

Economic Determinants of Newsprint Consumption in India: A Time Series Analysis

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Postscript

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I. Introduction

As India celebrates 60 years of its independence, it is appropriate to recall that the press in India was among the key role players in India's successful struggle for independence. Since independence, the press has been helping to advance several objectives nationwide including democracy and good governance. In turn, aspiration of the people of India for socio-economic development, a stronger democracy and better governance has ensured continued freedom of the press itself. Over the years, the press has grown enormously in both depth and spread. Although the story of the growth of the press in India is fascinating we are interested here in the core raw material used by the press — newsprint — a category of paper used for printing newspapers.

The share of newsprint in the total cost of production of newspapers is likely to vary across newspapers and over time. However, the fact that this share for the *Hindustan Times* group of newspapers in India is currently around 40 to 50 per cent shows that newsprint is a major material input into production of newspapers (HT Media Ltd, 2006). One might therefore expect that there would exist in the public domain quantitative studies that would have rigorously analysed economic determinants of consumption of newsprint in India. However, our literature search reveals that there are no such studies. It is possible that our search has not been exhaustive but, even so, we expect this study to be of interest to India's print media; newsprint producers, exporters and importers; policy makers; and market analysts and economists who need estimates of responsiveness (elasticity) of newsprint consumption to changes in economic determinants. We also harbour a hope that this study encourages further research on the subject.

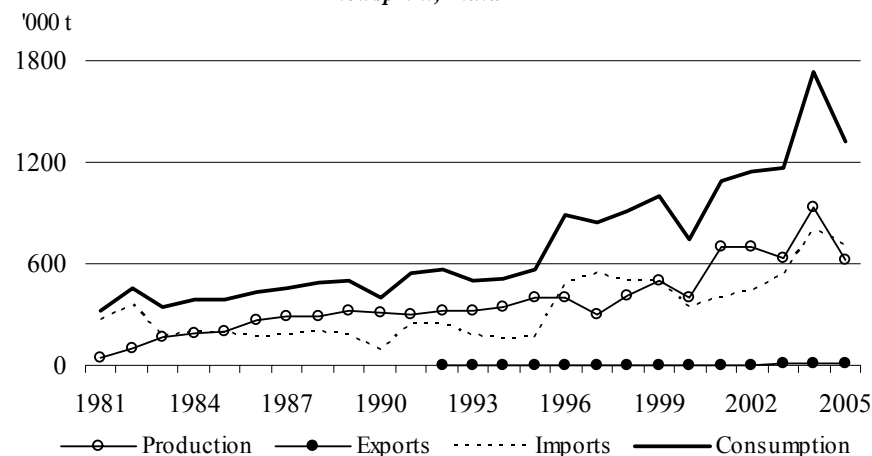
The next section of the study provides an overview of production, trade and consumption of newsprint in India. With this background, subsequent sections present a review of literature, details of estimation procedure and results of a time series econometric model of consumption of newsprint, forecasts of newsprint consumption, and, finally, the concluding comments.

II. Production, trade and consumption of newsprint

One of the reasons for the paucity of analyses of newsprint consumption in India is inadequacy of data availability. For this study we could get consistent data for all variables only for the 25-year period of 1981 to 2005. However, at places the study deals with sub-periods and selected years of the period, and occasionally extends to years outside the period.

Over the 25 years, production, imports, exports and consumption of newsprint in India have all had rising trends (figure 1). Computed trend growth rates indicated that the average annual growth rate of production was 7.6 per cent, imports 5.4 per cent and consumption 6 per cent. In the first half of the period, the consumption growth rate was 3.8 per cent a year; the rate more than doubled to 8.8 per cent in the second half, indicating acceleration in newsprint consumption by India's newspapers.

