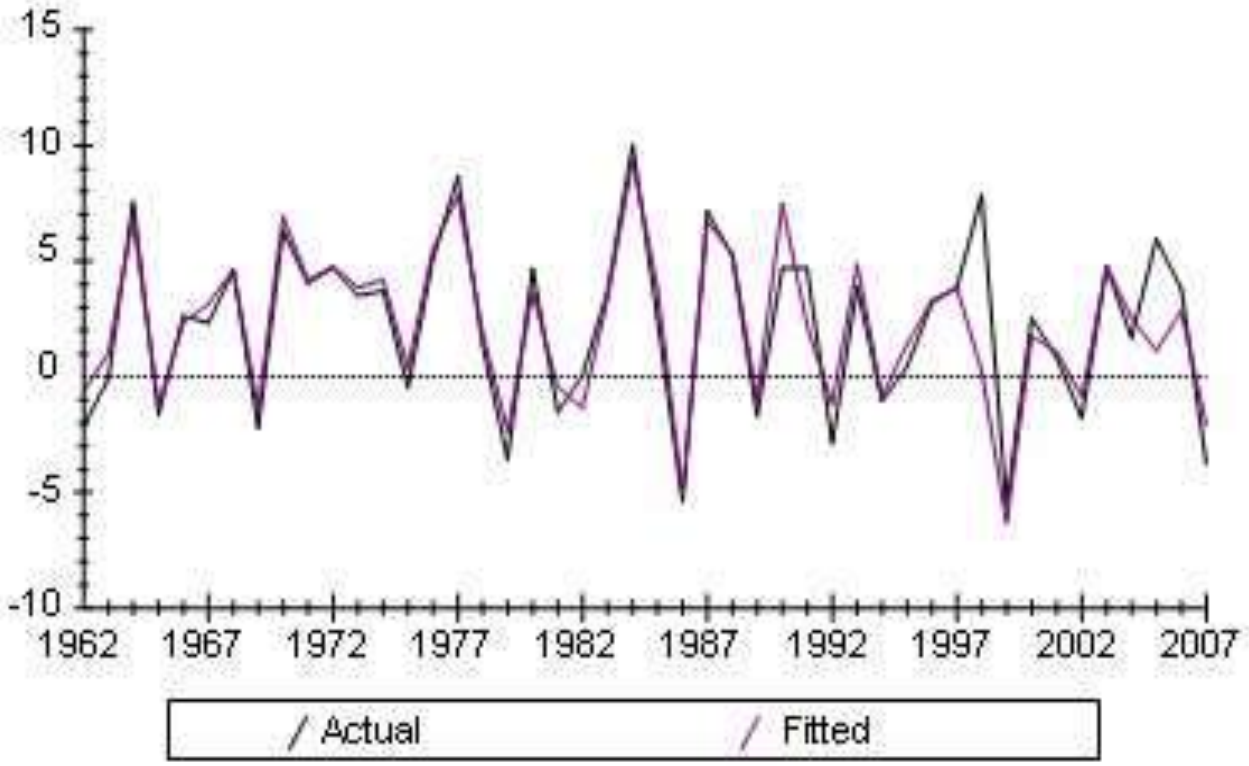
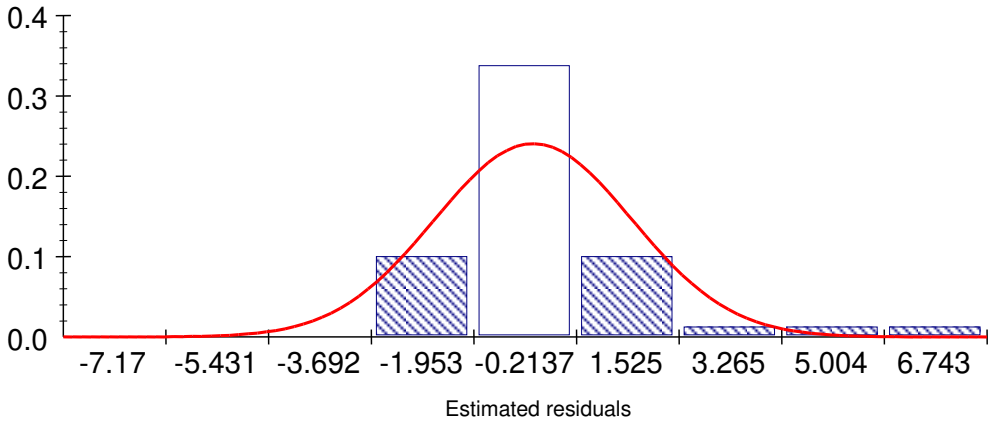


Figure 17b. Histogram of residuals and the normal density



We now turn to our basic regression results as depicts in the table 2a. It seems to be clear from the table that the growth of output of tea is hardly depends on the external factors like export, domestic demand as well as price. All the demand side variables have very insignificant effect on the tea supply. The growth of tea supply is significantly affected by the growth of yield rate, the physical factor. Our regression shows that there is a positive relationship between output and yield such that about 87 per cent change of output growth of tea is caused by the change of yield.

Table 1.2a: Ordinary least squares estimation

Dependent variable is: Growth of output of tea (GTO) 46 observations used for estimation from the year 1962 to 2007					
Explanatory variable		Coefficient	Standard error	T-ratio	[Probability]
•Intercept term	A	1.515	0.491	3.084	[.004]
•Growth of tea yield	GTY	0.871	0.071	12.305	[.000]
• Growth of tea export	GRX	0.013	0.023	0.456	[.651]
• Growth of domestic demand	GRD	-0.024	0.110	-2.18	[.828]
• Growth of auction price	GAP	-0.017	0.018	-0.929	[.358]

R-Squared	.806	Residual Sum of Squares	123.698
S.E. of Regression	1.74	F-stat. F(10, 24)	42.582 [.000]
Mean of Dependent Variable	2.222	S.D. of Dependent Variable	3.764
Akaike Info. Criterion	-93.023	Equation Log-likelihood	-88.023
DW-statistic	2.011	Schwarz Bayesian Criterion	-97.594

Table 1.2b: Unit root test for residuals

Based on the ordinary least squares regression in table 2a 35 observations used for estimation from the year 1971 to 2005					
Test Type	Test Statistic	Maximized Log-likelihood	Akaike Information Criterion	Schwarz Bayesian Criterion	Hannan-Quinn Criterion
Dickey Fuller	-6.788	-88.510	-85.510	-86.402	-85.841
Augmented Dickey Fuller (1)	-4.752	-84.509	-86.509	-88.294	-87.171
95% critical value for the Dickey Fuller statistic =		-4.739			

2.1.3 International level

At the outset, we give light on the relative performance of major tea producing countries with respect to world production and export of tea vis-à-vis India. Subsequently, we offer a comprehensive analysis of the import demand across various regions of the world and selected countries, and the actual sales of Indian tea in such places. This sort of worldwide supply-demand comparison derived from the prediction through observed behaviour of the selected variables would essentially enable us to determine Indian relative performance in international tea market. The section concludes by mapping the effect of market demand in different regions of the world on Indian export performance via time series regression model.

Supply side analysis

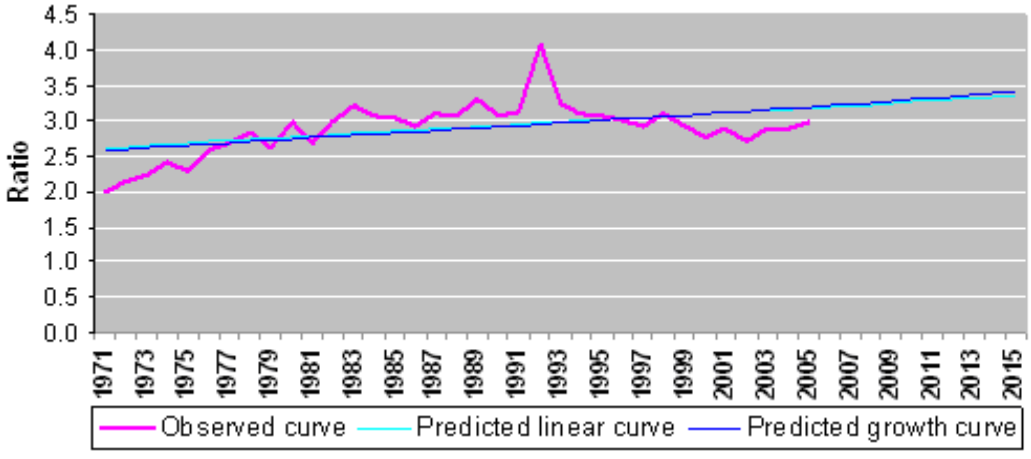
This section offers evidence on the performance of India vis-à-vis other tea producing countries like Sri Lanka, Bangladesh, Kenya, Indonesia, Malawi and China with respect to (i) tea output, (ii) tea export and (iii) unit export price as observed between 1971 and 2005. Here, we provide a comparative analysis of the performance of different tea producing countries vis-à-vis India. We estimate ratios of the said variables like share in world export and production, and export price etc. The ratio is defined as the value of the variable under consideration for India to each of the other country. Our aim is to observe the variations in this ratio and forecast it for the next 10 years. This should help to predict the performance of Indian tea as compared to other countries. It should be instructive to note that if the value of the ratio is greater than one, India's position is better than that of the reference country and increase in the ratio makes the situation even better for India.

Relative production share

Sri Lanka

The following figure (18a) shows that the observed ratio between India and Sri Lanka is not only greater than one but also rising over time. Although the predictions are not free from ambiguity, the predicted linear curve and growth curve coincide throughout the period. It is expected that the ratio might reach the value of 3.4 by 2015.

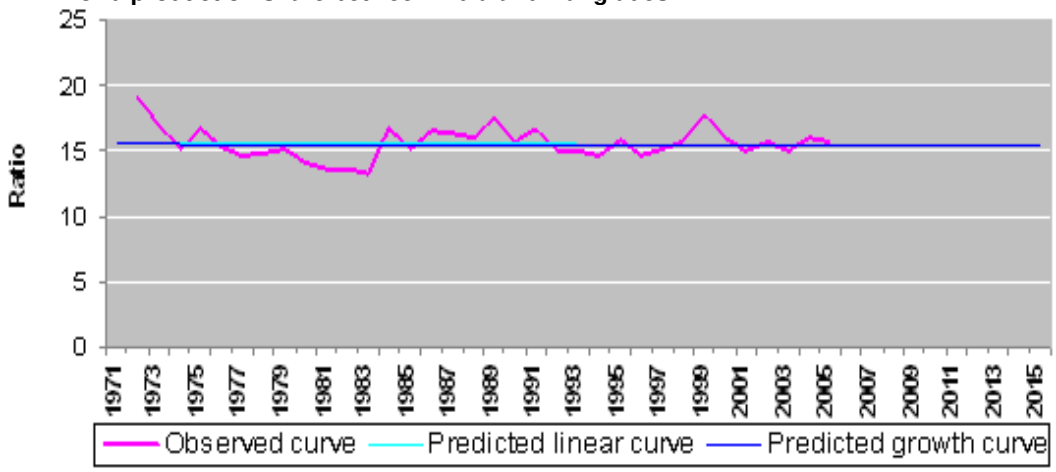
Figure 18a. Observed curve, predicted linear curve and predicted growth curve of ratio of world production share between India and Sri Lanka



Bangladesh

Indian share in world production is almost 15 times better than that of Bangladesh and it should continue in future. Since the size of land under tea production widely differs among the two countries, it is quite expected.

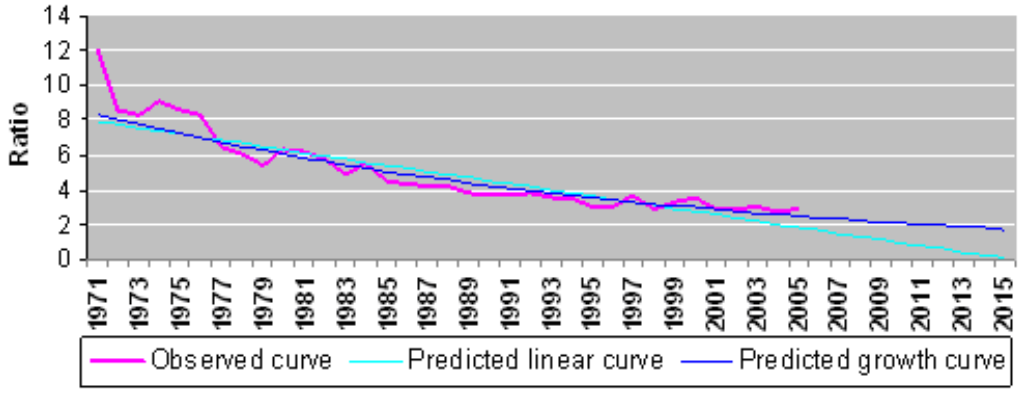
Figure 18b. Observed curve, predicted linear curve and predicted growth curve of ratio of world production share between India and Bangladesh



Kenya

There is a considerable progress made by Kenya over the period. The ratio decreased steadily and reached to around 2.5 in 2005 from 12 in 1971. As well the predictions are very good fitted. The forecasted value of the ratio as per the relatively best fit growth curve is below 2 by 2015.

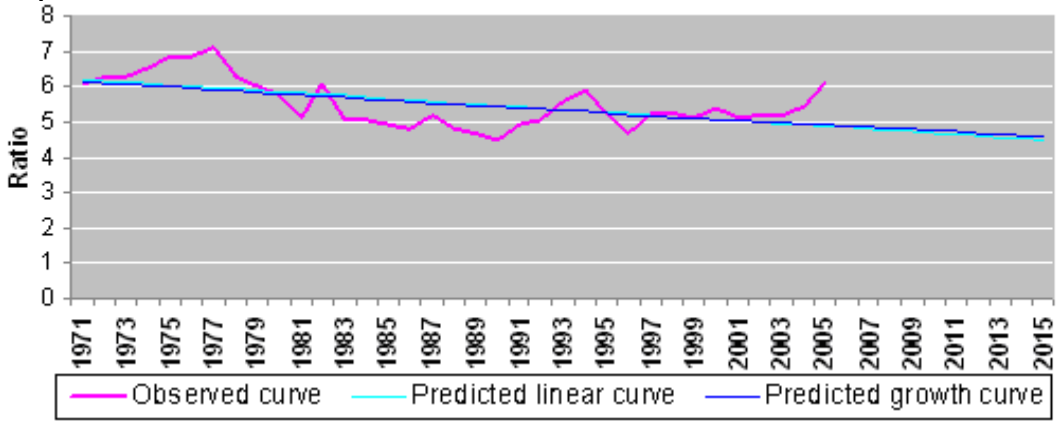
Figure 18c. Observed curve, predicted linear curve and predicted growth curve of ratio of world production share between India and Kenya



Indonesia

Like Kenya, Indonesia also made some progress although at a slower pace. Interestingly, with some moderate cyclical fluctuations between the observed period, the ratio is about 6 both in 1971 and in 2005. Although the predictions do not conform the goodness of fit, the ratio is expected to be around 2.6 by 2015.

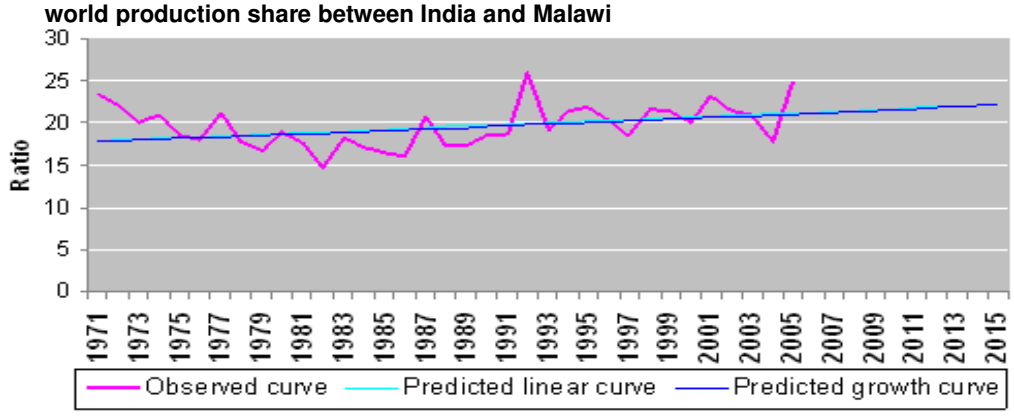
Figure 18d. Observed curve, predicted linear curve and predicted growth curve of ratio of world production share between India and Indonesia



Malawi

With respect to Malawi the ratio is consistently around 20 and sometimes reaches 25. The predicted ratio is larger than 20 in 2015.

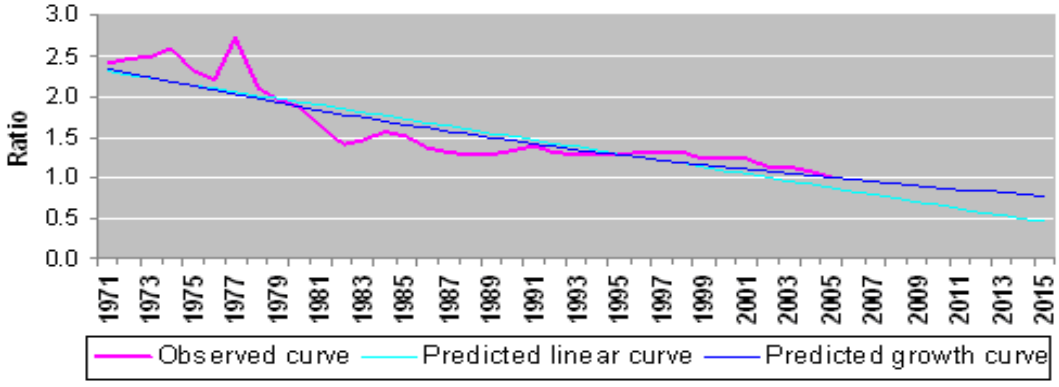
Figure 18e. Observed curve, predicted linear curve and predicted growth curve of ratio of world production share between India and Malawi



China

Initially India was in a better position compared to China but over the period India lost her superiority in the tea business. By the end of 2005 the ratio goes below 1. India's position might slide further in future since the predicted ratio stands between 0.5 and 0.8 by 2015 as per the linear and growth estimates, respectively.

