

ABSTRACT

**MEASUREMENT OF TECHNICAL EFFICIENCY AND DEMAND
FOR HIGHER EDUCATION INSTITUTIONS: A STUDY OF
GENERAL DEGREE COLLEGES IN BARAK VALLEY**

*An Abstract of the thesis submitted to Assam University in partial fulfilment of the
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Measurement of Technical Efficiency and Demand for Higher Education Institutions: A Study of General Degree Colleges in Barak Valley

1. Introduction

Human capital is generally acknowledged as one of the most important resources for economic development. Education aims at contributing to national development by way of dissemination of knowledge, skills and abilities, excellence of standard of achievements, providing opportunities to reflect upon the social, political, economic and moral issues facing the country, and its key role in generating leadership and manpower resource. It is of great significance for the all round development of the region. Schultz (1961, 1975) recognized the human capital as something similar to property against the concept of labor force in the classical perspective, and conceptualized 'the productive capacity of human beings in now vastly larger than all other forms of wealth taken together'. Goel (1974) investigates the relationship between the levels of educational attainment and economic development in India during the period 1950-51 to 1970-71 and found that there is a high and positive correlation between primary education and per capita income (0.85); between secondary education and per capita income (0.94); between tertiary or higher education and per capita income (0.95).

Thus for formation of human capital, an effective effort should be given on the education system especially on higher education system because it is generally acknowledged that level of productivity increases with the increase in level of education. Improved education system in any economy requires efficient role of education institutions. In the present situation of higher education all over the world, performance measurement of HEIs has become one of the subjects of growing attention in recent years.

Efficient management of resources in every sector is a central issue with respect to scarce resources from the perspective of management. Further from the viewpoint of growing public expenditure on different sectors in developing countries priority should be given not only to necessity but also on efficiency as well. Recently, different organizations and

institutions use various methods to measure their efficiency and then search ways to improve them. This is not only applied to profit-making organizations, but also in non-profit making organizations and the public sectors, including educational institutions. Efficiency of Higher Educational Institutions (HEIs) is one of the subjects of growing attention in recent years. The issue of efficiency in higher education in this Barak Valley or elsewhere has remained vague and problematic due to huge heterogeneity within the system itself. However, despite the importance of efficiency measurement in education institutions, there are a few studies in India that have addressed the matter for developing region like Barak Valley. Further low success rate with growing enrollment is the hallmark of inefficiency of any education institution and the situation is observed for the HEIs Bark Valley. Thus the study contributes to the literature on measurement of technical efficiency and demand for HEIs in Barak Valley by applying two alternative methods of measuring efficiency and then further compares the efficiency of the HEIs with demand which not considered earlier in any previous studies.

The present study is also important from the view point of efficient management of scares resources through measurement of technical efficiency, which basically measures productive capacity of any producing unit to produce maximum possible output for a given level of inputs or to produce a given level of outputs with minimum possible costs. However, despite the importance of efficiency measurement in educational institutions, there are a few studies in India that have measured efficiency of educational institutions in a comprehensive manner. Hence, it is also important to analyze whether these higher educational institutions (HEIs) are over utilizing or under utilizing their resources and to know about the reasons behind such problems. Policy suggestions based on this kind of study may enrich the quality of educational institutions, and finally helps in reduction of underutilization of resource which can be invested in other crucial sectors.

The present study attempts to measures efficiency of higher education institution in a developing region of India situate in the southern part of north-eastern state, Assam with the

help of both primary and secondary information related to the HEIs of the region. Further the study compare the level of technical efficiency with demand for the HEIs which is distinguishes the present study from others with an exceptional novelty.

2. Area of the Study

The present study is conducted for the HEIs in Barak Valley which is situated in southern part of the state Assam, consisting of three districts viz: Cachar, Karimganj and Hailakandi. The Barak valley mainly consists of three administrative districts of Assam State namely Cachar, Karimganj, and Hailakandi.

3. Objectives

The study is based on following objectives:

- To investigate the status as well as infrastructural facilities available in the Higher Education Institutions (HEIs) of Barak Valley.
- To estimate the technical efficiency of the HEIs in Barak Valley.
- To determine the factors of efficiency or inefficiency of the HEIs in Barak Valley
- To construct an efficiency index of the HEIs.
- To compare the efficiency level of NAAC Accredited HEIs with non-NAAC accredited HEIs.
- To compare technical efficiency scores of NAAC Accredited HEIs with NAAC ranking.
- To examine the demand for higher education institution with its determinant and to check whether the technically efficient HEIs have higher demand or not.