Figure 1: Production, exports, imports and consumption of newsprint, India



Newsprint is an essential input into production of printed newspapers. Hence, to understand the growth in consumption of newsprint, it is useful to look at the development of printed newspapers in India. Table 1 shows how the numbers of newspapers, their circulation and the languages in which they are published have all increased over time. The rise in circulation of newspapers from 54 copies per 1000 persons in 1976 to 164 copies in 2005-06 summarise the changes. The statistics confirm that printed newspapers in India have grown in both depth and spread. Factors contributing to this include the increases in literacy, income and the people's choice to acquire knowledge and information from newspapers. The increased demand for and supply of newspapers in India has led to growth in its demand for newsprint.

Table 1: The press in India: key statistics

	Newspapers ^a No. of titles	Circulation ^b No. of copies	Languages ^c No.
1976	13 320	34 075 000	68
1986	23 616	64 051 000	92
1996	42 388	89 434 000	100
2006 ^d	62 483	180 738 611	123

Notes: **a** Newspapers are printed (including cyclostyled) periodical works containing public news or comments on public news, as at 31 March. Their periodicity can be daily, tri- and bi-weekly, weekly, fortnightly, monthly and other.

b Circulation is average number of copies sold and distributed free per publishing day. The circulation numbers may be underestimates because not all newspapers submit their reports by due dates.

c Includes English, main languages recognised in the Constitution of Republic India and other languages and dialects of India.

d The year ending 31 March. Other years are calendar years.

Source: Registrar of Newspapers for India (2007).

Turning to supply of newsprint, there are two sources of it: domestic newsprint manufacturing industry and imports. We deal with these sources in turn, based mainly on the information from FAO (2007), Registrar of Newspapers for India (2007), Central Pulp and Paper Research Institute (2005) and Jaakko Poyry (2002). Prior to 1956, India did not have any newsprint mill. Hence, imports alone met the demand for newsprint in India. It was only in early 1956 that the first mill, owned by government, came to produce newsprint in India. Since then additional government-owned and many private mills had sprung up. At present, the newsprint manufacturing industry consists of 73 mills. Five of the mills are “large”, and these account for about one-third of the total installed newsprint capacity in India. However, by current international trends it is debatable whether all five mills can be regarded as “large.” The industry, consisting of many small mills that use obsolete technology and machines, is further characterised by relatively high costs of papermaking fibre, energy and transport. In addition, the quality of newsprint produced tends to be poor. In a nutshell, India’s newsprint manufacturers, particularly its medium to small mills, have difficulty competing against imports. The problem is however not confined to newsprint industry; it extends to India’s several manufacturing industries — a lingering result of government policies in the past (Kochhar, et al. 2006). As a result of the introduction of economic liberalisation policies and other developments since early 1990s, the industry situation is improving but not fast enough to keep pace with the rising demand for newsprint by the rapidly expanding newspaper industry.

Notwithstanding the problem of competing against newsprint imports, India has been exporting newsprint on a regular basis since early 1990s. But the quantities have been relatively tiny. In contrast, imports have been huge. Not surprisingly, the gap between imports and exports has widened over time (figure 1).

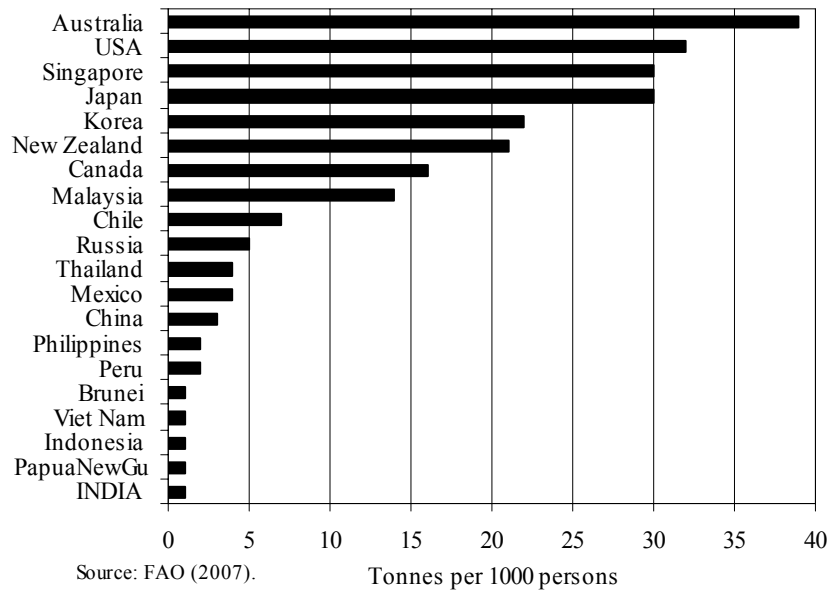
India turned into a significant net importer of newsprint in 2005, when it was the world’s fifth largest importer of newsprint. The top four world importers in descending order were the United States of America, the United Kingdom, Germany and China. Leading suppliers of newsprint to India were Canada and Russia, together accounting for 60-70 per cent of India’s total imports.