Figure 18f. Observed curve, predicted linear curve and predicted growth curve of ratio of world production share between India and China

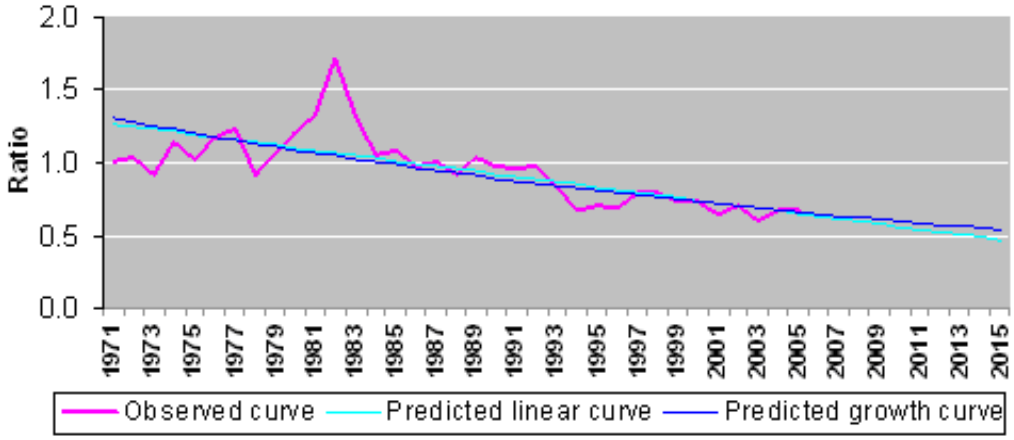


Share in world export

Sri Lanka

Compared to India, as Sri Lanka's export to total output increased over time it lowered the value of ratio during the period and may be at 0.5 by 2015.

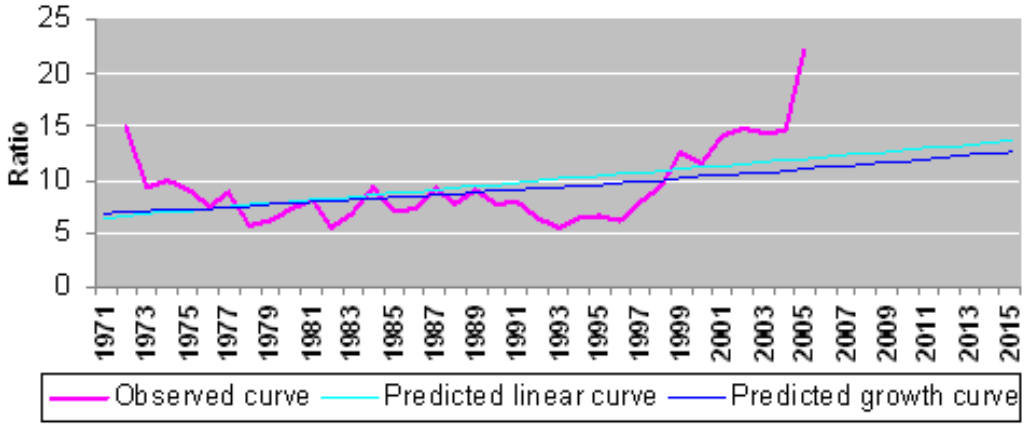
Figure 19a. Observed curve, predicted linear curve and predicted growth curve of ratio of world export share between India and Sri Lanka



Bangladesh

The prediction shows that the value of the ratio will be around 13 by 2015.

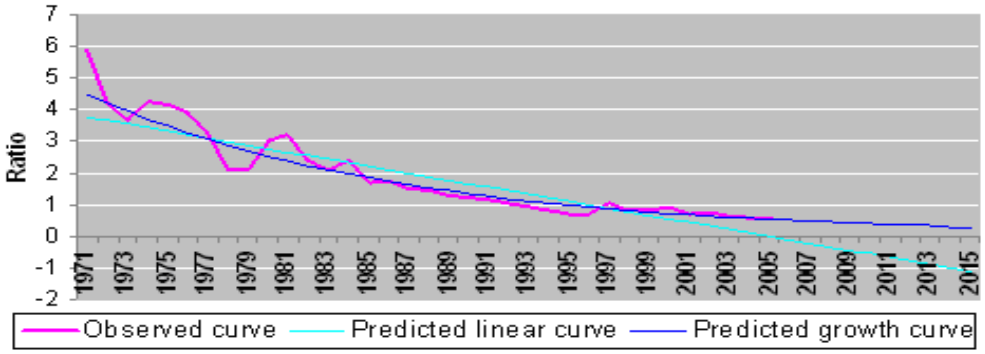
Figure 19b. Observed curve, predicted linear curve and predicted growth curve of ratio of world export share between India and Bangladesh



Kenya

Kenya made considerable progress in her export performance compared to India over the period. Predictions are also good fit with the data. And as per the best fit predicted growth curve the ratio will approach asymptotically to zero.

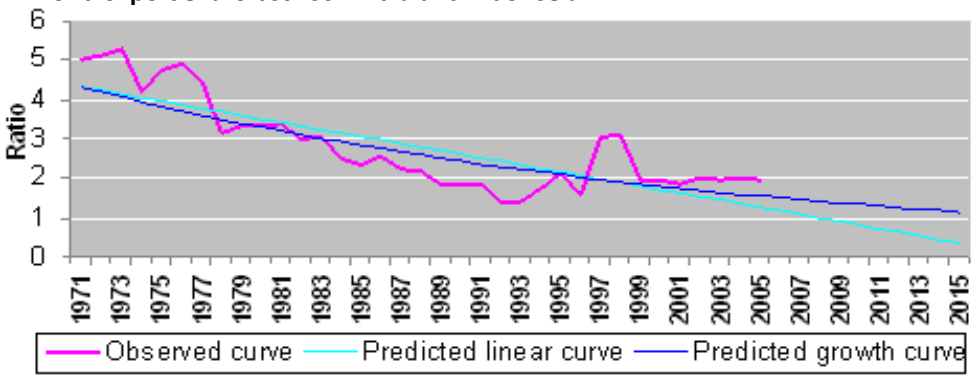
Figure 19c. Observed curve, predicted linear curve and predicted growth curve of ratio of world export share between India and Kenya



Indonesia

As argued above, Indonesia follows the same pattern like Kenya compared to India. But unlike Kenya, Indonesia is not overcoming the performance of India since the ratio is not only above 1 at the end of 2005, it will be still above by 2015 as per the best fitted growth curve.

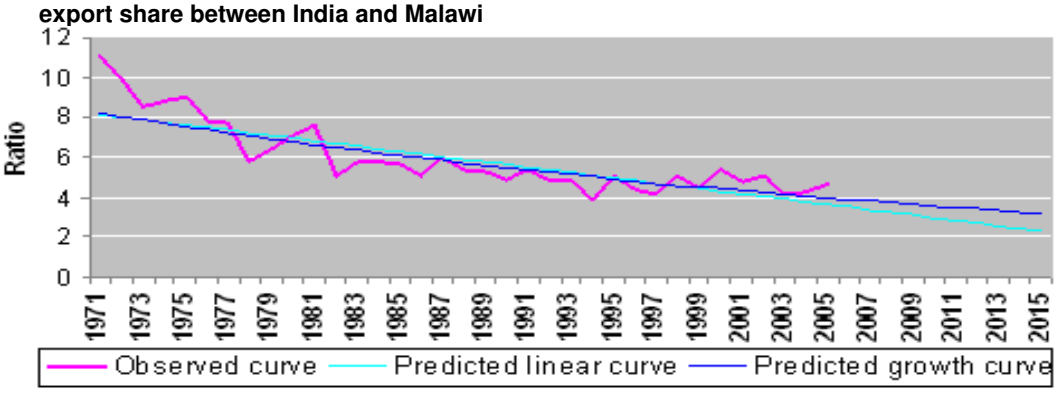
Figure 19d. Observed curve, predicted linear curve and predicted growth curve of ratio of world export share between India and Indonesia



Malawi

The performance of Malawi is more or less similar to Indonesia relative to India. The value of the ratio is decreasing but still greater than 1. As per best fitted predicted growth curve the ratio to be above 3 by 2015.

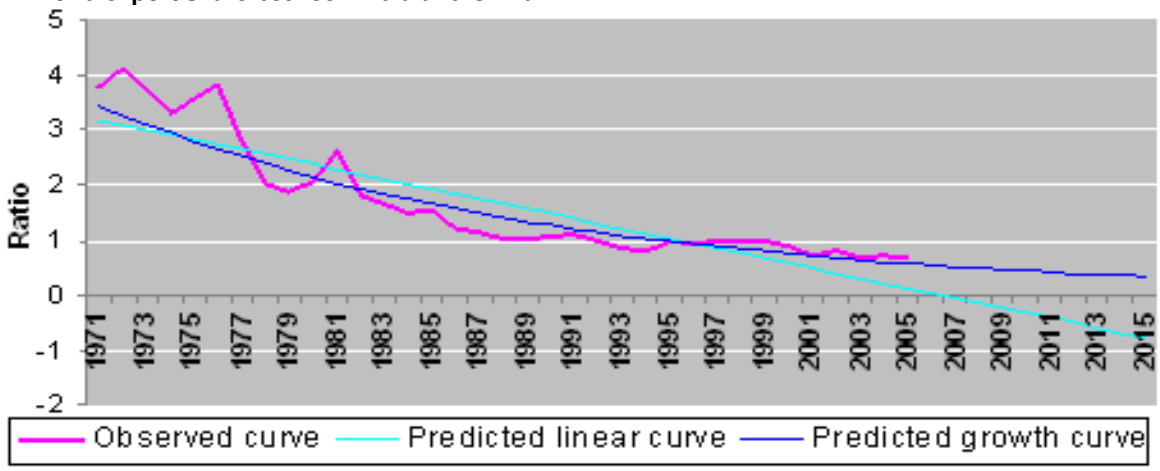
Figure 19e. Observed curve, predicted linear curve and predicted growth curve of ratio of world export share between India and Malawi



China

The value of the ratio is steadily decreasing to below 1 level during the observed period. The goodness of fit for predictions is very high. Like Kenya the best fitted growth curve is asymptotic to below 1 level, and the forecasting value of the ratio is just 0.3 by 2015.

Figure 19f. Observed curve, predicted linear curve and predicted growth curve of ratio of world export share between India and China

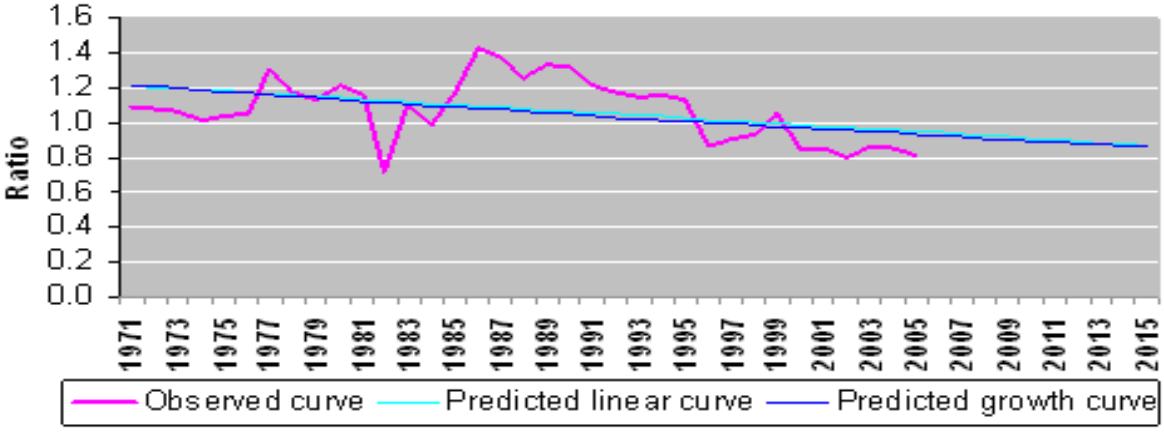


Relative export price

Sri Lanka

We observe, the relative export price for Sri Lanka is better than India during last quarter of the study period. Although our prediction is not good fitted to the data, the value of the ratio to be at below 1 by 2015.

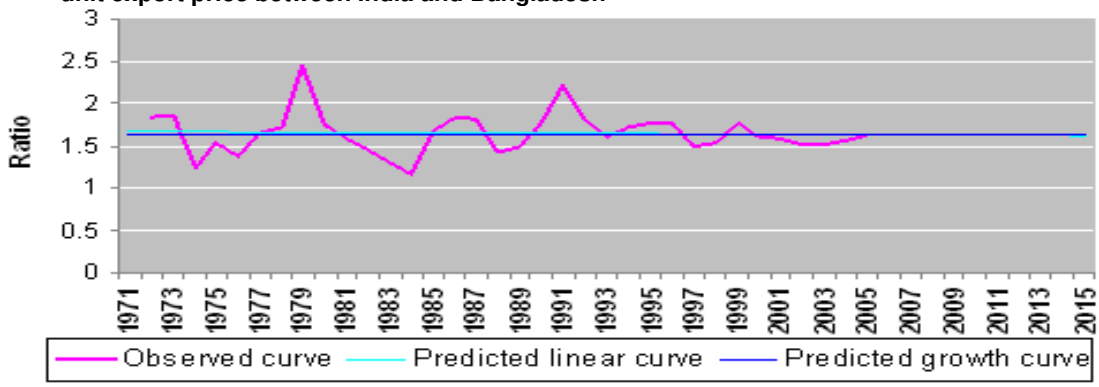
Figure 20a. Observed curve, predicted linear curve and predicted growth curve of ratio of unit export price between India and Sri Lanka



Bangladesh

Like the volume of output and export, here also Bangladesh does never be performed better than India. Predation shows a constant value of the ratio which is above 1 to be continued in 2015.

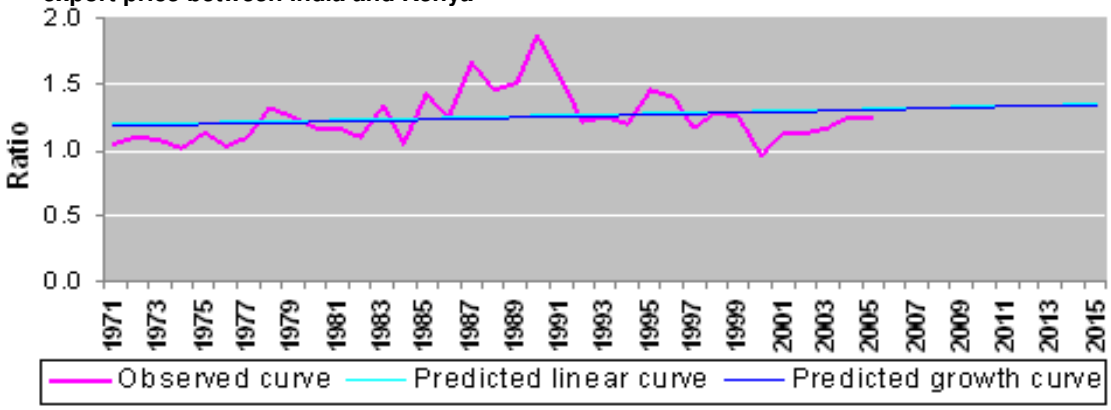
Figure 20b. Observed curve, predicted linear curve and predicted growth curve of ratio of unit export price between India and Bangladesh



Kenya

Unlike the volume of output and export, Kenya here does not perform better than India. The value of the ratio above 1 is not only we observed during the study period, it is to be continued at above 1 still the prediction period.

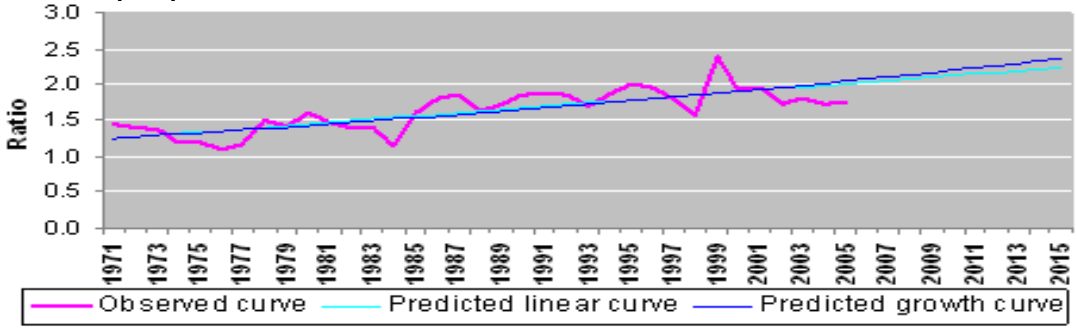
Figure 20c. Observed curve, predicted linear curve and predicted growth curve of ratio of unit export price between India and Kenya



Indonesia

Here India consistently performs better than Indonesia. Prediction is not bad, and as per the best fitted predicted growth curve the 'above 1' value will be reached at above 2 level by 2015.

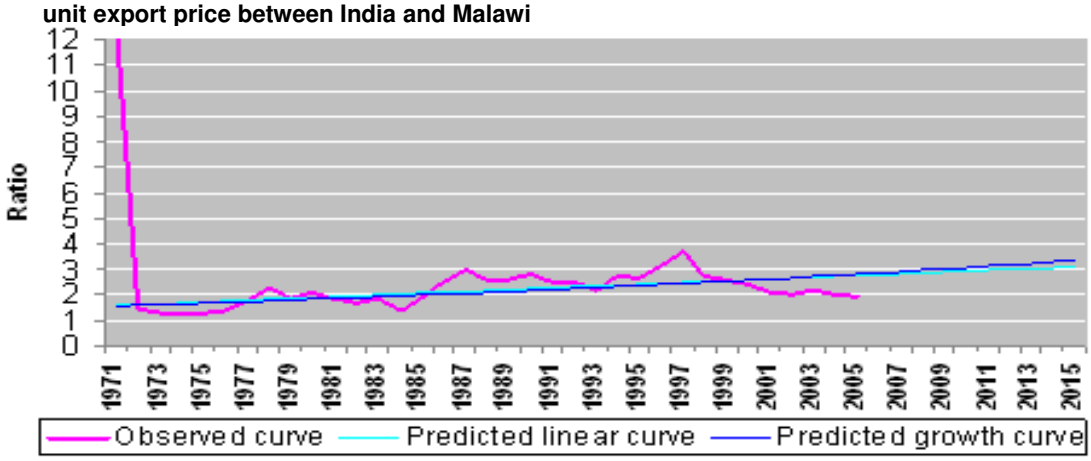
Figure 20d. Observed curve, predicted linear curve and predicted growth curve of ratio of unit export price between India and Indonesia



Malawi

As we observed, there is a dramatic shock for India regarding the ratio relative to Malawi during the early 70's; the ratio became below two from 12 during this period. After that it tends to some improvement ranging between 2 to 3 except 1997 when the value reached around 4. Whatsoever the fact, the ratio to be improved at above 3 by 2015 as per prediction.

Figure 20e. Observed curve, predicted linear curve and predicted growth curve of ratio of unit export price between India and Malawi



China

Due to the lack of available data in this regard we are unable to present it.

Demand side analysis

We offer a detailed analysis of the world import demand for tea in different regions as well as some selected countries along with the supply of Indian tea to these regions/countries. Variables (defined above) shall be used for calculating: (i) region/country wise relative import demand with reference to world demand and (ii) region/country wise relative supply share of Indian tea as part of total import demand in the region/country. Finally, we turn to the analysis of the effectiveness of region wise import demand for tea in the world on Indian export performance.