4. Hypotheses

On the basis of these objectives the following hypotheses can be framed:

- The status and infrastructure of most of the Higher Educational Institutions in Barak Valley are poor.
- Most of the HEIs of Barak Valley are technically inefficient.

- Technical efficiency or inefficiency is influenced by environmental factors (non-inputs).
- Technical efficiency varies between NAAC Accredited HEIs and non-NAAC accredited HEIs.
- Technical efficiency score and NAAC ranks are positively related.
- There is significant demand for higher education institution and especially it is more in case of technically efficient HEIs.

5. Methodology of the Study

Methodology section is divided into two sub-sections viz; methodology for data collection (in 5.1) and methodology for data analysis (in 5.2).

5.1 Methodologies for Data collection

The study is based on both secondary data and primary data. Secondary data is collected through complete enumeration method. Relevant primary as well as secondary data have been collected from all the general degree colleges of Barak valley. The secondary data collected from the colleges are of both cross-section and time series in nature related to the inputs and output over the last seven years. Other secondary sources are Assam University Annual Reports, Result Booklets, College Development Council Records collected from CDC Office, AUS etc. Some secondary information is collected from government documents namely statistical handbook, Report from Director of Higher Education (DHE) of Assam, MHRD Annual Reports, U.G.C. Annual Reports etc.

For the collection of primary data on students' information purposive random sampling is used. The information has been collected from the students admitted in the year 2012 in the various departments of Assam University. As the study covers up to the time period 2012, so the data has been collected from the students who have passed TDC examination in 2012 and have taken admission in the university. It is not possible to collect the information from the students who do not take admission in the university which is the

limitation of the study. But, as it is a sample study, the collected information can represent the population characteristics.

5.2 Methodology for Data Analysis

Analytical tools of the study are discussed according to the objectives of the study

I. In order to examine the status of the HEIs in Barak Valley a composite status index is constructed by assigning equal weights to infrastructure index and performance index with the help of some infrastructural and performance related indicators.

II. In order to measure technical efficiency of the HEIs examine the objective both Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA) techniques are applied in this study.

III. While examining the determinants of inefficiency SFA effect model of production frontier (Battease and Coelli 1992) for panel data set of accredited, non accredited and all affiliated colleges are applied. Further the same model is used for cross section data set of 30 HEIs and student background model is examined here. Further to analysed the determinants of technical efficiency Tobit regression for DEAVRS and DEACRS technical efficient scores are analysed here with the same data set of panel SFA effect model.

IV. In order to construct efficiency index an index using principle component of analysis and composite index of six set of average technical efficiency scores obtain over the study period for difference specifications are applied here.

V. In order to examine the variation in efficiency scores independent t-test for equality of mean is applied in this study. Further percentage bar diagram is applied to show divergence in distribution of efficiency scores across different efficiency score rages.

VI. Further efficiency ranking of NAAC accredited colleges are compared with NAAC ranking and the analysis is done by using simple tabular analysis.

VII. In order to examine the demand for higher education institutions growth in terms of gross enrolment over the study period and applicant to enrolment ration of the HEIs are taken

as proxy for demand for higher education. Further analysing the determinants of demand for higher education institutions, linear regression model for institution specific factors on applicant to enrolment ratio and simple percentage analysis of the opinion of the students from their point of view percentage tabular analysis is used in this study. Then the co-efficient of co-relation between technical efficiency estimates and demand related factors are applied in this study.

6. Outline of the Chapters

Chapter 1 is the introductory chapter which covers relevance and importance of the study followed by objectives, hypotheses etc. Chapter 1 is followed by other six chapters. A brief outline of these six chapters is given in the following:

Chapter 2 consist the review of literature which is combined by both theoretical and empirical literature. There are several literatures in the field of Economics of Education which measures the performance, efficiency and demand for educational institutions at national and internal level. In this chapter important works related to the study have also been explained in chronological manner.

Chapter 3 discusses the Theoretical and Conceptual framework related to measurement of technical efficiency of the higher education institutions and others along with methodology of the study.