Tariff duty on imports of newsprint (tariff item 4801) into India has been lower than that on other categories of paper. During the second half of 1995, the duty on newsprint imports was 10 per cent and, at present, it is zero. At the same time, highly regulated and cumbersome bureaucratic procedures that governed the imports have now been removed and/ or greatly simplified. The reduction in tariff duty and the simplified import procedures would have had the effect of lowering the price of imported newsprint and the related transaction costs for newspaper industry. These changes would have also created more competition in the market place for India’s domestic newsprint manufacturing industry which, in the long run, may benefit it.

In 2005, India’s net imports satisfied 53 per cent of its total consumption of 1.3 million tonnes of newsprint. To put India’s newsprint consumption in perspective, Australia’s newsprint consumption for the same year was 0.8 million tonne and Korea’s 1.0 million tonne. Continuing with international comparison: India was the third largest consumer of newsprint in Asia, with Japan the second largest at 3.9 million tonnes and China the largest at 4.1 million tonnes.

On per capita basis however, India newsprint demand presents a very different picture. Figure 2 shows average consumption of newsprint per 1000 persons in India and in member countries of the Asia Pacific Economic Cooperation (APEC) — a regional group of the developing and the developed economies. It is clear from the figure that per capita consumption in India was among the lowest, whereas it was highest in Australia and USA.

Figure 2: Annual consumption of newsprint, 2005



The low per capita consumption in India signals that if India — the second most populous country in the world — sustains its fast pace of socio-economic development, its newspaper industry will grow further, inducing a greater consumption of newsprint. In that event, India will emerge as a major consumer of newsprint on per capita and aggregate bases. In contrast, since the late 1980s, consumption of newsprint in USA has been falling in both aggregate and per capita terms and, from 2000, the fall has accelerated. Hetemaki and Obersteiner (2002) explain that the fall in newsprint consumption in USA was on account of the decline in circulation of newspapers there. (The decline in circulation is due partly to electronic media replacing the print media.) Notwithstanding this, in 2005, consumption of newsprint per 1000 persons in USA averaged 32 tonnes and in India only 1 tonne. It suggests enormous scope exists in India for increase in its newsprint consumption and underscores the importance of understanding the determinants of newsprint demand. This paper seeks to address this issue.

As explained in Bhati and Jha (2006) India's consumption and imports of paper and paperboard, including newsprint, are likely to rise significantly in the future. In addition, India is also highly likely to significantly increase its imports of papermaking fibres such as pulp, recovered paper and pulpwood.

III. Review of literature and the approach to modelling

Although we did not find any time series studies on consumption of newsprint in India, there were several studies on other countries. Examples of these include Edquist and Morris (1985) and Love, Yainshet and Grist (1999) on Australia; Baudin and Westlund (1985), Zhang and Buongiorno (1997) and Hetemaki and Obersteiner (2002) on USA; and Baudin and Lundberg (1987) and Simangunsong and Buongiorno (2001) on selected developed and developing countries, and Chas-Amil and Buongiorno (2000) on the European Union and its member countries. Authors such as Chas-Amil and Buongiorno have noted that they were compelled to using pooled cross-sections of countries' time-series data to overcome the limitations that short time series data for individual countries impose on obtaining dependable estimates of parameters of consumption functions.