Region wise

West Europe

The following figures (21a-d) show the observed pattern of long run trend growth and predicted curves (linear and growth curve) of the share of world import demand as well as share of Indian supply of tea in West European region. As seen in the figures 21a and 21b, both the shares (import demand in West Europe and Indian supply in West Europe) declined sharply over the observed period, except for the Indian share in 2004-05 where the curves depict slow upward trends.

Figure 21a. Relative import demand for tea in West European region

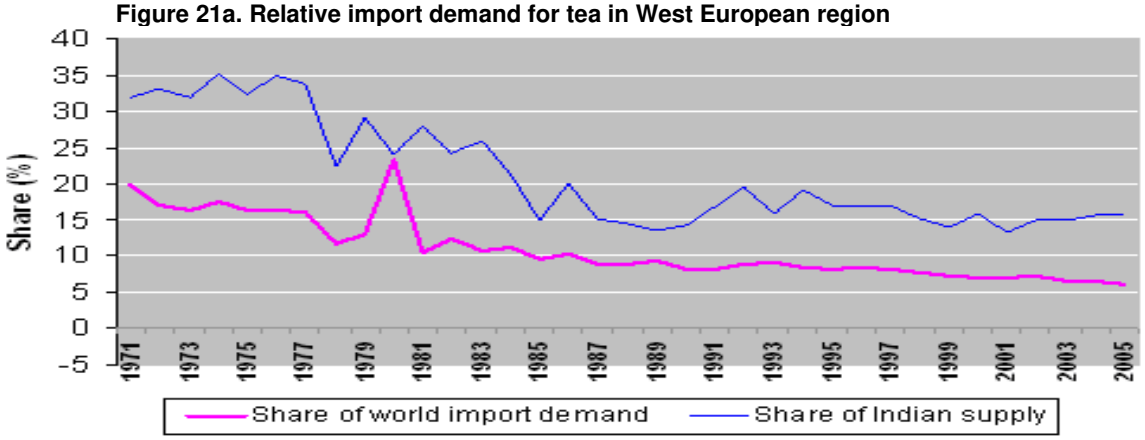
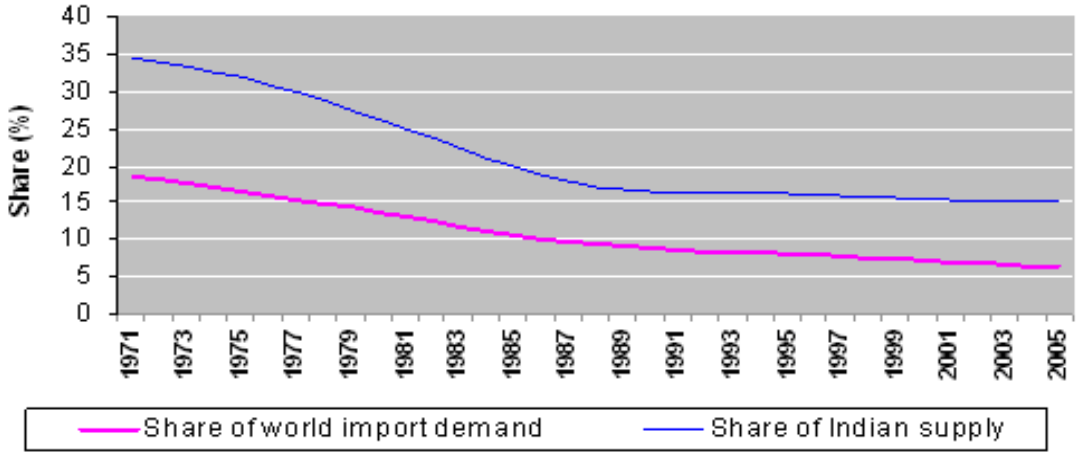
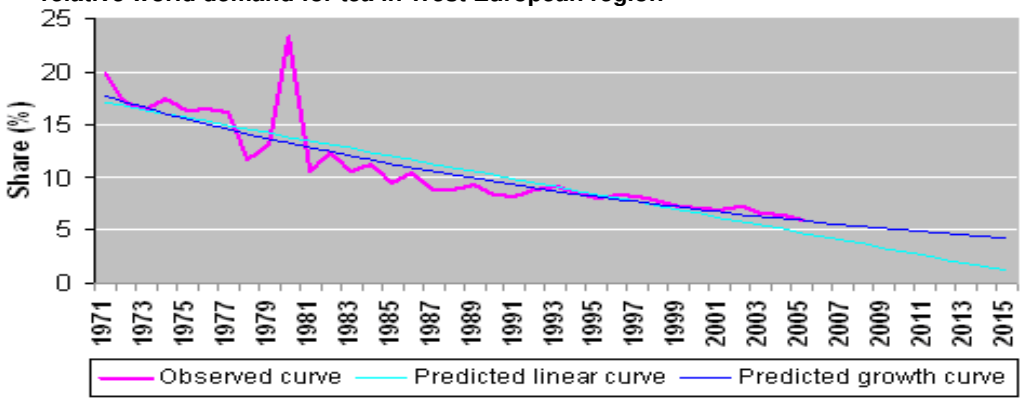


Figure 21b. Long run growth of relative import demand for tea in West European region



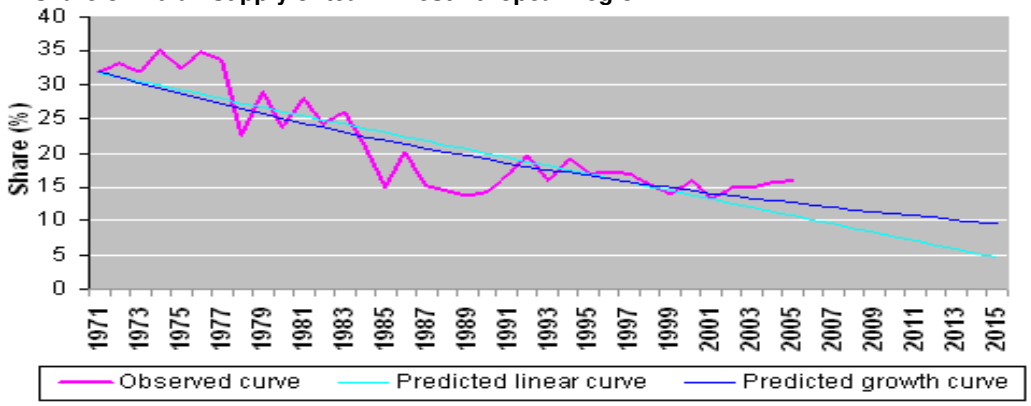
Based on the specifications of relationship between the values of the variables and the time path, discussed in the methodology, we obtain the forecasted values of the shares (see figures 21c for import demand in West Europe and 21d for Indian supply in West Europe) beyond 2005 and up to 2015 (10 years). As argued above, if the relationship is linear in nature, then the predicted shares would be about 1.2 percent for import demand in West Europe and 4.6 percent for Indian supply in West Europe respectively by 2015, whereas, if the relationship follows non-linear pattern as specified in (ii) in section 1.1.2 above, then the shares would go up to 4.3 percent and 9.6 percent respectively by 2015.

Figure 21c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in West European region



Also, given the test statistic for these regression models (see in the appendix), we claim that the growth curve is a better fit of the import demand in West Europe (F-value for equation in (ii) in section 1.1.2 is 200.35 vis-à-vis the F-value for equation in (i) in this section at 95.58; similarly, R^2(ii) = 0.859 > R^2(i) = 0.743.

Figure 21d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in West European region



East Europe

The following two figures offer the observed pattern of and long run trend growth of the share of import demand as well as share of Indian supply of tea in East European region. It is found that although the share of import demand in East European region more or less increasing over the period, the share of Indian supply in this region decreases spectacularly from above 90 percent to below 20 percent level.

Figure 22a. Relative import demand for tea in East European region

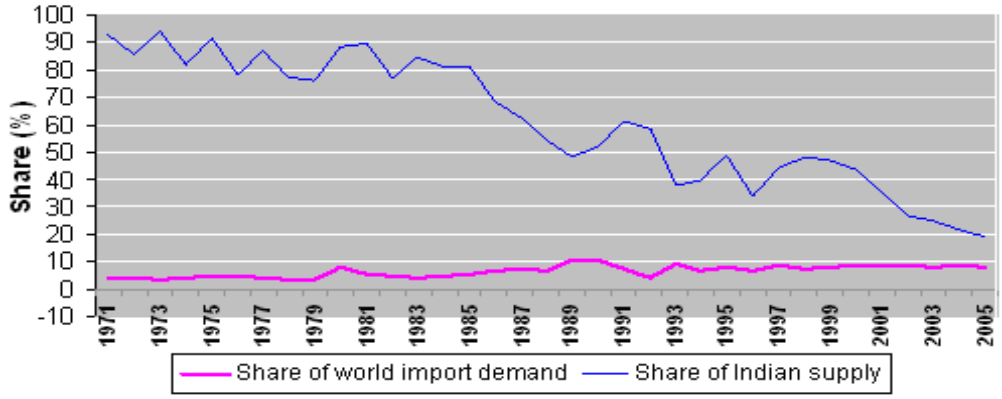
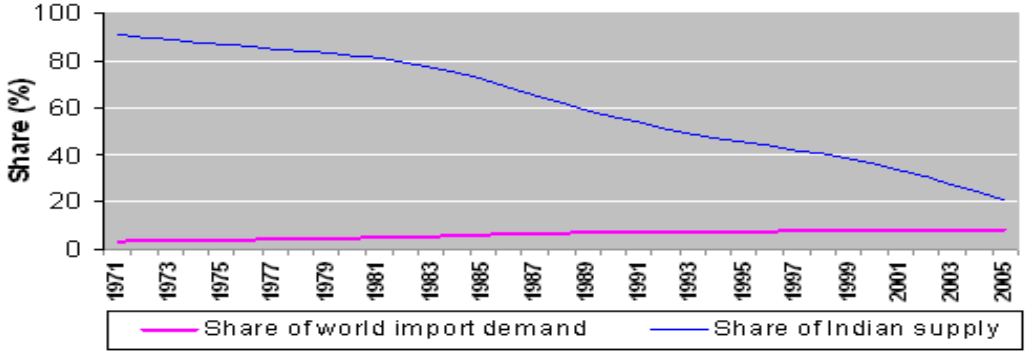


Figure 22b. Long run growth of relative import demand for tea in East European region



The share of world demand in East European region, however, will be within the range of 11 to 13 percent levels in 2015 (the predicted two values as shown by the respective linear and growth curves). But the increased demand by this region can not be recompensed by the Indian supply since the predicted level of Indian share will be either shrink to 3.5 percent or at best stable at 19 percent level as in 2005.

Figure 22c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in East European region

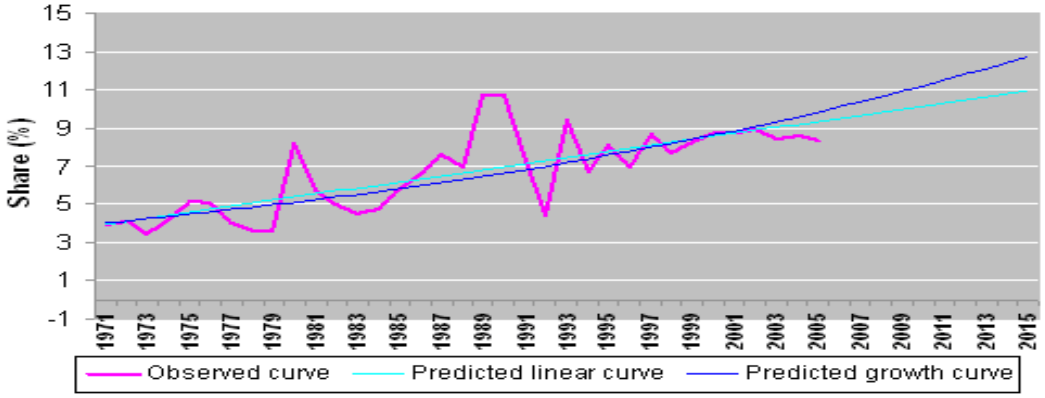
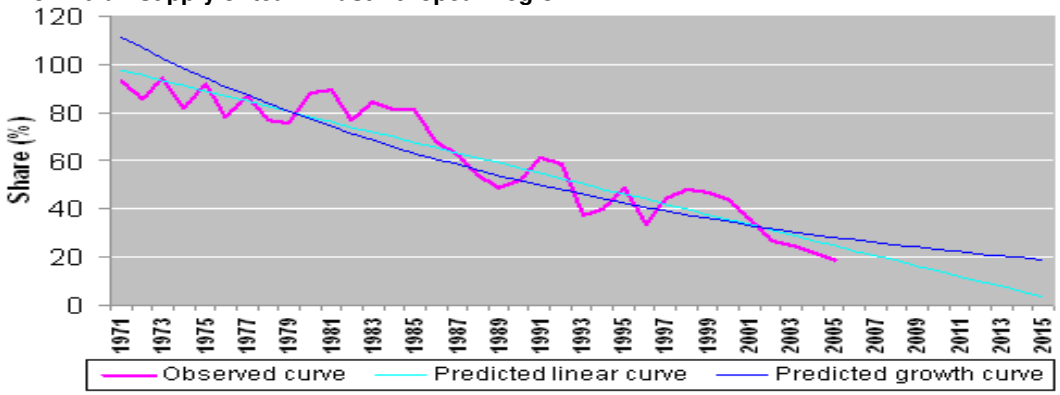


Figure 22d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in East European region



North America and West Indies

It is observed in the following figures that after 1980 the share of import demand in North America and West Indies region is in moderately declining trend but the Indian supply in this region after 1989 is sharply rising.

Figure 23a. Relative import demand for tea in North America & West Indies region

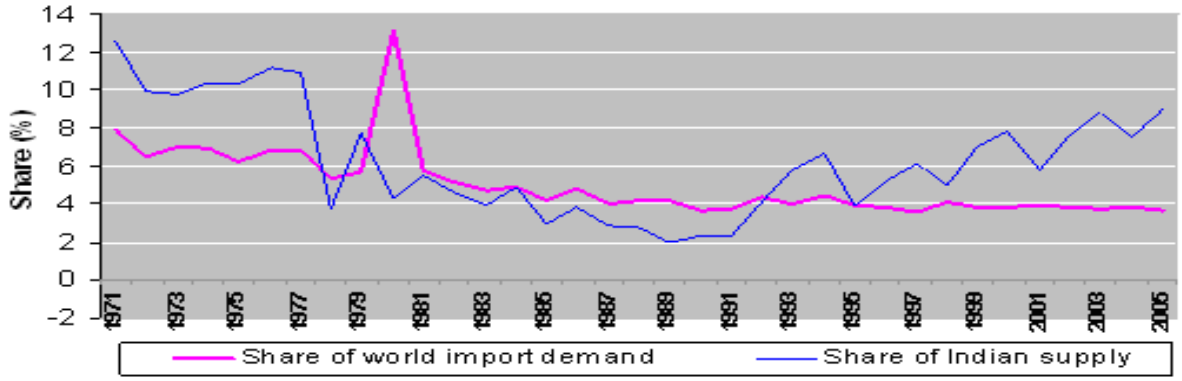
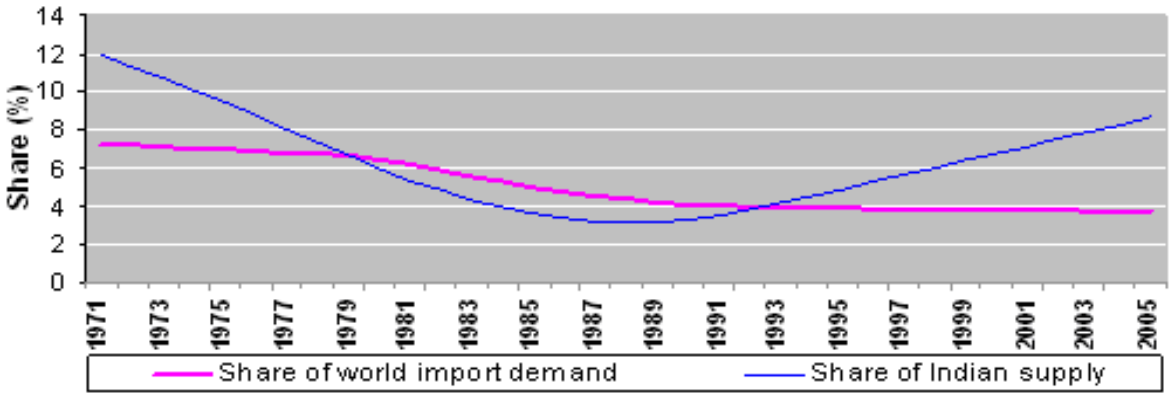


Figure 23b. Long run growth of relative import demand for tea in North America & West Indies region



As per the best fit of predicted curves – growth curve with $R^2 = 0.64$ and F value = 58.97 against the linear curve with $R^2 = 0.46$ and F value = 28.15 (see appendix), the import demand in 2015 may fall to around 2.5 per cent level. And likewise, the Indian supply will decline moderately.