Chapter 4 describes the present status of higher education institutions in Barak Valley in terms of basic infrastructural facilities available in these HEIs and performance indicators of the HEIs. This chapter is divided into two sections; namely structure of Higher Education in Barak Valley and Status and Infrastructure of HEIs in Barak Valley, which is further divided into different subsections.

Chapter 5 measures the technical efficiency (TE) of the higher educational institutions (HEIs) of Barak Valley over the period 2005-06 to 2011-12 by using both parametric and non-parametric approach. Further the chapter deals with comparative analysis of technical

efficiency scores between the two groups across the estimation techniques and then with NAAC ranking.

Chapter 6 deals with demand for HEIs in Barak Valley along with its determinants and examines the relationship between efficiency and demand for HEIs in this region. This chapter also describes students' perspectives on demand for higher education and demand for education institutions.

Chapter 7 describes the summary, conclusion, policy suggestions and limitations of the study and further scope for research. Finally, the dissertation ends with Bibliography.

7. Findings of the Study

The main findings of the study are mentioned as follows:

- The study reveals that status of the majority of HEIs of Barak Valley is below average in terms infrastructure and performance related indicators. The mean value of the status index is approximately 0.32 for the HEIs of Barak Valley, with range 0 to 1 and the HEIs status index value is highly skewed towards lower range. The status index value of the 50 per cent HEIs of Barak Valley are under the range of status index value 0.21-.04 and approximately 23 per cent HEIs scored below 0.2 in terms of status index. This implies that approximately 73 per cent HEIs are below the average level of status index score, while approximately 27 per cent are above average range.
- Teachers quality measured in terms of higher qualifications and experience depict a favourable situation in accredited colleges. Here, it is found that approximately 41 per cent teachers in the HEIs of Barak Valley are only master degree holders without any additional qualification, while 25 per cent have MPhil degree are 26 per cent have PHD degree. The situation is quite adverse in non accredited colleges where 72 per cent of the teachers are teaching in the HEIs with only master degree. The approximate share of young teachers in the HEIs of the region is 33 per cent, which is 27 per cent are in NAAC accredited and 43 per cent are in non-accredited colleges.

- NAAC accredited colleges (HEIs) are better in terms of physical resources and teachers quality, while availability of human resource in non accredited colleges are better than that of in accredited colleges.
- Application of SFA and DEA reveal that majority of the HEIs of the Barak Valley are producing below the best practiced frontier. The mean efficiency score of the session 2005-2006 2011-2012 varies from 0.51 to 0.75 across different specifications.
- The composite variance parameter related to measurement of efficiency by SFA denotes presence of inefficiency for panel data, cross section data and student background models.
- The result of Malmquist DEA reveals that productivity gain in affiliated degree colleges of Barak Valley is mainly attributed by technological change resulted from change in scale efficiency due to change in enrolment to input ration in the HEIs. Over the study period there is loss of productivity during 2010-2011 and 2006-2007 sessions, while the other sessions have witnessed gain in productivity of the HEIs resulted from change in technology as well as efficiency change.
- The overall mean of total factor productivity index is greater than one for non accredited colleges while it is less than one for accredited colleges. Here NAAC accredited colleges have shown productivity loss due to change in efficiency resulted from pure efficiency change from change in quality of the students. Whereas in case of non-NAAC accredited colleges, productivity gain over the study period has been observed due to technological change from scale efficiency through increase in enrolment.
- The findings from panel data set of 27 HEIs over the session 2005-2006 to 2011-2012 regarding determinants of technical efficiency reveals that in case of non accredited colleges the trend parameter and year of establishment are significant and positively relative with inefficiency, indicating deterioration in technical efficiency over the time. While in case of NAAC accredited and combined HEI group these coefficients are insignificant. Location of

the college is negatively related in all the three panel models, while significant for non-NAAC accredited and over all models. This implies that colleges of Barak Valley situated in urban areas, especially non-NAAC accredited colleges are more efficient than that of situated in rural areas. This specifies importance of prosperous region for learning process of higher education.