Although the theoretical approach to modelling the consumption of newsprint varies across these studies, production theory provides the foundation for many of them. The theory starts on the basis that newsprint is one of the inputs in producing printed newspapers, and that the newspapers themselves directly or indirectly become inputs into production of final goods and services in the economy. The approach begins with the simplifying assumptions that a firm operates in a competitive market and that the firm uses only two factors of production whose prices are w_1 and w_2 , and that objective of the firm is to minimise its total cost for production, given output level y . With x_1 and x_2 as the quantities of the two inputs, and assuming a Cobb-Douglas production function, the cost minimisation problem is:

$$\begin{aligned} & \min (w_1x_1 + w_2x_2) \\ & x_1, x_2 \\ & \text{subject to } \alpha x_1^a x_2^b = y. \end{aligned}$$

As shown in Varian (1992, pp. 54-55), the cost minimisation process leads to the derived input demand for x_i as:

$$x_i = x_i(w_1, w_2, y).$$

Thus, the input quantity x_i consumed by the firm is a function of the input prices (w_1 and w_2) and the chosen level of output (y). Derived demand coefficient of own price (w_1) has a negative sign and the coefficients of substitute input price (w_2) and output (y) have positive signs. The theory applies to a firm, but when aggregated over all firms it is assumed to apply to an industry or to the output sector of an economy. Based on this production theoretic approach and its simplifying but plausible assumptions, the econometric studies have obtained theoretically consistent and statistically meaningful results. In accord with those studies, we visualise the derived consumption of newsprint (x_1) as a function of real price of newsprint (w_1) and real gross domestic product, a proxy for output (y).¹

¹ Data on prices for other categories of paper are not available on a consistent basis for the period 1981–2005.

Data

Consumption of newsprint is in thousand tonnes by calendar years; derived by adding India's annual newsprint production and imports and then deducting from it the exports. Because data on stocks or inventories of newsprint were not available for India, as is the case for many countries, derivation of annual consumption could not take into account changes in stocks. Hence, the derived consumption represents apparent consumption. Source of the data is FAO (2007).

Price of newsprint is an index of real wholesale price of newsprint, with base year: 2000 = 100. We derived it by deflating India's nominal wholesale price index (WPI) for newsprint (base: fiscal year, ending 31 March 1994 = 100) with consumer price index (CPI) for India with base year: 2000 = 100. Sources of WPI: website of the Office of Economic Advisor (OEA) to Government of India [<http://eaindustry.nic.in/>], accessed 10 May 2007] and data from OEA receive by post on 11 April 2007. Source for the CPI is the website of International Finance Statistics of International Monetary Fund [<http://www.imf.org/>], accessed 7 June 2007].

Real gross domestic product (GDP) of India is in constant prices (base year: 1999 = 100) in billion Indian rupees, by calendar years. Source: International Finance Statistics of International Monetary Fund [website <http://www.imf.org/>], accessed 7 June 2007].