Figure 23c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in North America & West Indies region

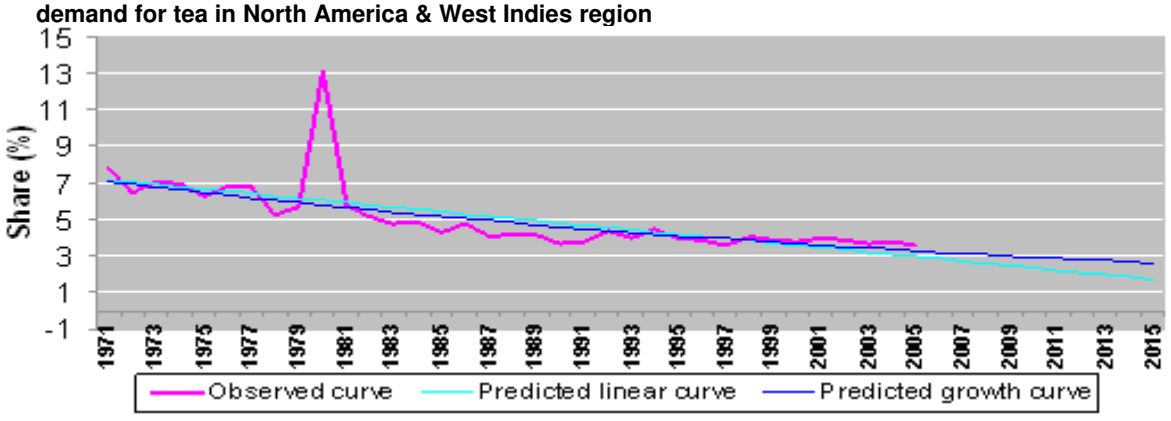
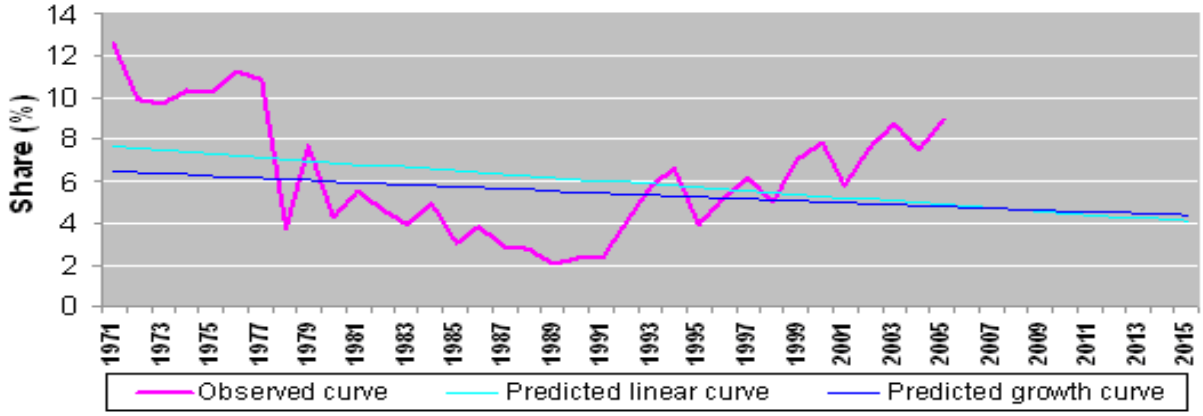


Figure 23d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in North America & West Indies region



West Asia

Although this region observed more or less the same demand trend in the range of 5 to 7 percent of world demand, the Indian supply however, improved recently after recovering from the

shock during 1987-1995. As seen in figure 1.2d, the recovery started after 1995 and by 2005 reached closest to the trend growth level observed in the past peak periods.

Figure 24a. Relative import demand for tea in West Asia region

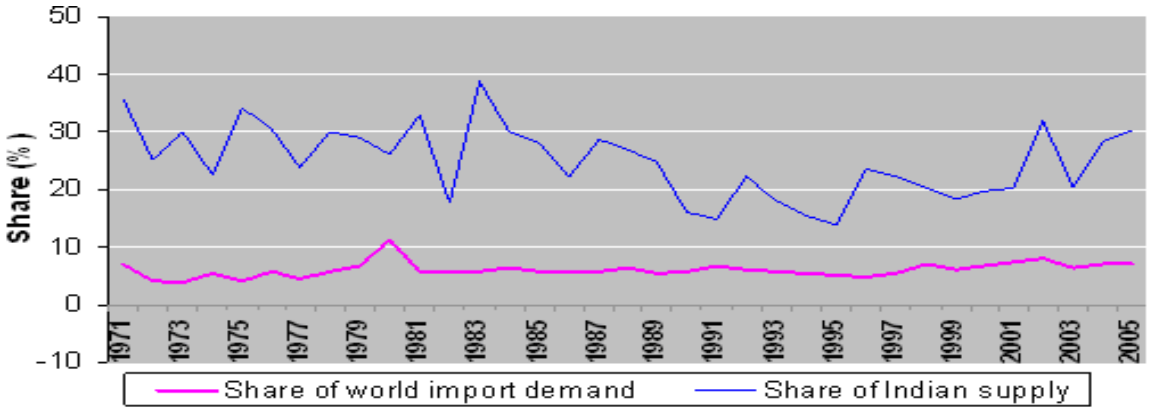
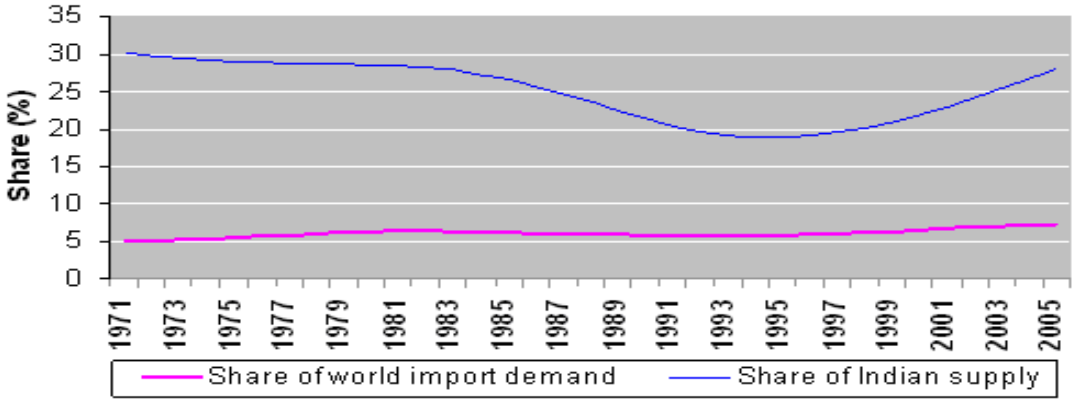


Figure 24b. Long run growth of relative import demand for tea in West Asia region



The predicted curves (although not good fit with the data) in the following figures conform to above discussions regarding share of import demand in this region. But, in case of Indian supply our predictions are not exactly attuned to the observed patterns over the last five years. We shall in later attempts endeavor to identify sources of specification biases, if any.

Figure 24c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in West Asia region

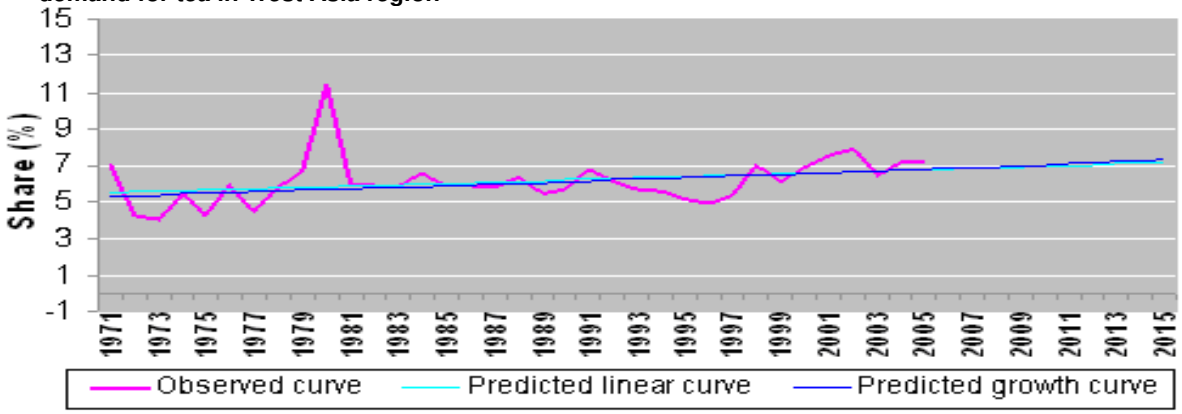
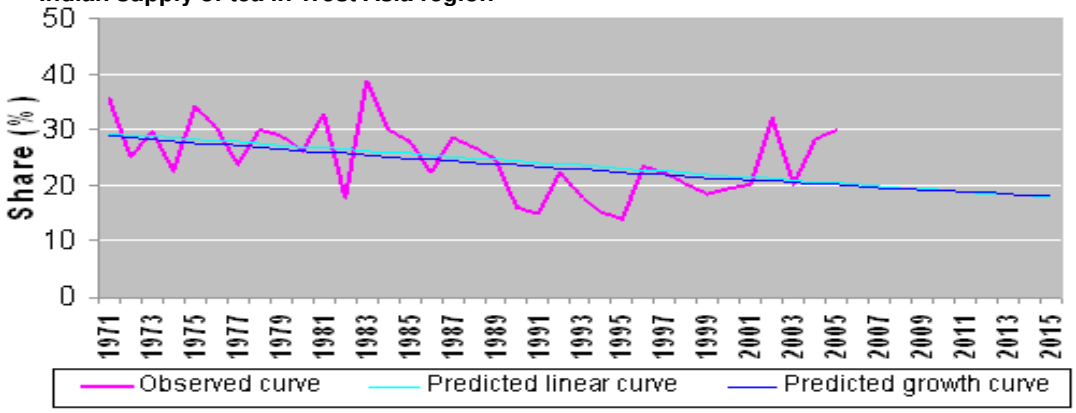


Figure 24d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in West Asia region



Other Asia

Like the West Asian region the Other Asia (Asia other than west Asia including countries of the SAARC, Afghanistan, Hong Kong, etc.) also followed the same pattern in world import demand for tea over the observed period. The share in Other Asian import demand for Indian tea, however, moderately declined with some recovery in recent years.

Figure 25a. Relative import demand for tea in Other Asia region

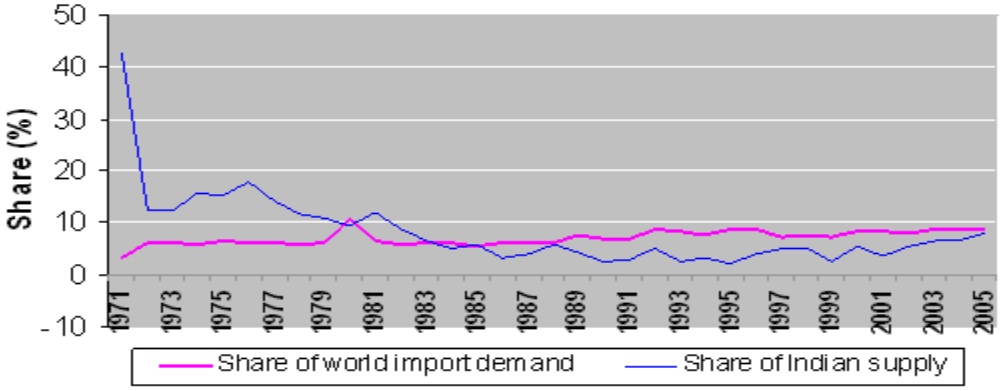
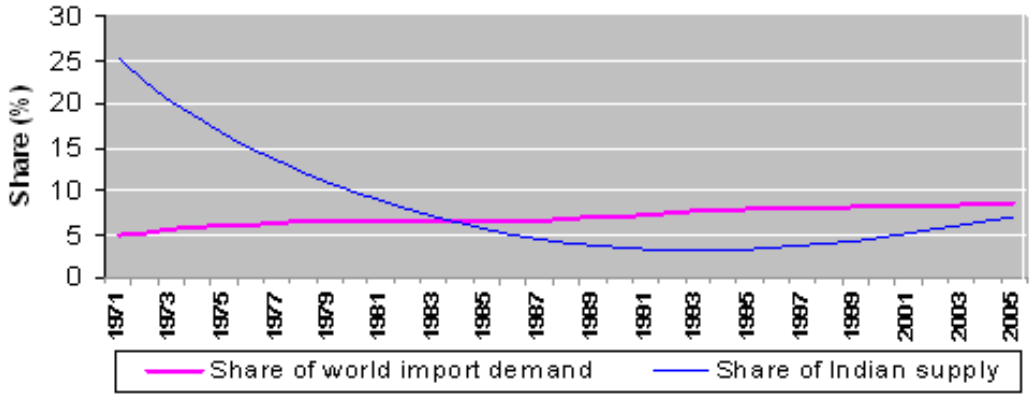


Figure 25b. Long run growth of relative import demand for tea in Other Asia region



Influenced by the observed trend, the predicted share of import demand in this region is expected to increase to around 10 percent by 2015, but the Indian supply to this region might remain at just 2 percent.

Figure 25c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in Other Asia region

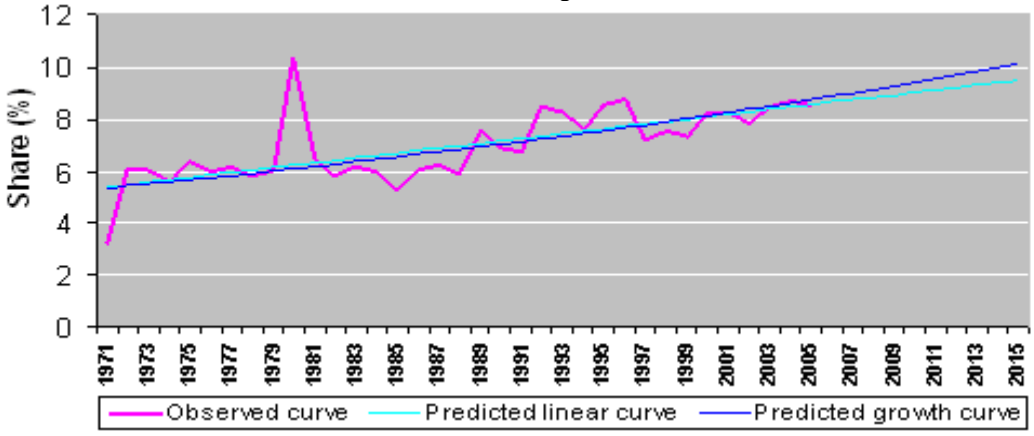
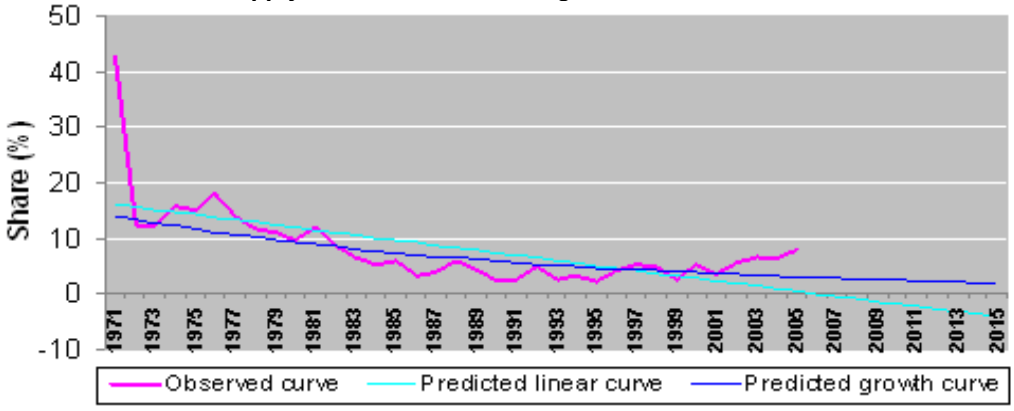


Figure 25d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in Other Asia region



Africa

Regions in Africa registered a moderately constant trend demand in the range of 6 to 8 percent. The Indian supply, however, declined sharply after reaching its peak of 23.5 percent in 1978, to below 2 percent in 2005.

Figure 26a. Relative import demand for tea in African region

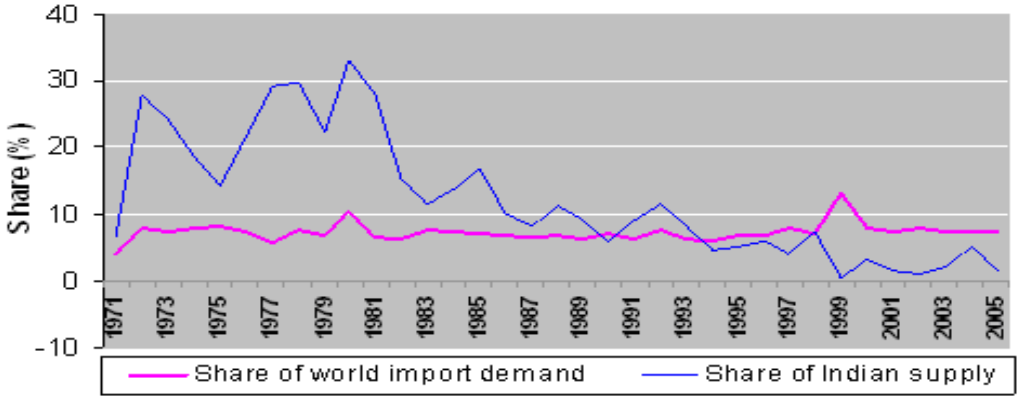
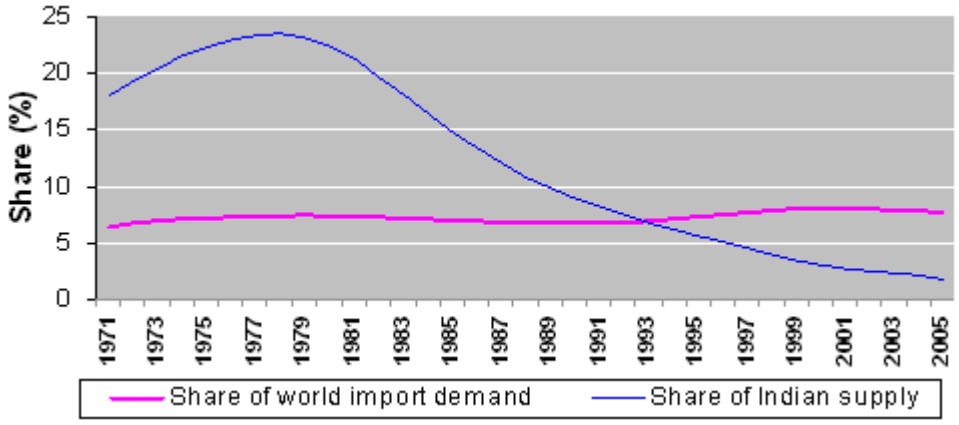


Figure 26b. Long run growth of relative import demand for tea in African region



Again, the predictions of the share of African import demand do not fit well with the data, but the predicted curves follow the same pattern as we observed from their trend behaviours. The better fitted prediction of Indian supply in this region, on the other hand, shows that the share might not only shrink in the future, but it also might go below 1 percent level.