- Type of affiliation is also found negatively related and significant in reducing inefficiency of the HEIs of Barak Valley which implies that permanently affiliated colleges are better in terms of efficient production of quality graduates. Courses offered by the HEI is found insignificant for overall model, while positively influencing inefficiency in accredited colleges and negatively influencing non accredited colleges. This implies more specialisation in accredited colleges, while more diversification in non accredited colleges.
- Cut of mark at both honours course and pass course at entry level for are negatively influencing inefficiency in non accredited colleges indicating importance of screening in non accredited colleges. in case of accredited colleges cut of mark for pass course is negatively influencing with inefficiency, which implies that colleges opted for screening in admission of pass course has positive impact on production of quality graduates in the region.
- Tobit estimates of determinants of technical efficiency also support screening of students at the time of admission in pass course over the study period for both DEA-CRS and DEA-VRS efficiency scores. Type of affiliation dummy for CRS technical efficiency model shows a divergence outcome indicating negative association with technical efficiency scores, which is a contradiction of SFA effect models. This is may be due to the reason that both the models have their specific characteristics which are not similar in terms of specification and estimation.
- Like SFA models location of the college is also found positively related with efficiency for both CRS and VRS Tobit estimates. Time variable is found significant for overall DEACRS technical efficiency scores and the coefficient is found negative and

significant at ten per cent level of significance. This implies that technical efficiency of HEIs is decreasing over the study period.

- The determinants of technical efficiency for cross sectional variables indicate that quality of teachers place an important role in determining efficiency of the HEIs. Average teaching experience of the teachers is found positively influencing efficiency of the HEIs. Again share of teachers with NET/SLET and MPhil degree is negatively influencing inefficiency which implies that HEIs with greater proportion of teachers with additional qualifications of teachers rather than simple master degree have significant influence on efficiency.
- In case of students background related model the study reveals that number of tutors for honours course is found negatively related with inefficiency. Academic background, i.e., entry grade or past performance of the students have positive influence on further production of quality graduates. Natural science dummy is also found significant and negatively related with inefficiency this implies that HEIs having more share of students pursuing science graduation have positive influence of efficiency of the HEIs. Socio economic backgrounds like annual family income (per capita) and number of siblings are also significant and negatively related with inefficiency; whereas average parental education is found insignificant in the study. The general caste dummy is also has significant impact on determining efficiency of the HEIs. This implies that HEIs having greater share of general caste students are more efficient than that of others.
- In this study efficiency index scores varies from zero to one with standard deviation 0.2163 for mean value 0.589 and the mean average technical efficiency scores of the HEIs is 0.627 which ranging from 0.924 to 0.085 with standard deviation 0.182. Here college C9 has occupied highest position in terms of efficiency index and average technical efficiency score, followed by C3 and C26, the lowest position is occupied by college C13 preceded by C28 and C11.

- Further the study reveals that NAAC accredited HEIs are more efficient than others in terms of efficiency index and average technical efficiency scores and the distribution of composite efficiency scores are positively skewed towards higher values for NAAC accredited HEIs.
- The study reveals that efficiency score varies among the HEIs with same NAAC rank. The findings show that there is variation in terms of efficiency ranking and NAAC ranking.
- The enrolment growth over the study period has shown significant positive trend indicating higher demand for HEIs is found in this study. Further the study reveals that the mean value of applicant to enrolment ratio is significantly different from one, which means that more number of students is applying for getting admission in the HEIs of Barak Valley.
- Regarding the determinants of demand for HEIs the study reveals that location of the college; teachers' quality and past performance of the HEIs are positively significant.
- Applicant to enrollment ratio is found positively related with all the technical efficiency estimates for this region, however statistically significant for stochastic frontier estimates and composite efficiency indices.
- The coefficients of correlation with composite technical efficiency indices are positive significant and moderately related applicant to enrollment ratio, while moderately high and significant in case of SFA estimates. On the other hand correlation coefficients of average enrollment of the HEIs with most of the technical efficiency estimates are positively related and statistically significant here. This implies that technical efficiency and demand for education is positively related with moderate degree of association.