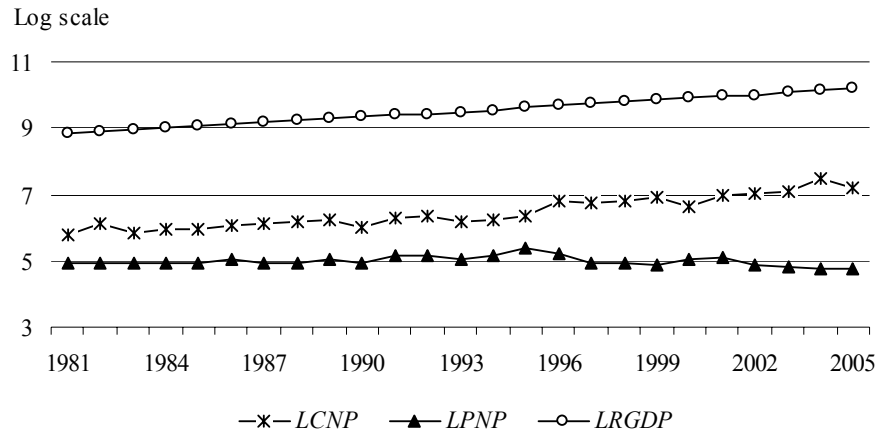
We noted earlier that the data on nominal wholesale prices index of newsprint were by fiscal years of India (year ending 31 March), whereas other data were by calendar years. Hence, we took the recourse to treating the nearest fiscal and calendar years as being equivalent. For example, we treated the fiscal 2004-05 as equivalent to calendar 2004. The equivalence has up to nine common months between the fiscal and calendar years. It is not the ideal situation but under the circumstances, it was the only feasible solution.

IV. Estimation of the consumption function for newsprint

Because of data limitations, in particular short data series and the non-availability of data on prices of substitutes for newsprint, we chose only three variables for the analysis. In common with many studies cited earlier, the three variables — in natural logarithms — were: real wholesale of price index of newsprint (*LPNP*), real GDP (*LRGD*) and consumption of newsprint (*LCNP*). Figure 3 presents natural log values of these variables from 1981 to 2005.

Using econometrics software Microfit (version 4, 1997) for analysis, the augmented Dickey Fuller (ADF) tests revealed all three variables are integrated of order 1. Hence, use of the ordinary least squares would give spurious results. The situation called for use of the time series cointegration methods. Johansen cointegration estimation revealed the presence of one cointegrating variable among the three variables, using both the maximum eigenvalue of the stochastic matrix (test statistic of 34.01 against the 95 per cent critical value of 24.35) and the trace of the stochastic matrix (test statistic of 44.33 against the 95 per cent critical value of 39.33).

Figure 3: Consumption of newsprint (LCNP), real wholesale price of newsprint (LPNP) and real GDP (LRGDP), India, natural logarithm



This evidence shows the existence of one cointegrating vector among the three variables. The estimated cointegrating vector in normalised form is:

$$-1.000*LPNP + 8.3833*LRGDP - 3.3093*LCNP = 0.$$

This reveals the existence of a long run consumption function for newsprint in India, with a long-term price elasticity of -0.30 and a long run GDP elasticity of 2.53 . The restrictions, that the coefficients of $LPNP$, $LRGDP$ and $LCNP$ are zero, are rejected by non-parametric chi-squared tests at 1.4 per cent, 5.3 per cent and 0.00 per cent, respectively.²

The analysis has identified a robust consumption function for newsprint in India. All coefficients have the correct signs and are statistically highly significant. The Appendix reports on the short-run dynamics of this relationship as determined by the error correction model.

Elasticities

To put our estimates of the price and GDP elasticities of newsprint consumption in perspective, in table 2 we compare them with the elasticities reported by other studies. It is evident from the table that our estimate of long run price elasticity of -0.3 for India is broadly similar to the price elasticities reported by the other studies for other countries or groups of countries. However, our long run estimate of GDP elasticity of 2.53 for India is distinctly high relative to those reported by the other studies. The question arises, why is the GDP elasticity so high for India? To explain it we note that first, the levels of both per capita newsprint consumption and GDP are very low in India. Second, we draw attention to the study Baudin and Lundberg (1987), which found that the elasticity tends to be high when GDP per capita is low (see table 2). These facts partly explain why the GDP elasticity is so high for India. Additional plausible explanations may include differences between our and the other studies in their estimation method and time period.

² Short run dynamics of the model, as captured in Error Correction Models for the three variables, are reported in an appendix to the paper.