Figure 26c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in African region

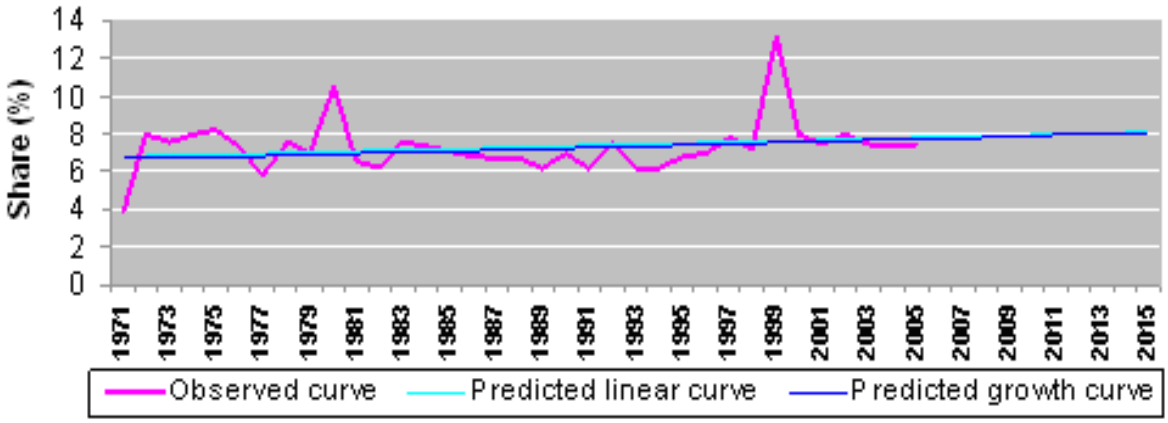
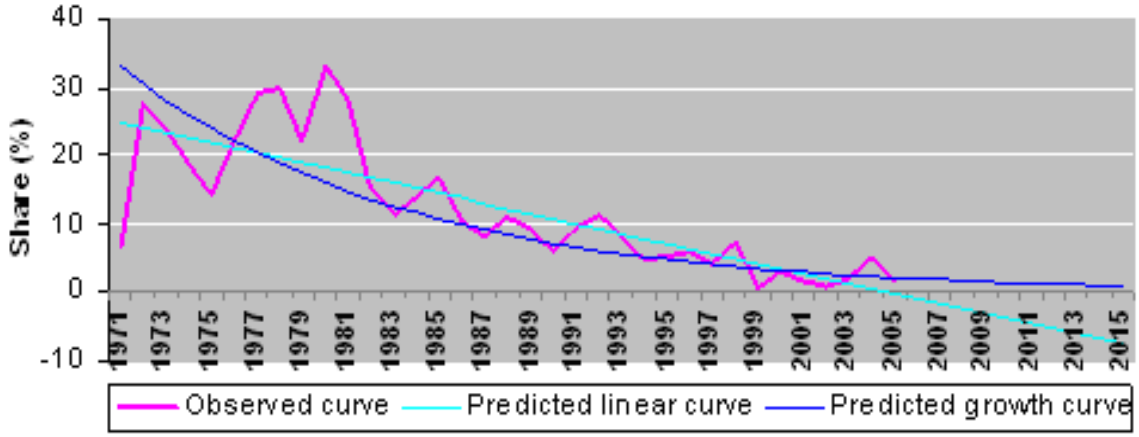


Figure 26d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in African region



Australia and Oceania

Not surprisingly, the thin consumer base of this region causes the share of import demand to be particularly low compared to other regions in the world. The approximately horizontal curve for import demand, regardless of the observed long run trends supports this phenomenon (see following figures). However, once must note that since 2005, there has been an upward surge in the demand for Indian tea in this region, although we do not possess appropriate information to identify the sources of this sudden increase in demand. Nonetheless, the growth prediction does not offer an optimistic picture mainly because the result is strongly biased by past performance.

Figure 27a. Relative import demand for tea in Australia & Oceania region

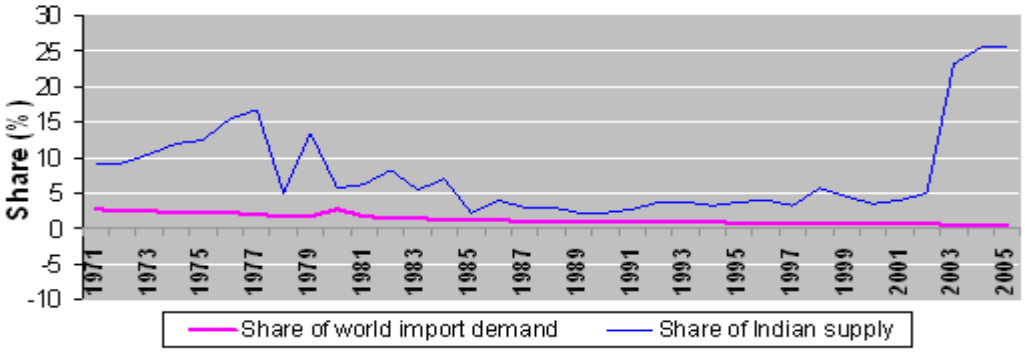
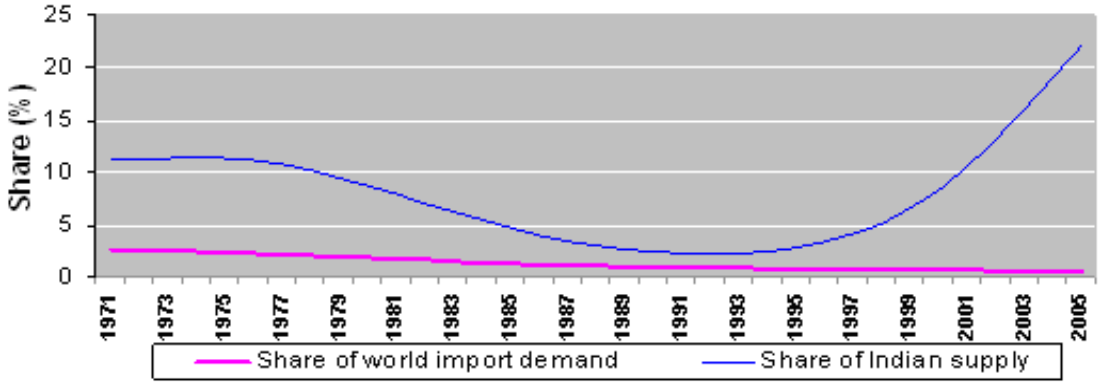


Figure 27b. Long run growth of relative import demand for tea in Australia & Oceania region



A well fitted predicted growth curve of the share of import demand in this region suggests that the share might go further low 2015.

Figure 27c. Observed curve, predicted linear curve and predicted growth curve of relative world demand for tea in Australia & Oceania region

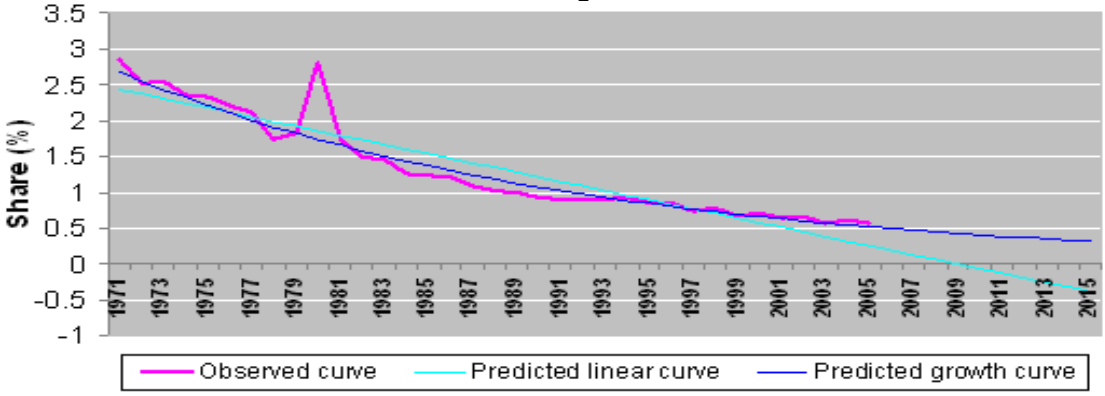
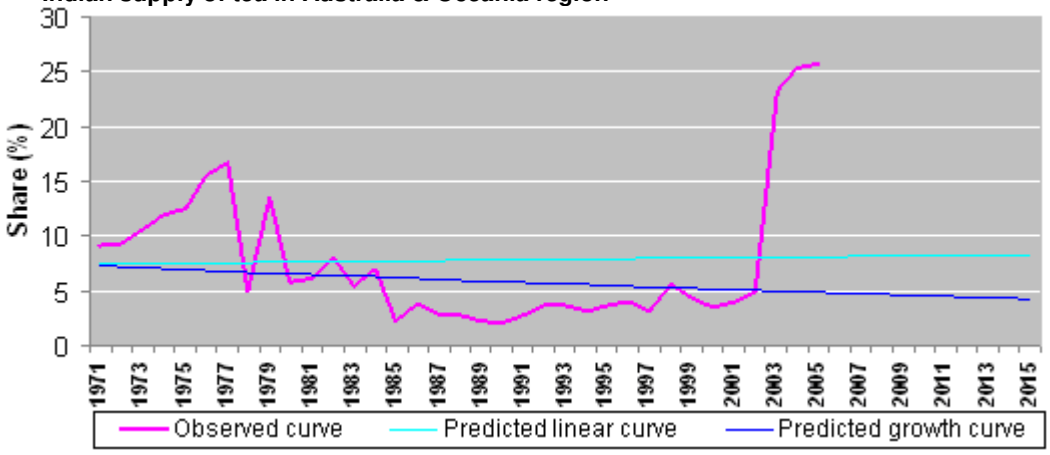


Figure 27d. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in Australia & Oceania region



Latin America

The market for tea in Latin America is not comparable to any other regions in the world. If we look at the following two figures, it will be clear that during the observed 35 years the share of this region in world import demand rarely exceeds the 1 per cent level (1974 and 1980, only). The role of India in this region is negligible and entries such as 'the Indian share is nil' appears repeatedly in the published data. And, not unexpectedly, the observed curves for Indian share nearly coincide with the horizontal axis. Thus, we refrain from further analysis of this region, although inquiries may certainly be made regarding the causes behind such low participation in this market.

Figure 28a. Relative import demand for tea in Latin American region

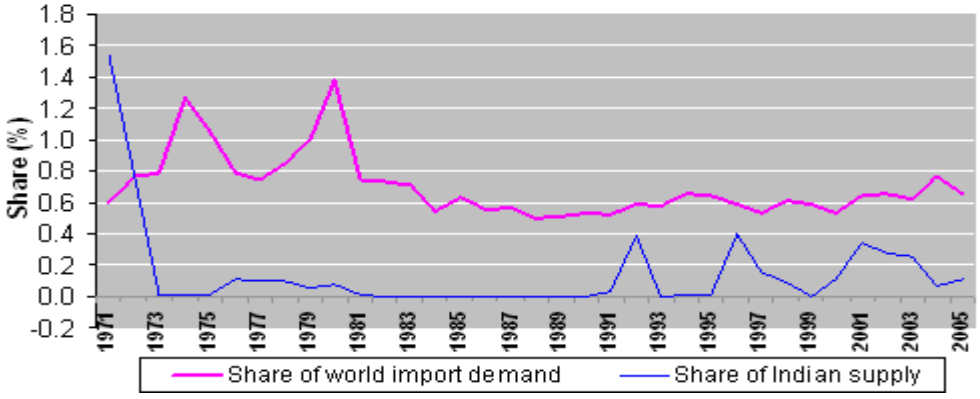
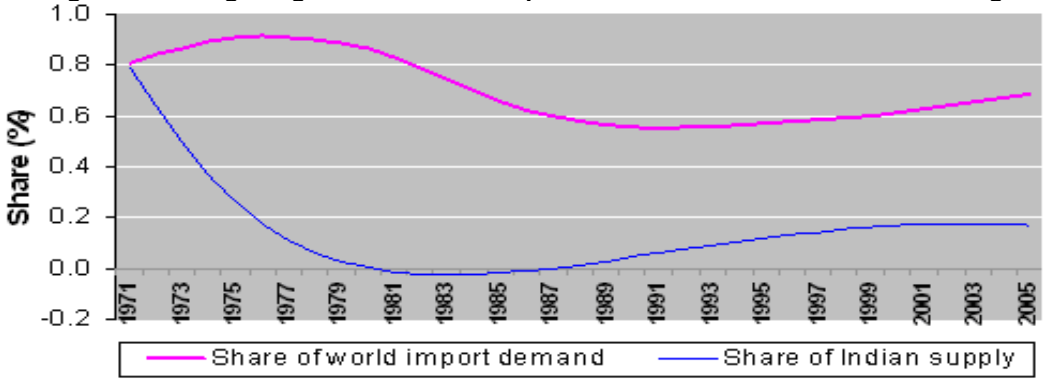


Figure 28b. Long run growth of relative import demand for tea in Latin American region



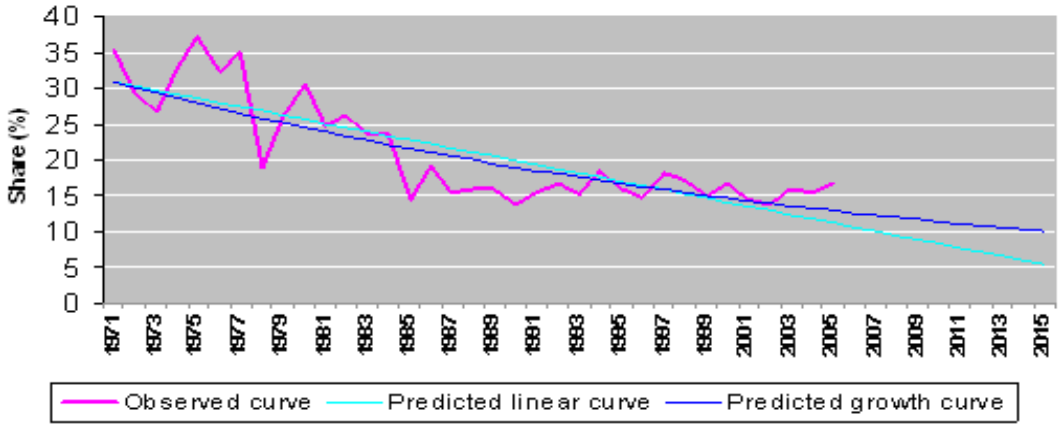
Country wise

We now turn to the discussion on some specific countries which are selected on the basis of the fact that India occupied a leading position as an exporter either in 1971 (starting year for the series) or in 2005 (ending year of the series). In addition, USA is automatically selected owing to its economic position in the world. A total of seven countries, namely, UK, USSR, Poland, USA, UAE, Afghanistan and Australia are selected for the analysis (these also offer consistent data sources).

U K

It is the single most important country for India in terms of marketing of tea. During the past decades a significant amount of Indian tea was directly sold in the London tea auction centres, with re-export to other destinations. As may be seen from following figure (29), the share of Indian supply of tea out of total import in UK was as high as 35 percent in the initial years; such share is clearly decreasing lately and has plummeted to a 15 percent mark in the last few years. Predictions on the share for the next 10 years up to 2015 show good fits with $R^2 \approx 0.7$ and $F \approx 70$ (see appendix A-1). Here we also see that the growth curve is better fitted than the linear curve. However, even if the relationship is non-linear in nature, still the predicted share would be around 10 percent by 2015. As in all previous analysis, a drop in share however, does not mean a lower volume of sales. We have run this exercise with constant demand, and if there are positive changes in demand during this period, the present share of export would still mean higher sales volume.

Figure 29. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in UK

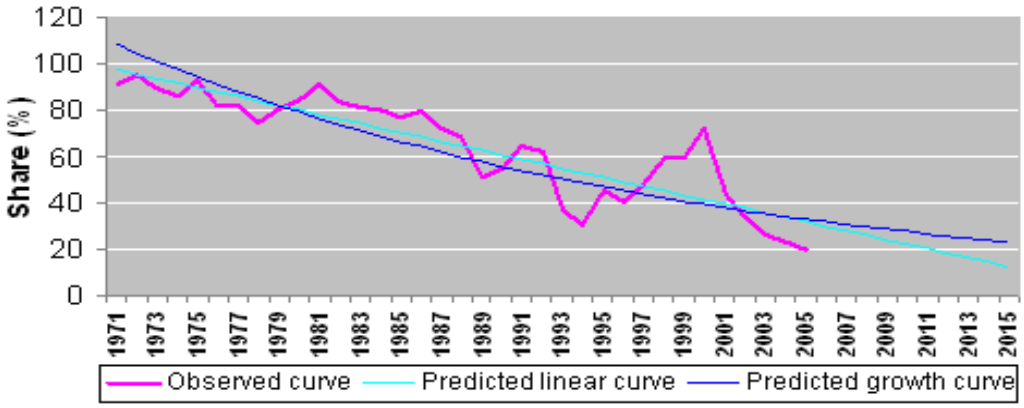


Former U S S R Countries

It is also well-known to all concerned with the tea industry, that the largest (not necessarily for the finest tea, though) market for India has been the erstwhile USSR. The curves in the following figures bear testimonials to that account. They clearly show, however, that although the Indian share (around 90 percent) was so high to begin with, there is a sharp decline to a mere 20 percent level by 2005. Many ascribe this to the dismantling of the USSR into smaller fragments with Indian suppliers finding it so much more difficult to deal with compared to the centralised system they were accustomed to previously. Interestingly, it also came out through conversations at several levels with people in the tea industry that, the post 1991 is also the time when the quality of

Indian tea dropped significantly. It is alleged that CTC varieties exported through tea bags and other forms were of the poorest quality and it turned the consumers away. These are issues which need to be given some importance in otherwise macro-level studies of this nature. According to the predicted linear curve (best fit) the share may fall even more at around 12.5 percent level by 2015.

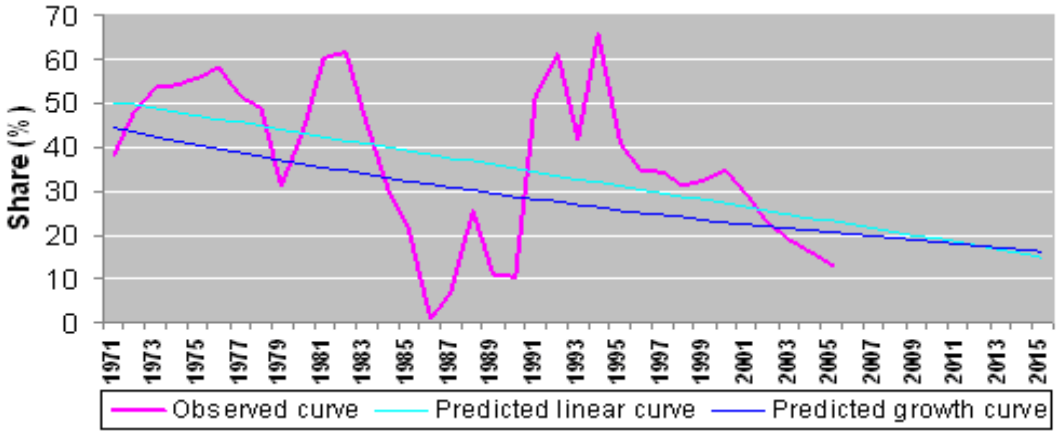
Figure 30. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in USSR



Poland

Poland is another country where India serves a major portion of the country's import demand. Except from a major shock in 1986 and during recent years, India meets nearly a half of the import demand in this country. Although the prediction is not unambiguous with the data, both the predicted linear and growth curves tell us that the share to be at around 16 percent level by 2015.