8. Conclusions of the Study

The affiliated general degree colleges of Barak Valley both publically funded and privately funded are operating simultaneously to provide higher education for the people of the valley and its nearby areas. However, the status of these HEIs are not that much satisfactory in terms of their infrastructural and performance indicators. The value of the

infrastructure index lies between zero to one, and the average value for the HEIs of the region is 0.534 and approximately 50 per cent of the HEIs of Barak Valley are functioning with a score below the average level. However the mean value of infrastructure index for NAAC accredited colleges is 0.742 and 54 per cent of the colleges have scored below the average level. While in case of non-NAAC Colleges is 0.374, 9 and 53 per cent of the HEIs from this group have scored below average level. Thus it can be said that infrastructural status of the majority of HEIs of Barak Valley are below average. Further the mean value of the status index which is a composite measure of infrastructure and performance is approximately 0.32 for the HEIs of Barak Valley, with range 0 to 1 and the HEIs status index value is highly skewed towards lower range. Thus here the study accepts the hypothesis that status of the most of HEIs of Barak Valley is below average/poor.

Affiliated general degree colleges of Barak Valley are providing higher education and help to develop local community however there is presence of inefficiency in the colleges of Barak Valley and majority of these are producing quite far from the best practice frontier. The SFA estimates of the variance related parameter viz; Sigma-squared and Gamma are significantly different from zero and statistically significant for all the groups which indicate that there is presence of inefficiency in production of quality graduates in affiliated general degree colleges of Barak Valley. The results obtained from Malmquist DEA suggest that the main responsible factor for change in technical efficiency has been both technological change and efficiency change. However in case of non-NAAC accredited colleges technological change is the main responsible factor for majority of the non-accredited colleges resulted from change in scale and input combinations, while efficiency change is mainly influencing productivity change in NAAC accredited colleges contributed change in quality of students and other factors rather than input combinations. Over the study period the growth rate of total factor productivity of non-accredited colleges is almost three times higher than that accredited colleges. This is may be due to the region the NAAC accredited colleges are somewhat

consistent in terms of efficiency and there is less change in factor combination unlike non-accredited colleges. From the theoretical point of view, any producing unit is said to be technically efficient if the technical efficiency score is one or approaches to one. But the average technical efficiency score of the HEIs of Barak valley over the study period for different specifications in both SFA and DEA estimates ranges from 0.45 to 0.75 approximately. This implies that the HEIs of the region are comparatively far from the efficient frontier; hence second hypothesis is accepted here.

The results from both SFA effect models and Tobit regression regarding the determinants of technical efficiency reveal that type of affiliation of the college is significant for different models. This implies that the colleges which have gone through some sort of monitoring for affiliation are better in production of quality graduates and under graduates than others. Location of the HEI is also significant and positively related with technical efficiency implying the fact that colleges of urban region are more efficient than others. This is may be due to the region that these colleges are situated in prosperous areas with better infrastructural facilities in terms of availability of resources related to studies and private tutors which contribute highly in production of quality output of any HEI and significant in reducing inefficiency. Years of establishment is negatively influencing the level of technical efficiency for non-accredited colleges indicating deterioration in technical efficiency over the years with significant trend parameters. Teachers' qualification and experience both are significantly influencing technical efficiency of the HEIs in the region. Students' academic and socioeconomic factors are also influencing technical efficiency of the colleges here. The quality check parameters at entry level with cut-off marks is also helpful in reducing technical inefficiency of the HEIs of Barak Valley. Hence it can be that selected environmental (non-inputs) factors related to the HEIs, viz; institutional characteristics, teachers' qualifications and students' background have significant impact on determining efficiency or inefficiency of

the HEIs. Thus we accept the hypothesis that environmental (non-inputs) factors are significantly influencing the technical efficiency of the HEIs in Barak Valley.

The study reveals that distribution of NAAC accredited colleges are at a greater proportion towards higher values for both efficiency index and average technical efficiency scores, while in case of non-NAAC accredited HEIs efficiency scores are more clustered towards average and below average levels. However there are few exceptions where some non-accredited colleges performing better than others in terms of technical efficiency scores. The mean difference between technical efficiency scores of NAAC accredited and non-NAAC accredited HEIs in terms of average technical efficiency score is 0.120 and 0.213 in terms of efficiency index. So it can be said that NAAC accredited colleges of Barak Valley are more efficient than non-NAAC accredited colleges. Thus the study accepts the hypothesis that technical efficiency varies between NAAC accredited HEIs and non-NAAC accredited HEIs. Further the study reveals that efficiency score ranks vary among the HEIs with same NAAC ranking for the HEIs of the region. In some cases it is also found that HEIs technical efficiency rank is better even with a comparatively lower NAAC ranks. Hence the hypothesis, technical efficiency score and NAAC ranks are positively related is rejected here.