Table 2: Estimates of newsprint consumption elasticities with respect to newsprint price and GDP

Authors	Price elasticity	GDP elasticity	Comments
<i>This study (2007)</i>	-0.30 LR	2.53 LR	<i>India: 1981-2005; Johansen cointegration estimation method</i>
Hetemaki & Obersteiner (2002, p. 23)	-0.49 SR -0.58 LR	0.70 SR 0.84 LR	USA; 1971-1987; elasticities for the 'best' of the several models
Simangunsong & Buongiorno (2001, p. 165, 167)	-0.13 SR -0.29 LR	0.50 SR 1.08 LR	Fifty developed & developing countries for newsprint; 1973-1997; LSDV time series dynamic model
Chas-Amil & Buongiorno (2000, p. 993, 996)	-0.30 SR -0.48 LR	0.39 SR 0.63 LR	European countries; 1969-1992; LSDV time-series model
Zhang & Buongiorno (1997, p. 372)	-0.22	NA	USA, 1960-1991; a two-stage AIDS demand model for communications media (stage 1) & for printed materials, computers, TV & radios (stage 2)
Baudin & Lundberg (1987, p. 192)	-0.278 LR	Elasticity, by GDP per capita income in US\$: <2 000 0.975 2 000-4 000 0.923 4 000-9 000 0.821 >9 000 0.878	Fifty-six developed & developing countries for newsprint; 1961-1981; pooled cross-section time-series models

SR, Short run. LR, Long run. NA, not available. LSDV, Least squares (country) dummy variable.

Indicative forecasts

For forecasting consumption of newsprint in India, we first reviewed recent trends in and short to medium term outlook for newsprint prices in global and Indian markets and for GDP growth rate for India. Based on the review, and using 2005 as the base year, we chose two alternative annual growth rates of zero per cent and 1.5 per cent for *LPNP* for the forecast period 2006 to 2010. Similarly, we chose two annual growth rates of 7.5 per cent and 9 per cent for *LRGDP*. The two alternative growth rates each for *LPNP* and *RGDP* represent plausible low and high average annual levels for the forecast period. Thus, the selected ranges in *LPNP* and *RGDP* encompass the likely value of the two variables for India. The combination of the two assumed levels of *LPNP* growth rate with the two *RGDP* growth rates created four scenarios. Using the estimated cointegration equation and 2005 as the base year, we calculated indicative forecasts of annual consumption of newsprint from 2006 to 2010 for each scenario. The forecasts thus derived are in table 3. Note that the first row of the table represents actual newsprint consumption for the base year 2005.

To put the forecasts in perspective, we now review the forecasts made by other studies. At the outset, we note that except for Zhu et al. (1999), other studies and sources have not given details of the methodology used by them. In addition, none of the studies has used cointegration methodology. With these comments, we note that Zhu et al. (1999, p. 101) forecast newsprint consumption in India at 1.0 million tonne

in 2010. With the benefit of hindsight, we see the forecast of 1.0 million tonne in 2010 as an underestimate, because actual consumption at 1.3 million tonnes in 2005 has already exceeded the forecast five years earlier. Jaakko Poyry (2002, p. 86) forecast newsprint consumption at 1.5 million tonnes in 2010. Jaakko Poyry also forecast that consumption growth rate would be 5 per cent a year beyond 2000. Again with the benefit of hindsight, we note that average growth rate of actual consumption, at least during the 2000-2005 part of 'beyond 2000', has been 12 per cent a year vis-à-vis their forecast of 5 per cent a year. Like Jaakko Poyry, Central Pulp and Paper Research Institute (CPPRI) of India (2005, p. 145) also forecast newsprint consumption at 1.5 million tonnes in 2010. With actual consumption already at 1.3 million tonnes in 2005, the forecasts by both Jaakko Poyry and CPPRI are, in our opinion, underestimates. Quoting Norske Skog, the world's biggest newsprint maker, a reporter for Bloomberg wrote that demand for newsprint in India would grow at 5.6 per cent a year to 2019 (Roy 2006). In September 2005, Gurusurthy (2005), a reporter for *The Hindu* newspaper, quoted Mr Raji Philip, Chairman of Hindustan Paper Corporation and President of the Newsprint Manufacturers Association of India, as saying that newsprint consumption in India was expected to be 2.0 million tonnes within two years, that is, by late 2007. Assuming the media has quoted Mr Philip correctly, we note that his forecast of consumption at 2.0 million tonnes is identical to our forecast of 1.9 to 2.0 million tonnes for 2007. On this basis, our forecasts appear reasonable. Of course, only time will tell how reasonable our forecasts are to actual consumption in year 2010.