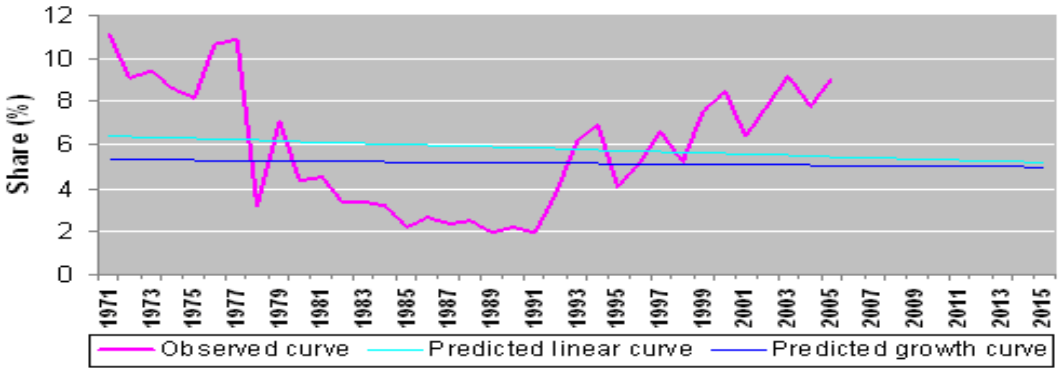
Figure 31. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in Poland



U S A

For the United States, there has never been a high preference for tea, although as the observed curves shall testify, there seems to be increased enthusiasm for tea in the recent years. Notwithstanding, the predictions do not expect the level to exceed 5% by 2015.

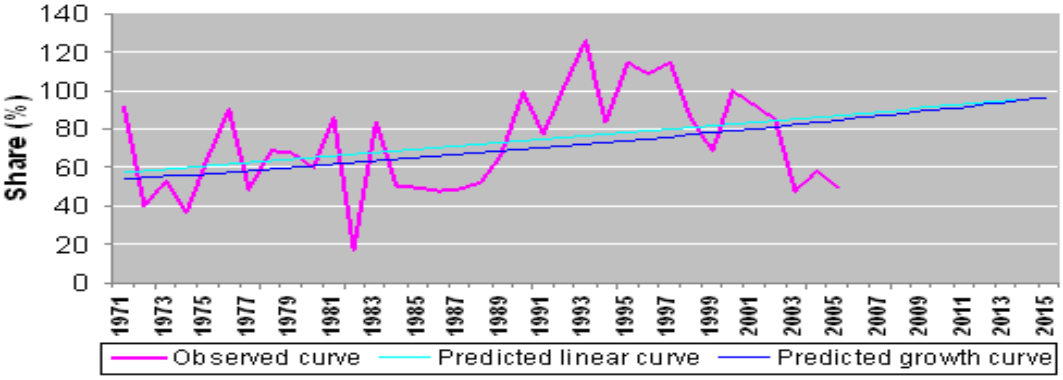
Figure 32. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in USA



U A E

The import demand for tea in UAE is mostly dependent on the Indian supply. The predictions are not robust, but the share is expected to be steadily increasing over time.

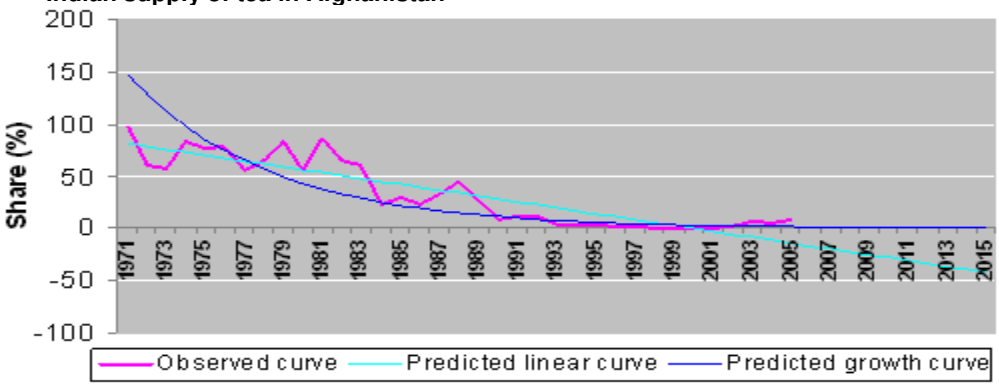
Figure 33. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in UAE



Afghanistan

It is another special case that we observe for Afghanistan where the Indian share dramatically declined from the 100 percent level to nearly zero. As per the best fit linear growth curve, however, the share continues to be rather low and it is not unexpected under the prevailing state of political affairs in the country.

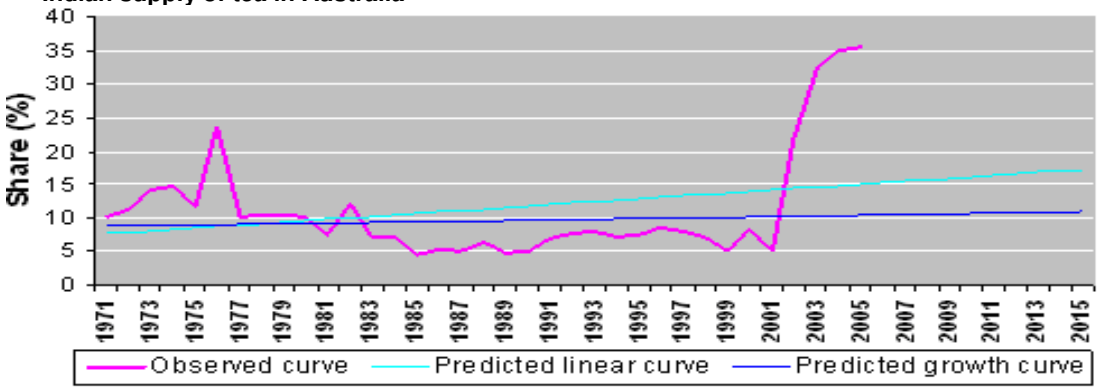
Figure 34. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in Afghanistan



Australia

An interesting fact from the observed pattern of Indian share of tea in Australia is that initially during 70's the share was above 10 percent which declined in 80's and 90's, and afterward shot up above the 20 percent level. Once again, albeit the forecast is not robust statistically (see appendix A1.2) the trend is upward rising.

Figure 35. Observed curve, predicted linear curve and predicted growth curve of share of Indian supply of tea in Australia



Multivariate regression analysis

The following table (table 1.3a) depicts the results obtained from the regression model specified earlier and table 1.3b gives us the basic properties of residuals obtained by estimating this time series model. In the technical note we have already discussed the properties and the methodology used to run these tests. Our basic regression is best fit (R^2=0.97) and the observed and estimated values move in the same direction (figure 36a). Consequently, the residuals follow the desirable normal distribution (figure 36b).

Figure 36a. Actual and fitted values of share of world export of tea by India

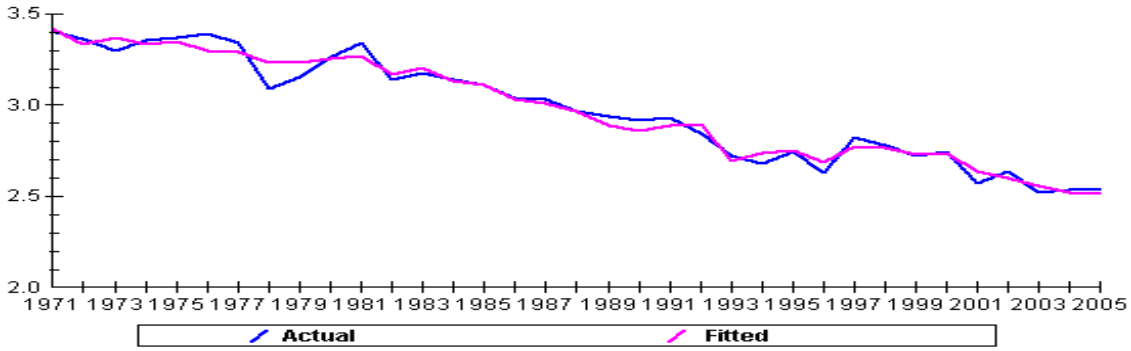
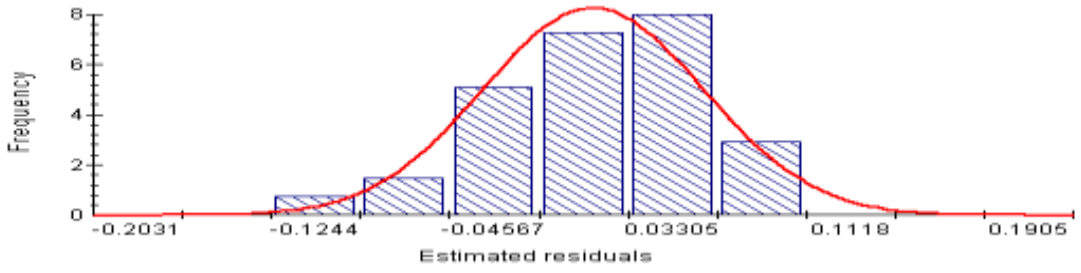


Figure 36b. Histogram of residuals and the normal density



We now turn to our basic regression results as depicted in table 1.3a. Indeed, there are two sets of explanatory variables in our regression model: control variable like domestic demand, export price and exchange rate, and basic variable that is share of Indian supply in different regions say West Europe, East Europe, etc. Pertaining to the control variables it seems to be clear from the table that each of the variables has negative impact on the export performance, though not especially significant at all except for exchange rate. However, such an association of export performance corresponding to the control variables is almost elucidated from a priory concept. Now referring to the basic explanatory variables it is found that out of seven regions only East European region shows a significant and positive relation with the share of Indian supply. We observe not only insignificant results for the other regions but also negative in some cases like North America & West Indies, Africa, and Australia and Oceania.

Table 1.3a: Ordinary least squares estimation

Dependent variable is: logarithm of share in world export by India (LSQX) 35 observations used for estimation from the year 1971 to 2005					
Explanatory variable (Code)		Coefficient	Standard error	T-ratio	[Probability]
•Intercept term	A	2.444*	1.159	2.109	[.046]
•Logarithm of share in domestic demand for India	LSDD	-0.173	0.262	-0.659	[.516]
•Logarithm of unit export price	LPX	-0.030	0.058	-0.528	[.602]
•Logarithm of exchange rate per USD	LER	-0.127	0.057	-2.212	[.037]
•Logarithm of share of India in West Europe's import demand	LS1	0.104	0.123	0.847	[.406]
•Logarithm of share of India in East Europe's import demand	LS2	0.298*	0.077	3.872	[.001]
•Logarithm of share of India in North America & West Indies' import demand	LS3	-0.014	0.063	-0.219	[.829]
•Logarithm of share of India in West Asia's import demand	LS4	0.030	0.058	0.518	[.609]
•Logarithm of share of India in Other Asia's import demand	LS5	0.057	0.046	1.241	[.227]
•Logarithm of share of India in Africa's import demand	LS6	-0.017	0.025	-0.663	[.514]
•Logarithm of share of India in Australia & Oceania's import demand	LS7	-0.005	0.031	-0.154	[.879]

R-Squared	.972	Residual Sum of Squares	.079
S.E. of Regression	.058	F-stat. F(10, 24)	82.868 [.000]
Mean of Dependent Variable	2.979	S.D. of Dependent Variable	.288
Akaike Info. Criterion	45.868	Equation Log-likelihood	56.868
DW-statistic	1.945	Schwarz Bayesian Criterion	37.314

Table 1.3b: Unit root test for residuals

Based on the ordinary least squares regression in table 1.3a 35 observations used for estimation from the year 1971 to 2005					
Test Type	Test Statistic	Maximized Log-likelihood	Akaike Information Criterion	Schwarz Bayesian Criterion	Hannan-Quinn Criterion
Dickey Fuller	-5.511	52.882	51.882	51.134	51.630
Augmented Dickey Fuller (1)	-4.669	53.452	51.452	49.955	50.948
90% critical value for the Engle-Granger statistic =		-4.582			

Section - 2

Evidences from stakeholders of Indian tea industry

This section is based on the field survey conducted in three major tea producing states of India, namely West Bengal, Assam and Tamil Nadu. For the northern tea producing region as it is traditionally coined in the Indian tea industry, the survey covers all major tea plantation districts in West Bengal and Assam. Likewise, for the southern tea producing region the survey is conducted in the Nilgiris plantation district of Tamil Nadu. Sample primary stakeholders, which are randomly selected from the tea industry constitute large tea growers, small tea growers and bought-leaf/cooperative factories. These are the basis of information assembled via scheduled questionnaires on quantitative study of production, marketing and organizational issues. Albeit, the assessment of yield rate of final tea for the traditional tea estates (big tea growers) and yield rate of green tea leaves for the small tea growers are of primary focus in the production analysis, some efforts have also been made to recognize the usefulness of dual form of plantation across regions. Besides, the decomposition of eventual changes of tea leaves productivity across plantations (large and small growers) by sources like fertilizer use, labour management, land utilization, mechanization and weather condition are studied in this section. Subsequently, the separate marketing channels as applicable for small tea growers and tea estates/factories are examined to find out the sales pattern and price movements. This is done with particular reference to auction market deals entered into by the estates/factories. Finally, the organizational predicaments of the tea growers towards developmental promotion are investigated relating financial, technical, labour issues, etc. Moreover, in the age of globalization the important issue of foreign direct investment in Indian traditional tea industry also appears in this section. This helps to configure the relative preference of estates towards joint venture over lease or buy-outs.

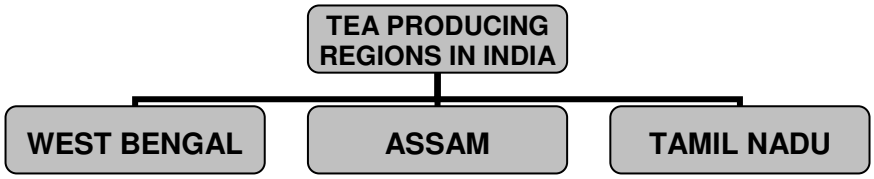
2.1 Methodology

Simple algebraic operators and descriptive statistics are mainly employed to represent the sample information in tabular form. For sampling, we have used the stratified random sample procedure. It is applied to investigate the quantitative behaviour of the stakeholders, including growers and manufacturing units. To begin with, the major tea producers in India are divided into three different regional clusters namely West Bengal, Assam and Tamil Nadu. The production units with valid license to produce and also participate in auction markets are then considered for sampling within each individual region.

The types of tea producing factory found in these regions are mainly garden factory (GF) and bought leaf factory (BLF) / cooperative factory (CF), and their approximate distribution are: 310 (GF) and 80 (BLF) in West Bengal, 810 (GF) and 180 (BLF/CF) in Assam, 300 (GF) and 200 (BLF/CF) in south India respectively. We draw ten per cent sample factories in each of the regions for conducting field survey. Worthwhile to mention here that there are two types of setup in production of tea: first, the garden setup which supplies raw green tea leaves (the large and small tea growers) and the factory setup which ‘manufactures’ the tea (GF of large tea growers and BLF/CF fall in this category). Thus, three types of stakeholder are involved in the production of tea

in India: big tea estates comprising of large gardens with factory setups, small tea estates cultivate and harvest green tea exclusively and BLF/CF produces the final tea. Since GF and large growers are identical in most respects, the study considers the sample GFs as large growers. For the selection of small growers with garden sizes less than 10.12 hectares, nearly five times of the sample BLF/CF in each region are considered. It is noteworthy that in practice the actual sample size of small growers was briefly adjusted to suit requirements of the survey. Apart from over treating of sample size to capture regional heterogeneity of small growers or under treating given homogeneous nature of the growers, some adjustments were carried out to make best use of locational disadvantages of visiting dispersed producers, a fraction of which operate without appropriate authorization or status. The distribution of survey units from each category and from each region is depicted in the following diagram 1.

Diagram - 1: Sampling distribution of tea stakeholders



Large grower or GF	→	**31**	**81**	**30**
BLF / CF	→	**6**	**18**	**20**
Small grower	→	**62**	**90**	**75**

2.2 Production, Marketing and Organizational Issues

2.2.1 Production patterns

This section deals with the issue of productivity of tea across two forms of plantation, namely the large and small growers, and decomposition of their productivity change over time owing to changing inputs, fertilizer use, labour aspects, land utilization, mechanization and weather condition. Note that, the distinct roles played by these two types of growers in the tea industry as a whole are hardly comparable. Notwithstanding, the small growers have crucial role in social and economic life of the locality since they function as small-scale entrepreneurs with strong regional implications, unlike large producers with wider linkages. We therefore carry out the discussion on productivity of large and small growers separately.

Productivity and its decomposition for large growers

Large growers are basically the traditional tea estates. These are well equipped in terms of resources necessary for the production of high-quality tea. Note that, the entire set of large growers is not necessarily involved with production of high-quality tea. Production of premier quality tea (non-CTC categories like orthodox tea, special grade tea, green tea and Darjeeling tea) largely

depends on several structural and institutional factors such as climatic conditions, administrative capacities, etc. Furthermore, the intra-quality gradations of quality tea vary across regions alongside garden-specific attributes. Likewise, the widely produced general grade tea that is to say the CTC tea has many intra-gradations. Since both CTC and orthodox tea have their intra-gradations, the study accordingly considers the non-CTC tea in general as quality tea vis-à-vis CTC. Inclusion of an analysis of the quality tea is essential in view of the general perception on the strong association between yield rate and quality. Table 2.1 offers yield rate and proportion of quality tea across regions surveyed.

Table 2.1: Yield rate and proportion of quality tea for large growers

		Yield rate (kg/ha)			Correlation between estimated yield and quality tea
		Estimated	Calculated	Average	
West Bengal	Darjeeling	571	898	719	- 0.96 (- 0.79)
	Terai	1683	2761	2222	- 0.26 (0.66)
	Dooars	1919	2131	1985	0.46 (0.76)
	Average	1226	1770	1499	- 0.83 (- 0.52)
Assam	Sibsagar	2064	2835	2264	- 0.14 (0.68)
	Darrang	1605	2075	1776	- 0.42 (- 0.24)
	Dibrugarh	2105	3402	2569	0.29 (0.05)
	Cachar	1554	2177	1869	Indeterminate
	Average	1908	2753	2211	0.23 (0.15)
Tamil Nadu	Nilgiris	3036	3532	3156	0.65 (0.58)

Note: Parenthesis represents correlation between calculated yield and quality tea

While the estimated yield rate represents the per hectare output of final tea with the officially determined conversion ratio of 4.65 as against reported production of green tea leaves, the calculated yield rate is directly observed from the reported production of final tea. Next we consider an average value of these two to neutralize the reporting bias. We found the average difference between estimated and calculated yield is around 500 units with some atypical cases such as Terai and Dibrugarh. Turning now to the region wise average yield rate, we found averages ranging between 719 to 3156 kg/ha. It is expected given that different regions produce different graded tea. The variation of yield rate is wider between north and south India. The south performs relatively better than north. Within north, however, Assam is moderately advanced to West Bengal. The testing of hypothesis suggests that the sign of the correlation coefficient should be negative. This holds true for the plantation districts in northern region and the coefficient is significant for Darjeeling. Owing to the well-known premier quality of tea in Darjeeling the lower yield seems to be justified. On the other hand, spurious correlation is observed for some other regions. However, unless other critical aspects such as biological varieties of tea bushes, agro-climatic factors, institutional factors and intergradations of quality tea (beyond the scope of the present study) are clearly understood, some of the coefficients, especially in south India are difficult to explain.