While examining the demand for higher education institution, the study reveals a significant demand for higher education in the region and there are several institution specific and student specific factors influencing demand for HEIs here. Here the past performance and teachers' quality of the HEI are found positively influencing the demand for HEIs in the region and also supported by a large proportion of the students as reasons for selection of HEI from their perspectives. Hence it can be stated that past performance and quality of teachers are crucial in determining demand for HEI in Barak Valley. Again location of the college is found positive and significant indicating the piece of evidence that colleges situated in prosperous region are not only efficient, but also attracting more number of students. This is may be due to the reason that in urban areas people are more interested in higher education or

even those of rural area are putting a forward step for mobility into the HEIs of urban areas to have a better academic infrastructure. The coefficients of correlation between technical efficiency estimates and demand for HEI are also found significant for the region. Thus it can be said that there is significant demand for HEIs in the region with considerable influence of various institution specific and students' background related factors, and demand for HEIs and technical efficiency is positively related. Hence the hypothesis there is significant demand and especially it is more in case of technically efficient colleges, is accepted in this study.

9. Suggestions

The study suggests some measures for the improvement of the HEIs on the basis of findings in the following:

- The study reveals noteworthy variation in terms of infrastructure, performance, enrollment and technical efficiency for NAAC accredited and non-NAAC accredited HEIs of the region. As NAAC accredited Colleges are performing better in terms of efficiency and all other indicators, so it is suggested that regular NAAC accreditation is necessary for the better performance of the colleges. Although NAAC was established by the UGC in 1994 with the prime objective for accreditation of universities and colleges in general education in India, but the trend of NAAC assessment in this region is not so much popular. So NAAC should be made compulsory or any new body should be formed in order to provide continuous and comprehensive assessment with proper guidance to these HEIs for efficient and smooth functioning.
- The colleges situated in rural areas are to some extent reformative in nature as these are providing higher education to those who either cannot move to other areas due to several socio economic constraints or comparatively academic past. Thus by providing low cost study materials and remedial teaching to the students who are poor in terms of financial ability or knowledge with special care may improve their result. This may further boost performance of their institution which may further lead to more demand for these HEIs in near future. By

doing so it would become possible to control the mobility of good quality nearby students in other HEIs and ultimately can raise the efficiency of these HEIs

- The overall average annual partial elasticity of teacher student ratio with respect to output, i.e., production of quality graduates for all the HEIs in this study is found positive, though for non-accredited institutions it is found negative and for NAAC accredited institutions the value is positive. However, within the same group average value of partial elasticity of teacher student ratio with respect to quality output for the HEIs over the study period is found positive for some HEIs and negative for others. Hence, it can be suggested that the more numbers of qualified teachers should be appointed in the institutions, so that teacher-student ratio will be increased and that would increase the efficient level of output.
- The coefficients of correlation between technical efficiency estimates and demand for HEIs is found significant for the region which suggests that affiliated general degree colleges of Barak Valley may increase their demand by increasing efficiency and with higher demand they may raise their technical efficiency.

10. Limitations of the Study

i) The study limited to affiliated general degree colleges only. For a more conclusive result all the higher education institutions including technical and professional would have been studied. However this was not possible due to the reason that the number of other higher education institutions in this region is very less compared to general degree colleges for which inclusion of these institutions in the study would have brought more heterogeneity in the data set. In addition to that the concept of measurement of technical efficiency itself is relative in nature as it compares the producing units with best practiced producing units within the group and incorporation of heterogeneous units in a single might have lead to misleading findings.

ii) The study is based on panel data set for 27 HEIs over seven consecutive academic sessions 2005-06 to 2011-12. It wouldn't become possible to cover few more sessions before 2005-06 due to unavailability of records in these institutions and due to change in examination

pattern from yearly system to semester system in these colleges which are under same university further information post to the session 2011-12 were not included in this study.

iii) It was not possible to cover the opinions of parents and other stakeholders of the society in the study because tracing them would have required considerable time, resource and other logistics for completion of the research.

iv) The study is restricted to analysis of quality related variables for cross section data only. Further inclusions of these variables over the years would have given a more clear structure. It was not possible to incorporate all these variables for long period of time due to unavailability of data.

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