Table 3: Indicative forecasts of consumption of newsprint in India, 2006–2010

	Average annual growth rate of real price of newsprint 1.5%		Average annual growth rate of real price of newsprint 0%	
	Average annual growth rate of real GDP 7.5%	Average annual growth rate of real GDP 9%	Average annual growth rate of real GDP 7.5%	Average annual growth rate of real GDP 9%
	'000 tonnes	'000 tonnes	'000 tonnes	'000 tonnes
<i>2005 (Actual)</i>	1 324	1 324	1 324	1 324
2006	1 570	1 620	1 576	1 626
2007	1 860	1 982	1 875	1 996
2008	2 205	2 424	2 230	2 451
2009	2 614	2 965	2 654	3 009
2010	3 098	3 627	3 157	3 694
(Average annual growth rate of consumption: 2005-2010)	(18.6%)	(22.3%)	(19.0%)	(22.8%)

V. Concluding comments

Our study modelled the consumption of newsprint in India using robust time series methods. The study found that the consumption of newsprint and its two determinants — real price of newsprint and real gross domestic product — were non-stationary; hence, modelling of this consumption function must use cointegration methods. Johansen estimation revealed a robust consumption function for newsprint, with meaningful price and gross domestic product elasticities. Short-run dynamics of the three variables were also discussed.

Although the study has estimated a robust consumption function for newsprint in India, the results are subject to a few limitations. First, the assumptions that underlie the cost-minimisation production theoretic approach to modelling consumption function may not adequately reflect the complex real world. Second, the mismatch between one of the data series being for fiscal years and the other two for calendar years may have affected the results. Third, as complete time series data set was available for 25 years only, our model is based on a relatively short time series, which may have also affected the estimates.

Based on the estimated model and specific assumptions about future prices of newsprint and economic growth rates, we forecast that consumption of newsprint in India could be 3.1 to 3.7 million tonnes by 2010. Parts of the forecasts are in line with the forecast made by a prominent insider of India's newsprint manufacturing industry. Nonetheless, our forecasts must be treated as indicative rather than definitive. This is because they are based on assumed future values of economic determinants, and the unfolding of economic and non-economic factors may eventually show them to be either under- or over-estimates.

Looking to further research on the subject, such work should attempt, first, to minimise the above-mentioned limitations of this study. Second, competition between electronic and print news media in India is in early stages, but the competition is bound to increase. Although data on electronic media may remain hard to obtain, future studies should try to examine its impact on the print media and thereby on newsprint consumption. Third, attempt should also be made to complement the model-based objective forecasts of newsprint consumption with the systematically collected views on the forecasts from both the newspaper and the newsprint manufacturing industries. To maximise return from investment in such research, serious consideration should be given to regularly disseminate the forecasts and industry's comments on them, among all involved in the supply and consumption of newsprint in India.

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APPENDIX:

Short Run Dynamics through Error Correction Models (ECM)

1. ECM for variable LPNP estimated by OLS based on cointegrating VAR(1)

Dependent variable is dLPNP (change in log of WPI newsprint)

23 observations used for estimation from 1982 to 2004

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	10.0701	21.7189	.46366[.648]
Trend	.038828	.097205	.39945[.694]
ecm1(-1)	-.059577	.13023	-.45749[.652]