We now turn to changes in productivity by sources of inputs over the last year (table 2.2) and it has the following results. First, the weather condition is a key factor behind change in productivity in West Bengal and Tamil Nadu. Secondly, none of the states in northern tea producing region consider mechanized harvesting as playing a significant role in the change in productivity. In

contrast, it is the second largest factor behind change in productivity for southern tea estates. Thirdly, while better management of land is the prime source of change in productivity in almost all districts in Assam, its effects are modest in West Bengal and Tamil Nadu. Finally, although the effects of fertilizer use and labour management on change in productivity vary widely across regions, their strength and direction are identical. Except Darjeeling, Darrang and Dibrugarh (to some extent) neither fertilizer use nor labour management show significant changes.

Table 2.2: Decomposition of sources of productivity change (%) for large growers

		Fertilizer	Labour	Land utilization	Mechanization	Weather
West Bengal	Darjeeling	20.83	22.08	13.75	2.08	41.25
	Terai	7.13	7.50	2.50	1.25	81.63
	Dooars	7.86	15.71	13.57	12.86	50.00
	Average	13.41	16.11	10.37	4.63	55.48
Assam	Sibsagar	2.65	3.78	51.83	0.22	41.52
	Darrang	21.25	13.75	34.92	10.25	19.83
	Dibrugarh	14.19	9.35	55.00	0.12	21.35
	Cachar	1.82	2.73	56.36	Nil	39.09
	Average	10.67	7.79	49.62	2.47	29.45
Tamil Nadu	Nilgiris	8.89	6.67	18.89	25.56	40.00

Trade unions and productivity for large growers

A profile of the workers' union in tea estates across the regions is given in table 2.3. Not unexpectedly, West Bengal faces more trade union related problems compared to other tea producing states in the country. Despite similarity in trade union memberships and activities (on an average) per garden, Tamil Nadu records supportive behaviour of the part of the trade unions compared to West Bengal and Assam, which faces moderate trouble in day to day activities related to tea production.

Table 2.3: Trade Union Activities

		Reported Cooperation (%)	Average number of TUs/Garden	Stoppage of production (days/year)
West Bengal	Darjeeling	84.6	1.3	7.2
	Terai	87.5	1.8	3.3
	Dooars	88.9	3.2	7.0
	Average	86.7	2.0	6.4
Assam	Sibsagar	100	1.1	4.0
	Darrang	94.4	1.1	Nil
	Dibrugarh	79.3	1.1	4.8
	Cachar	100	1.0	Nil
	Average	91.4	1.1	4.6
Tamil Nadu	Nilgiris	95.8	2.1	Nil

Productivity decomposition for small growers

Over the last two decades there has been a rapid expansion of the small tea growers (STGs) in the tea industry, and presently they play an important role by producing nearly 20 per cent of total output in India. As a matter of fact, the STGs cultivate wholly the green tea leaves which they primarily trade to bought-leaf factories (BLFs). The estimated production of this sector is given in table 2.4.

Table 2.4: Yield rate (kg/ha.) for small tea growers

	Yield rate of green tea leaves	Estimated yield rate of tea
West Bengal	16197	3483
Assam	14522	3123
Tamil Nadu	14325	3081

West Bengal as a whole record higher rate of yield but on average many other STGs across the country report similar turnaround annually. Albeit the small and large growers are not directly comparable, effort has been made to compare the yield of tea in terms of the estimated values. We continue to use 4.65 as the conversion ratio of green tea leaves to made tea. Accordingly, the yield rate for small growers is shown in the last column of table 2.4. Recognizing the dual forms of plantation in tea industry, the comparative analysis between yield rate of tea for large growers (as shown in table 2.1) and small growers (see table 2.4) points out that there is wide difference in yield rate in the northern region. Since the common view in tea industry is that the large growers are relatively quality concuss compared to small growers, the lower yield for the large growers is quite expected and justifiable. Surprisingly, in the southern part of country no perceptible difference is observed among them.

Sources of productivity change for small growers are reported in table 2.5. It shows that fertilizer use and weather conditions are the main causes of change in productivity in all the regions under study. While both use of fertilizers and weather conditions affect productivity change (explaining about 30 per cent), the former stands as a crucial factor explaining up to 70 per cent in Assam and Tamil Nadu. Excluding the climatic events which are beyond the control of growers, there are asymmetric implications regarding the effect of change in productivity between small and large growers. Large growers have traditionally used information which is costly to acquire. In contrast, small growers are the new entrants in the tea industry with lack of knowledge and resources. As a result, the latter group are likely to have lower capacity and poor orientation.

Table 2.5: Decomposition of sources of productivity change (%) for small growers

	Fertilizer	Labour	Land utilization	Mechanization	Weather
West Bengal	31.94	8.63	17.26	6.53	35.65
Assam	68.26	7.62	8.26	Nil	15.87
Tamil Nadu	76.25	2.21	1.76	5.59	14.19

Trade unions and productivity for small growers

The structure of small tea estates characterized by lower farm size, irregular employment patterns, and homogeneous class categories across owners and labour, etc. These features preclude unionization from playing crucial role in this sector. While interacting with the respondent small

growers during the survey we found that the small tea growers, particularly the teeny and marginal tea estate owners themselves are from the worker class as well. Except for a few cases, the rural agricultural characteristics are typically present in the small growers' sector.

2.2.2 Marketing practices

As argued previously, the tea industry has three types of primary stakeholders: big tea estates which mostly have garden factory, bought leaf and cooperative factories, and the small tea estates that exclusively supply tea leaves to bought leaf sector and sometimes to the garden factory. Accordingly, there are two types of final products: (a) green tea leaf as small growers' final product which is an intermediate product traded entirely in the local market, and (b) produced tea from the factory by large tea estates as well as brought leaf sector involving sophisticated trading practices. We offer separate discussions for each channel.

Marketing channels and prices for large growers and BLFs

There are three primary marketing channels for the tea manufactures, namely auction centre regulated by government sponsored nodal agencies, private agents and direct export. Importance of such channels for selling different graded tea (CTC and orthodox) as shares in total tea sales is portrayed in table 2.6. The general observation is that the sale of CTC tea via auction is much less in the northern tea producing regions compared to the southern counterpart. While Tamil Nadu sells above 85 per cent CTC through auction, the northern states limits the same to approximately 50 per cent. Based on our sample the orthodox tea, however, does not enter the auction market in West Bengal. It is marketed predominantly by private procurement. In other parts of the country we found fairly equal participation in auction and other channels for orthodox tea. Despite the fact that auction market plays a pivotal role for tea producers, an overwhelming part of Bengal's orthodox tea, which is mostly produced in the Darjeeling region, is exported directly. Export of Orthodox tea is also noticeable for southern producers (about 40 per cent).

Table 2.6: Product-wise sale of tea via marketing channels (%) for large growers and BLF

		CTC	Orthodox	Total
West Bengal	Auction	49.2	Nil	44.3
	Private / Ex-factory	50.7	47.0	52.4
	Export	0.1	53.0	3.4
Assam	Auction	55.1	65.2	56.1
	Private / Ex-factory	42.7	24.1	40.6
	Export	2.2	10.7	3.3
Tamil Nadu	Auction	87.1	45.6	66.0
	Private / Ex-factory	11.9	14.8	13.9
	Export	1.1	39.6	20.1

Except orthodox tea in West Bengal, the cost of production of different graded tea is does not vary largely across regions, although the cost of production of CTC varieties in general is slightly lower (around Rs. 10/kg) than orthodox varieties. Moreover, the cost of production is somewhat lower in southern part as compared to northern regions for every grades of tea. Again, except Bengal orthodox tea, the retail price is always higher than the wholesale price namely auction price, private price or export price. The retail price of orthodox tea is as more or less around

Rs. 100/kg more than the wholesale price in West Bengal. In other parts of the country the margins of retail price compared to wholesale price for each category are as follows: Rs. 15/kg, Rs. 28/kg and Rs. 13/kg for CTC in West Bengal, Assam and Tamil Nadu respectively. The corresponding figures for orthodox tea are Rs. 44/kg and Rs. 53/kg in Assam and Tamil Nadu. Worthwhile to mention, these are the profit margins of the middle men involved in the vertical chain of tea marketing. Now, the auction price is always lower than the prices offered by other markets, namely private and export markets. Among various reasons why the producers want to bypass auction, this may be an important one and receives special attention later.

Table 2.7: Product-wise cost, retail price and prices received via marketing channels

		West Bengal	Assam	Tamil Nadu
CTC	Cost of production	83	83	61
	Retail price	114	140	104
	Auction price	94	108	65
	Private price	100	112	86
	Export price	85	112	92
Orthodox	Cost of production	158	93	77
	Retail price	295	174	165
	Auction price	Nil	121	95
	Private price	392	130	101
	Export price	374	129	112

Analysis of auction market for large growers and BLFs

Indian tea manufacturers typically consider auction market as a benchmark to determine the price of their products. They are of the view that auction price plays the pivotal role in guiding retail prices. Nevertheless, at least 46 per cent of tea manufactures exclusively bypass auction to receive higher price for their tea (see table 2.8). This builds on associated problems with the auction market transaction, such as complexities, staggered sale and lack of transport or warehouse facilities. For instance, shipping of product via auction is a substantial challenge in Assam (35% of manufacturers consider it problematic). Similarly, around 25 per cent manufacturers bypass auction for quick sale of tea in Tamil Nadu, followed by West Bengal (17.2 per cent).

Table 2.8: Reasons for bypassing auction market

	West Bengal	Assam	Tamil Nadu
Proper price	54.3	46.0	62.4
Avoid complexities	8.6	4.1	5.0
Quick sale	17.2	Nil	24.9
Lack of transparency	Nil	4.1	Nil
Shipping problem (like lack of transport / warehouse) plus proper price	Nil	17.6	Nil
Proper price, quick sale and shipping problem	12.9	16.2	Nil
Not yet bypassed	6.9	12.05	7.7

We enquired about the level of satisfaction related to auction market transactions across regions. The respondents ranked it within a score of 100 points, higher points implying higher satisfaction. As expected, the average score is 64 in southern part of the country and it is about 58

for the northern states. Despite the difference in intensity to bypass auctions among the two northern states, perceptions do not differ at all – all respondents believe in the efficacy of tea auctions.

Marketing channels and prices for small growers

Garden factory plays negligible role for marketing green tea leaves produced by small growers in West Bengal and Tamil Nadu. But in Assam, it is equally important as bought leaf factory and private agents. The role of private agents is negligible in Tamil Nadu since the entire produce is sold to either bought leaf sector or garden factory. Since there is no auction channel for marketing green tea leaves, one important step for the small tea growers in some regions is to set up cooperatives to facilitate marketing and retain better bargaining capacity. Even though the role of small growers' cooperative, usually termed as self help group, is not limited merely to bargaining about prices, market promotion is till very crucial objective for the cooperative.

Table 2.9: Proportion of sale via marketing channels for small growers

	West Bengal	Assam	Tamil Nadu
Bought leaf factory	66.3	26.7	88.4
Garden factory	4.7	35.3	11.6
Private agent	29.0	38.0	Nil

Marketing channels determine price in a non-uniform manner. For instance, price received from bought leaf sector is usually lower by Rs. 5/kg in West Bengal compared to other parts of the country during both peak and lean seasons. Except private agents for West Bengal, the seasonal price variation is restricted to around ± Re. 1/kg. The situation is quite opposite in other places such as Assam and Tamil Nadu.

Table 2.10: Season-wise cost and prices received via marketing channels

		West Bengal	Assam	Tamil Nadu
Cost of production		7.3	7.9	8.0
Peak season	BLF price	10.4	15.8	16.2
	Garden factory price	13.8	14.5	13.8
	Private agent price	14.0	15.5	13.5
Lean season	BLF price	9.6	15.7	15.9
	Garden factory price	12.3	14.0	13.3
	Private agent price	10.2	15.3	13.3

2.2.3 Reorganization plans

The reorganization plans are based on the suggestions we accumulated from all stakeholders in the tea industry. These seem deeply rooted in the existing condition of the estates with regard to financial viability, access to technology, market promotion and labour management. So, given the legal identity of the estate, these are the four basic issues that carry significance in view of suggested reorganization plans. There is one more aspect that should not be ignored. Inflow of foreign capital may not only facilitate investment in big tea estates, but also help to ease shortage of capital or better technology for the industry as a whole.

Comprehensive reorganization plans for large growers

This sub-section offers the distribution of sample tea estates as per their present status over financial, technical, marketing and labour issues, and outlines the responses with regard to promotional measures on these aspects. As far as financial viability is concerned, we observe it as sufficient for more than 70 per cent estates in Assam and Tamil Nadu (see table 2.6). A completely different picture is found in West Bengal where two-thirds of all producers face insufficient financial status. The estates that need financial capital for development, responded in favour of access to credit and government subsidy with uniform preferences. Conversely, the demand for financial capital via credit in Assam is roughly the same as financing via subsidy in Tamil Nadu.

Table 2.11: Reorganization plan on financial issues

	Sufficient finance	Insufficient finance	
		Credit	Subsidy
West Bengal	33.4	33.3	33.3
Assam	72.6	21.9	5.5
Tamil Nadu	72.4	6.9	20.7

The technical aspect covers multi-dimensional measures such as uprooting and re-plantation, pest control, drainage and water logging, and improved machinery. We found that drainage, water-logging and pest control are not huge problems (and sometimes not problems at all). The main problems are uprooting and re-plantation and improved machinery (see table 2.7). Such problems however are not uniformly distributed across the regions. There is apparent dissimilarity in the problems faced in north and south. While the uprooting and re-plantation is the main problem in north, the south faces problems with improved machinery. The problem of improved machinery is just 40 per cent in Bengal and about 20 per cent in Assam respectively. Likewise, the problem of uprooting and re-plantation in Tamil Nadu is around 40 per cent. Among smaller problems like drainage and water logging, and pest control all of these seem negligible for Assam.

Table 2.12: Reorganization plan on technical issues

	Uprooting and re-plantation	Pest control	Drainage and water logging	Improved machinery
West Bengal	53.4	6.6	Nil	40.0
Assam	66.1	3.7	11.3	18.9
Tamil Nadu	38.9	5.5	Nil	55.6

Indian tea industry includes time-honoured tea producing units, namely the conventional big tea estates set up during early colonial periods. As an established sector the industry inevitably has the modern marketing arrangement like nationwide tea auction centres. In addition, the private marketing channels at national and international levels are well functioning within individual producers' network. Nevertheless, the study observes that a significant portion of production units is not satisfied with the current marketing strategies, particularly in the northern part (see table 2.8). The southern units, however seems quite comfortable with the present market systems (above 60 per cent producers are satisfied with existing marketing strategy). As may be seen in the table, the respondent producers seem to be felt that their unsatisfactory sale of product is founded on mainly three reasons: lack of ability to maintain the quality, incapability to introduce new packaging for

direct sale and poor marketing infrastructure. Among these three reasons, however, the market promotion via packaging for direct sale does not prominent at all, except for Assam. Other two together constitute around 35 to 45 per cent producers' misery about existing marketing of their product.

Table 2.13: Reorganization plan on marketing issues

	Satisfied with existing marketing strategy	Unsatisfactory marketing		
		Quality control	Packaging and direct sale	Marketing infrastructure
West Bengal	48.0	20.0	8.0	24.0
Assam	36.3	30.0	17.5	16.3
Tamil Nadu	62.1	17.2	3.4	17.2

The responses towards proper management of labour has five fundamental categories: education and training of the labourers, housing and amenities, incentives for better work, control of absenteeism and alcoholism, and overall labour supply. Table 2.9 shows that the difficulty to provide adequate housing and amenities is a big challenge for more than 60 per cent estates in West Bengal. Likewise, supply of labour is rather irregular and inconsistent for tea estates in Tamil Nadu. Labour supply is hardly a problem in the north. Adequate housing and basic amenities are fairly standard practices, but the coverage differs across regions: most coverage in West Bengal at 60 per cent, followed by Assam at 40 per cent and Tamil Nadu at 20 per cent. However, absenteeism and alcoholism accounts for 40 per cent of work place hazard in Assam vis-à-vis 20 per cent elsewhere.

Table 2.14: Reorganization plan on labour issues

	Education and training	Housing and amenities	Alcoholism and absenteeism	Work incentives	Labour supply
West Bengal	15.4	61.5	3.9	15.4	3.8
Assam	12.0	38.8	22.3	22.4	4.5
Tamil Nadu	4.0	24.0	4.0	16.0	52.0

Scope of foreign direct investment plan for large growers

Analysis of the sample based on responses regarding reorganization plan through entering joint ventures or accepting foreign direct investments returns clear preferences especially on the part of big tea estates. It is believed that it has the potential to open up multidimensional facilities in tea sector. First, FDI has its the usual direct benefits that cover lack of capital resources and better technology. Next, the flow of external resources will combat other shortcomings particularly management of labour force by renegotiating facilities. Finally, a proper plan for FDI such as introducing new capital as selective strategy (i.e., priority based investment in sick estates with clearly defined limits) will improve competition within the industry. Perceptions about various forms of foreign investments, namely joint ventures, buy-outs and lease are available in table 2.10. Given a hypothetical choice FDI ranks at the top, although the mode of preferred operation is joint venture in all the regions. Equal emphasis is given to the lease mode of investment in West Bengal too. Respondents do not seem to prefer lease in Tamil Nadu compared to complete buy-outs in West Bengal. Assam, however, prefers joint venture to lease and buyouts rank as the last option.

Table 2.15: Preferred plan on foreign investment

	Joint venture	Buy out	Lease
West Bengal	1	-	1
Assam	1	3	2
Tamil Nadu	1	2	-

Comprehensive reorganization plan for small growers

Apart from the customary issues, namely financial, technical, marketing and labour aspects, the small tea growers also have to worry regularly (more than proportionately to mid-sized or large gardens) about the legal side of their business. Since distribution and conversion of land is a state matter under Indian federation, any permanent conversion of land characteristic (common for tea plantations) requires no objection certificate from provincial governments. Given the complexities of property right issues and status of land, it is clearly not straightforward. However, recognizing the importance of small growers in the tea industry, state governments have taken some initiatives in this regard. But it continues to be problematic in regions like West Bengal. Table 2.11 shows that about 33.5 per cent (31.7 per cent for all issues including legal aspect plus 1.7 per cent for exclusive legal issue) of small tea estate face problems with legal identity. More generally, it argues that limited access to technology is an overwhelming problem in small growers' sector in the country. The relative weightage of the problem relating to technical issue ranges from a low 90.1 per cent in Tamil Nadu to 95.6 per cent in Assam and 98.3 per cent in West Bengal. Interestingly, the financial issue alone is not a problem anywhere in our sample regions. In fact, it is not at all a problem in the southern part. It is deemed as a problem in the northern part only, particularly in West Bengal. On the whole, West Bengal seems to be plagued by more problems than other tea producing regions (the average score related to problems is 32 per cent for West Bengal).