List of additional temporary variables created:

dLPNP = LPNP-LPNP(-1)

ecm1 = .57449*LPNP + 12.6449*LRGDP 0.00*LCNP

R-Squared	.094294	R-Bar-Squared	.0037231
S.E. of Regression	.13023	F-stat. F(2, 20)	1.0411[.371]
Mean of Dependent Variable	.066802	S.D. of Dependent Variable	.13047
Residual Sum of Squares	.33918	Equation Log-likelihood	15.8568
Akaike Info. Criterion	12.8568	Schwarz Bayesian Criterion	11.1535
DW-statistic	2.0760	System Log-likelihood	86.5871

Diagnostic Tests

* Test Statistics * LM Version * F Version

* A:Serial Correlation*CHSQ(1)= .037872[.846]*F(1, 19)= .031337[.861]

* *

* B:Functional Form *CHSQ(1)= 2.6721[.102]*F(1, 19)= 2.4976[.131]

* *

* C:Normality *CHSQ(2)= 1.7917[.408]* Not applicable

* *

* D:Heteroscedasticity*CHSQ(1)= 2.5034[.114]*F(1, 21)= 2.5649[.124]

A:Lagrange multiplier test of residual serial correlation

B:Ramsey's RESET test using the square of the fitted values

C:Based on a test of skewness and kurtosis of residuals

D:Based on the regression of squared residuals on squared fitted values

2. ECM for variable LRGDP estimated by OLS based on cointegrating VAR(1)

Dependent variable is dLRGDP (change in log of real GDP)

23 observations used for estimation from 1982 to 2004

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	7.8073	2.6403	2.9569[.008]
Trend	.035188	.011817	2.9777[.007]
ecm1(-1)	-.046516	.015831	-2.9382[.008]

List of additional temporary variables created:

dLRGDP = LRGDP-LRGDP(-1)

ecm1 = .57449*LPNP + 12.6449*LRGDP 0.00*LCNP

R-Squared	.32511	R-Bar-Squared	.25762
S.E. of Regression	.015831	F-stat. F(2, 20)	4.8171[.020]
Mean of Dependent Variable	.055532	S.D. of Dependent Variable	.018374
Residual Sum of Squares	.0050127	Equation Log-likelihood	64.3241
Akaike Info. Criterion	61.3241	Schwarz Bayesian Criterion	59.6208
DW-statistic	1.7013	System Log-likelihood	86.5871

Diagnostic Tests

* Test Statistics *	LM Version	* F Version
* A:Serial Correlation*	*CHSQ(1)= 1.6150[.204]*	F(1, 19)= 1.4349[.246]
* B:Functional Form	*CHSQ(1)= .21163[.645]*	F(1, 19)= .17645[.679]
* C:Normality	*CHSQ(2)= .32549[.850]*	Not applicable
* D:Heteroscedasticity*	*CHSQ(1)= .60095[.438]*	F(1, 21)= .56342[.461]

- A:Lagrange multiplier test of residual serial correlation
- B:Ramsey's RESET test using the square of the fitted values
- C:Based on a test of skewness and kurtosis of residuals
- D:Based on the regression of squared residuals on squared fitted values

3. ECM for variable LCNP estimated by OLS based on cointegrating VAR(1)

Dependent variable is dLCNP (Change in log of consumption of newsprint)

23 observations used for estimation from 1982 to 2004

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	-20.2559	33.3572	-.60724[.551]
Trend	-.088779	.14929	-.59466[.559]
ecm1(-1)	.12169	.20001	.60843[.550]

List of additional temporary variables created:

dLCNP = LCNP-LCNP(-1)

ecm1 = .57449*LPNP + 12.6449*LRGDP 0.00*LCNP

R-Squared	.022910	R-Bar-Squared	-.074799
S.E. of Regression	.20001	F-stat. F(2, 20)	.23447[.793]
Mean of Dependent Variable	.063376	S.D. of Dependent Variable	.19292
Residual Sum of Squares	.80007	Equation Log-likelihood	5.9877
Akaike Info. Criterion	2.9877	Schwarz Bayesian Criterion	1.2845
DW-statistic	2.7578	System Log-likelihood	86.5871