Table 2.16: Reorganization plan for small growers

	Financial issue	Technical issue	Labour issue	Marketing issue	Legal issue	Technical plus any other issue	All issues
West Bengal	Nil	13.3	Nil	Nil	1.7	53.3	31.7
Assam	Nil	65.6	4.4	Nil	Nil	30.0	Nil
Tamil Nadu	Nil	88.6	7.1	1.4	1.4	1.5	Nil

Section - 3

Concluding remarks

The pricing pattern in the tea industry in India along with the viability issues received some attention previously. This project offers a much more comprehensive analysis on the present status and future opportunities facing the tea industry spanning north and south of the country. In this respect, we accumulated a huge amount of data from a total of 142 large tea gardens, 227 small tea growers and 44 bought leaf factories in West Bengal, Assam and Tamil Nadu. The rich data set provides a plethora of information that we have strived to analyse in a systematic manner. We provided description of large tea estates vis-à-vis smaller tea plantations and the conditions as well as activities of the so-called bought leaf factories. In the process, it seemed to us that information does not flow out easily from the sector, in particular from stakeholders in the north. Information is

both instantaneous and rich when it comes to producers and related stakeholders including authorised public entities in the south. Nonetheless, we still gathered adequate range and depth of information that helps to understand the pricing patterns across orthodox and non-orthodox varieties of tea, the export prospects, domestic sales prospects, activities spread over various marketing channels, such as private wholesale traders, auction markets, direct export etc.

We reported various interesting patterns across tea producers in West Bengal, Assam and Tamil Nadu and offered predictions on how some of the variables listed above would behave. Interestingly, one of the important component of our analysis has been the forecasting of exports of various grades of Indian tea. Fortunately, the first regression analysis we conduct shows that the growth of export share of Indian tea to the east European countries is positive and robust. This is certainly a turnaround from the late 1990s when the market for Indian tea in the erstwhile USSR countries dwindled both due to breaking up of the bloc as well as poor quality related performance of the Indian tea. There are several anecdotal evidences regarding export-quality Indian tea which suggests that many companies and the quality control departments have worked poorly towards maintaining and upholding the quality for which Indian tea drew both premiums and accolades in the world market. It is not surprising then that the voids in Asia, Europe, Africa and East European countries has been taken up by strong competitors of Indian tea, particularly Sri Lanka and China. In this connection, note that, we provide export patterns and growth rates for (mainly) the non-orthodox tea produced by several other countries across the world. These include production and export by Sri Lanka, China, Malaysia, Malawi, Bangladesh, etc.

For a detailed analysis of the production patterns and related issues for India, we used random sampling of several large and small units from the three states and regions therein primarily known for quality and high yield of tea. We have used the stratified random sampling procedure. It has been used for investigating how the stakeholders, including growers and manufacturing units respond to changing situations in the tea business. To begin with, the major tea producers in India are divided into three different regional clusters namely West Bengal, Assam and Tamil Nadu. The production units with valid license to produce and also participate in auction markets were then considered for sampling within each individual region. The above evaluations on the productivity and performance of units were strictly based on the samples we collected from these units spread over the north and the south. The reorganization plans discussed in the text has also been a result of detailed inquiry of these units. The important issues of credit constraints, quality maintenance, technology etc., received substantial emphases in our discussion. For example, again drawing from anecdotal evidence we gather that some of the basic machineries used in processing green leaves in typical garden factories use antiquated technologies and still cannot be replaced in the absence of better machineries. Efforts have been made to build technologically advanced equipments to enhance productivity, but not with visible success. Under the circumstances, joint ventures with foreign firms seem a popular choice among large estates. Since, smaller firms are not affected by technological or marketing issues as much as large quality tea producers, the preferences for foreign collaborations stay within fairly limited circles. This duality in the tea production sector may pose serious hindrances for future improvements of the industry as a whole. Moreover, a captive and expanding domestic market without widespread concern for quality might affect initiatives for R&D

and innovative strategies for improvement negatively. While some of the other issues relating land utilization and labour market conditions specific to the tea industry are discussed separately, the present report identified several finer points that are amenable to policy advocacy from concerned authorities. The large number of tables and figures provide testimonials to the broad findings offered in this report and may be taken up for direct policy interventions and planning on the part of the concerned offices in the country.

APPENDIX

A-1: Test Statistic for Forecasting

Notes: Model – Lin: Linear; Gro: Growth; b0=constant; b1=slope Dependent: Dependent variable; Rsq: Goodness of Fit; DF: Degrees of Freedom; F: F-Statistic for the model chosen.

Independent Variable: Time

N_P = North India Tea Production

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
N_P	LIN	.961	30	742.67	.000	386998	10312.3
N_P	GRO	.963	30	774.95	.000	12.9055	.0188

S_P = South India Tea Production

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
S_P	LIN	.926	30	376.33	.000	109176	3873.20
S_P	GRO	.910	30	304.88	.000	11.6582	.0230

ALL_P = All India Tea Production

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
ALL_P	LIN	.972	30	1025.89	.000	496174	14185.5
ALL_P	GRO	.969	30	947.55	.000	13.1585	.0197

N_Y = North India Tea Yield Rate

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
N_Y	LIN	.595	30	44.03	.000	1415.71	9.6876
N_Y	GRO	.605	30	45.88	.000	7.2559	.0063

S_Y = South India Tea Yield Rate

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
S_Y	LIN	.086	30	2.81	.104	1829.93	7.6839
S_Y	GRO	.105	30	3.54	.070	7.5002	.0043

ALL_Y = All India Tea Yield Rate

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
ALL_Y	LIN	.472	30	26.81	.000	1494.03	9.5339
ALL_Y	GRO	.487	30	28.43	.000	7.3078	.0060

N_AU = North India Auction Sale

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
N_AU	LIN	.401	30	20.10	.000	254399	3646.54
N_AU	GRO	.428	30	22.40	.000	12.4268	.0131

S_AU = South India Tea Auction Sale

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
S_AU	LIN	.614	30	47.63	.000	89123.9	1925.82
S_AU	GRO	.635	30	52.12	.000	11.4136	.0164

All_AU = All-India Tea Auction Sale

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
ALL_AU	LIN	.584	30	42.13	.000	343523	5572.37
ALL_AU	GRO	.585	30	42.26	.000	12.7388	.0141

ALL-AUP = All India Tea Auction Price

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
ALL_AUP	LIN	.866	30	193.66	.000	6.7069	2.0408
ALL_AUP	GRO	.878	30	216.67	.000	2.5417	.0606

N_EQ = North India Tea Export Quantity

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
N_EQ	LIN	.728	30	80.38	.000	180900	-3029.1
N_EQ	GRO	.736	30	83.49	.000	12.1410	-.0237

S_EQ = South India Tea Export Quantity

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
S_EQ	LIN	.570	30	39.74	.000	32951.3	2096.23
S_EQ	GRO	.548	30	36.31	.000	10.5602	.0297

ALL_EQ = All India Tea Export Quantity

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
ALL_EQ	LIN	.167	30	6.01	.020	213851	-932.88
ALL_EQ	GRO	.151	30	5.34	.028	12.2682	-.0046

ALL_EP = All India Tea Export Price

Dependent	Model	Rsq.	DF	F	Sigf.	(b0)	(b1)
ALL_EP	LIN	.907	30	290.90	.000	3.7492	3.2493
ALL_EP	GRO	.905	30	285.87	.000	2.7391	.0678

NICTCP = Output of CTC tea in North India; NIORTP = Output of Orthodox tea in North India

NICTCAP = Unit price of CTC tea in North India; NIORTAP = Unit price of Orthodox tea in North India

SICTCP = Output of CTC tea in South India; SIORTP = Output of Orthodox tea in South India

SICTCAP = Unit price of CTC tea in South India; SIORTAP = Unit price of Orthodox tea in South India

ALCTCP = Output of CTC tea in All India; ALORTP = Output of Orthodox tea in All India

ALCTCAP = Unit price of CTC tea in All India; ALORTAP = Unit price of Orthodox tea in All India

Dependent	Model	Rsq.	DF	F	Sigf.	(b_0)	(b_1)
NICTCP	LIN	.970	23	744.83	.000	301971	14052.4
	GRO	.957	23	509.16	.000	12.676	.0301
NIORTP	LIN	.777	23	80.09	.000	130772	-4009.8
	GRO	.787	23	85.21	.000	11.877	-.0536
NICTCAP	LIN	.838	23	119.05	.000	12.778	2.5096
	GRO	.850	23	130.00	.000	2.860	.0647
NIORTAP	LIN	.846	23	126.15	.000	12.562	3.2035
	GRO	.860	23	141.79	.000	2.977	.0683
SICTCP	LIN	.953	23	462.17	.000	51983	5829.62
	GRO	.912	23	237.48	.000	11.031	.0507
SIORTP	LIN	.572	23	30.71	.000	66346	-1351.2
	GRO	.573	23	30.87	.000	11.124	-.0280
SICTCAP	LIN	.580	23	32.70	.000	17.790	1.4427
	GRO	.662	23	45.11	.000	2.922	.0461
SIORTAP	LIN	.657	23	44.09	.000	15.529	1.8581
	GRO	.735	23	63.86	.000	2.885	.0539
ALCTCP	LIN	.982	23	1243.07	.000	353888	19885.8
	GRO	.962	23	574.8	.000	12.853	.0340
ALORTP	LIN	.787	23	85.17	.000	197150	-5362.9
	GRO	.808	23	96.75	.000	12.258	-.0432
ALCTCAP	LIN	.797	23	90.05	.000	14.569	2.2090
	GRO	.816	23	102.08	.000	2.885	.0600
ALORTAP	LIN	.794	23	88.89	.000	15.962	2.4490
	GRO	.811	23	98.68	.000	2.991	.0596

WS_WE = Relative import demand as part of world demand in West Europe

IS_WE = Actual share of Indian supply in import demand in West Europe

WS_EE = Relative import demand as part of world demand in East Europe

IS_EE = Actual share of Indian supply in import demand in East Europe

WS_NA_W = Relative import demand as part of world demand in North America & West Indies

IS_NA_W = Actual share of Indian supply in import demand in North America & West Indies

WS_WA = Relative import demand as part of world demand in West Asia

IS_WA = Actual share of Indian supply in import demand in West Asia

WS_OA = Relative import demand as part of world demand in Other Asia

IS_OA = Actual share of Indian supply in import demand in Other Asia

WS_AF = Relative import demand as part of world demand in Africa

IS_AF = Actual share of Indian supply in import demand in Africa

WS_A_O = Relative import demand as part of world demand in Australia & Oceania

IS_A_O = Actual share of Indian supply in import demand in Australia & Oceania

Dependent	*Model*	*Rsq.*	*DF*	*F*	*Sigf.*	*(b_0)*	*(b_1)*
WS_WE	LIN	.743	33	95.58	.000	17.4449	-.3612
	GRO	.859	33	200.35	.000	2.9040	-.0320
IS_WE	LIN	.735	33	91.32	.000	32.2735	-.6140
	GRO	.736	33	92.03	.000	3.4930	-.0273
WS_EE	LIN	.579	33	45.43	.000	3.8030	.1584
	GRO	.617	33	53.20	.000	1.3714	.0261
IS_EE	LIN	.889	33	263.79	.000	99.6797	-2.1363
	GRO	.838	33	170.54	.000	4.7494	-.0401
WS_NA_W	LIN	.460	33	28.15	.000	7.2738	-.1233
	GRO	.641	33	58.97	.000	1.9826	-.0228
IS_NA_W	LIN	.080	33	2.87	.100	7.7069	-.0806
	GRO	.032	33	1.10	.301	1.8771	-.0088
WS_WA	LIN	.087	33	3.14	.086	5.4511	.0376
	GRO	.140	33	5.39	.027	1.6642	.0072
IS_WA	LIN	.182	33	7.32	.011	29.6685	-.2613
	GRO	.174	33	6.95	.013	3.3772	-.0107
WS_OA	LIN	.484	33	30.92	.000	5.3048	.0933
	GRO	.491	33	31.89	.000	1.6624	.0145
IS_OA	LIN	.407	33	22.62	.000	16.4195	-.4578
	GRO	.478	33	30.21	.000	2.6761	-.0458
WS_AF	LIN	.039	33	1.35	.254	6.8043	.0274
	GRO	.053	33	1.84	.184	1.8978	.0041
IS_AF	LIN	.632	33	56.60	.000	25.4170	-.7301
	GRO	.671	33	67.20	.000	3.5824	-.0809
WS_A_O	LIN	.858	33	199.23	.000	2.4994	-.0641
	GRO	.951	33	634.85	.000	1.0348	-.0480
IS_A_O	LIN	.001	33	.03	.865	7.5121	.0192
	GRO	.030	33	1.02	.319	2.0077	-.0122

SIUK = Supply share of Indian tea in total tea import by UK

SIUSSR = Supply share of Indian tea in total tea import by USSR

SIPOL = Supply share of Indian tea in total tea import by Poland

SIUSA = Supply share of Indian tea in total tea import by USA

SIUAE = Supply share of Indian tea in total tea import by UAE

SIAFGN = Supply share of Indian tea in total tea import by Afghanistan

SIAUS = Supply share of Indian tea in total tea import by Australia

Dependent	*Model*	*Rsq.*	*DF*	*F*	*Sigf.*	*(b_0)*	*(b_1)*
SIUK	LIN	.668	33	66.25	.000	31.3615	-.5783
	GRO	.682	33	70.62	.000	3.4528	-.0257
SIUSSR	LIN	.783	33	119.38	.000	99.2131	-1.9234
	GRO	.705	33	78.98	.000	4.7206	-.0349
SIPOL	LIN	.219	33	9.23	.005	51.1882	-.8005
	GRO	.084	33	3.01	.092	3.8152	-.0227
SIUSA	LIN	.010	33	.33	.569	6.4277	-.0283
	GRO	.001	33	.03	.872	1.6679	-.0015
SIUAE	LIN	.120	33	4.52	.041	56.7542	.8749
	GRO	.111	33	4.11	.051	3.9730	.0133
SIAFGN	LIN	.803	33	134.87	.000	84.1417	-2.7962
	GRO	.752	33	100.13	.000	5.1231	-.1352
SIAUS	LIN	.072	33	2.58	.118	7.4425	.2172
	GRO	.009	33	.29	.594	2.1621	.0051

RSWPSL = Ratio of world production share between India and Sri Lanka

RSWPBN = Ratio of world production share between India and Bangladesh

RSWPKN = Ratio of world production share between India and Kenya

RSWPID = Ratio of world production share between India and Indonesia

RSWPMA = Ratio of world production share between India and Malawi

RSWCH = Ratio of world production share between India and China

RESSL = Ratio of world export share between India and Sri Lanka

RESBN = Ratio of world export share between India and Bangladesh

RESKN = Ratio of world export share between India and Kenya

RESID = Ratio of world export share between India and Indonesia

RESMA = Ratio of world export share between India and Malawi

RESCH = Ratio of world export share between India and China

REPSL = Ratio of unit export price between India and Sri Lanka

REPBN = Ratio of unit export price between India and Bangladesh

REPKN = Ratio of unit export price between India and Kenya

REPIN = Ratio of unit export price between India and Indonesia

REPMA = Ratio of unit export price between India and Malawi

Dependent	*Model*	*Rsq.*	*DF*	*F*	*Sigf.*	*(b_0)*	*(b_1)*
RSWPSL	LIN	.215	32	8.79	.006	2.6032	.0166
	GRO	.253	32	10.87	.002	.9459	.0062
RSWPBN	LIN	.001	32	.05	.833	15.7080	-.0047
	GRO	.000	32	.0074	.932	2.7479	-.0001
RSWPKN	LIN	.841	32	169.71	.000	8.0924	-.1778
	GRO	.914	32	337.95	.000	2.1573	-.0356
RSWPID	LIN	.309	32	14.33	.001	6.2338	-.0388
	GRO	.290	32	13.04	.001	1.8221	-.0066
RSWPMA	LIN	.147	32	5.51	.025	17.7844	.0974
	GRO	.144	32	5.38	.027	2.8767	.0049
RSWPCH	LIN	.761	32	101.69	.000	2.3506	-.0422
	GRO	.824	32	149.75	.000	.8770	-.0252
RESSL	LIN	.541	32	37.66	.000	1.2828	-.0180
	GRO	.626	32	53.51	.000	.2838	-.0198
RESBN	LIN	.196	32	7.80	.009	6.3511	.1617
	GRO	.163	32	6.21	.018	1.9208	.0137
RESKN	LIN	.844	32	172.79	.000	3.8639	-.1108
	GRO	.932	32	439.92	.000	1.5616	-.0634
RESID	LIN	.637	32	56.13	.000	4.4129	-.0899
	GRO	.622	32	52.74	.000	1.4946	-.0300
RESMA	LIN	.711	32	78.63	.000	8.3066	-.1330
	GRO	.739	32	90.47	.000	2.1292	-.0213
RESCH	LIN	.764	32	103.63	.000	3.2948	-.0906
	GRO	.887	32	252.28	.000	1.2928	-.0527
REPSL	LIN	.186	32	7.32	.011	1.2211	-.0078
	GRO	.202	32	8.12	.008	.2038	-.0078
REPBN	LIN	.002	32	.08	.784	1.6700	-.0012
	GRO	.000	32	.0034	.954	.4917	-.0002
REPKN	LIN	.034	32	1.13	.296	1.1846	.0036
	GRO	.042	32	1.39	.246	.1576	.0030
REPIN	LIN	.577	32	43.61	.000	1.2240	.0226
	GRO	.585	32	45.17	.000	.2134	.0144
REPMA	LIN	.341	32	16.58	.000	1.5486	.0341
	GRO	.396	32	21.02	.000	.4223	.0173

Acknowledgements: This study is supported by the National Tea Research Foundation (NTRF), Tea Board of India (Government of India). The research team likes to thank Dibyendu Maiti (former co-investigator), Ritwik Sasmal, Priyanjali Sarker, Jayanti Ghosh, Anindita Majumder and Triparna Sinha, for excellent research support. We are indebted to many officials of the Tea Board in West Bengal, Assam and Tamil Nadu for their cooperation and guidance. We have benefited from two seminars organized by the NTRF and incorporated relevant comments. Thanks are also due to several officials in most tea estate-units we surveyed without whose active support this project could not be successfully completed.