Measurement of the Impact of Economic Reforms on Public Expenditure on Health and Health Outcomes in Karnataka - a simultaneous equation model

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Abstract: Economic reforms, typically in the form of liberalization, privatization, and globalization have far-reaching effects not only on the economy but also on the society of a country, and have now been amply appreciated. It should be emphasized that just as economic reforms have effects on the components of health and income, similarly the health and income would have implications for the economic reforms. In this paper the following research question are deemed to hold great significance to the understanding of health sectors performance in Karnataka, and drawing up an appropriate policy response on questions like, what has been the pattern of public expenditure on health? Has the introduction of economic reforms led to structural changes in government spending in social sector in general and health sector in particular? What is the impact of economic reforms on public health expenditure in Karnataka? Is there any links between economic reforms on public health expenditure and health sector performance in Karnataka? With the set of above questions we try to explore the relationships and impact of economic reforms on health expenditure and the health performance in Karnataka. With the help of a set of sector specific fiscal indicators for the state of Karnataka derived from cluster analysis, the pattern and structural shift in expenditure on health has been analyzed. We have also worked out the aggregated indices Using the factor scores for different set of indicators such as human man power capital (HM), health infrastructure (HI), and health performance (HP) in health services. Using the time series-wise estimated composite indices; a revenue deficit measure in relation to gross state domestic product (RDGSDP) is also used as to measure exact impact of reforms. We have analyzed the results with the help of two econometric models.

Using these estimated models, regressions are estimated for health performance productivity. The study found that, in terms of expenditure on health as Percentage of total expenditure on economic reform has positive effect on health in the ten years of reform period at the same time it has negative impact on health during post-reform period.

JEL Classification: H51, H52, H53

Key words: Expenditure side approach, CAGR, health infrastructure, human man power capital

1. Introduction

The Indian economy grew at a comparatively low rate of growth of 3.5 percent from 1950 to 1990. In 1991, India faced a macro economic crisis in the form of drastic fall in foreign exchange reserves accompanied by cut off in foreign private lending that swiftly followed the sharp downgrading of the country's credit rating, and Inflation was high and rising. Both fiscal and current account deficit were unsustainably large.

The gulf war in August 1990 sparked off the chain of events leading to increasing prices of oil, while the causes of crisis have been exogenous, political instability, declining agricultural prices, rapid economic growth, and natural calamities within the country compounded the severity of the situation. The experience of several developing countries that have embarked upon a process of macroeconomic reforms during the last 20 years shows that the accentuation of reforms leads to reduction in public expenditure on basic services and programmes, directly related to social service development or human resources development. (Mahbub Ul Haq, 2001) Even the European countries, which have experienced reforms, have had diverse experiences with respect to the social impact of reforms. In this background, the new Gov in India felt the need to introduce some measures in order to raise the tempo of the overall development of the economy in the form of stabilization policy (SP) and structural adjustment programmes (SAP).

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While the expenditure compression is the sole reform measure under the stabilization policy (SP) with regard to expenditure reform, the structural adjustment programme (SAP) has much wider agenda including the expenditure targeting, improving the efficiency and productivity of public expenditure. The reduction of fiscal deficits is normally included in the conditionality of structural adjustment programme and consequently Government expenditure have to be cut in order to meet the targets of reducing fiscal deficits.

A plethora of studies have been conducted to focus on the issue of the impact of economic reforms. Sen. (1991) examines data on public expenditure over a 15 time period (1974-75 to 198-90) to identify the extent of governmental involvement in human development in India and to locate possible shifts in emphasis over the chosen time period. At the aggregated level, despite the rising trends expenditures on human development sectors remained at low levels by international standards over the 15-year period analysis. Whereas disaggregated analysis at the states level exposes the inter-state variations in the trends in public expenditure on social services.

Bhatt R (2000) estimated the impact of reforms on public expenditure on health in Karnataka. He conclude that, some areas has poor health outcomes due to unregulated private sector and high prevalence of Communicable diseases in those areas, the inaccessibility of public health facilities, The long waiting period and the delays caused due to non- availability of services under one roof, the bribes which need to be paid. This prompts the people to seek private Health Care Services; as a result public expenditure is declining in real terms. A study on the public expenditure on health in Kerala was made by Sadananda.R (2001). The main overall conclusion of the study is that the impact of public expenditure on health in Kerala was unequally distributed, the public expenditure actually reduced income disparities, and it is actually pro-poor during reform period. Thus, what is generally glossed over is that the economic reforms in India and expenditure compression are inter-related. Moreover, cutbacks in expenditure are likely to impact more directly and heavily on allocation for social services in general, health in particular, thereby adversely affecting human development.

1.1. Linkages of health and economic development

The linkages of health to poverty eradication and long-term economic growth are strong. The burden of diseases such as HIV/AIDS can slow the economic growth of

developing countries. Health is an important tool to empower poor people and overcome exclusion based on gender, location and other correlates of poverty.

Being a source of enjoyment health status is also a valid indicator of HRD and consequently economic growth, so investment in health has multiple dimensions. The provisions of basic needs will improve the quality of human resource. The poor workers, who generally are in a spirit of resignation, will become healthy and more productive and thus, participate more effectively on the development efforts. Moreover, higher level of living will increase the survival rate at births, which eventually reduce birth rate and thus reduce the growth rate of population as well. A study conducted by Chandawat (1992) in Gujarat to analyse investment in health. Found that expenditure on health services enhances the productive capacity of the individuals concerned. They would earn more and this affects the distribution of income. Which in turn enhances human development the benefits from medical services reveal that rural household receive lower benefits from medical facilities than their urban counterparts. In current prices, the benefits from public health, Sanitation and water supply were comparatively more equitably distributed. It was found that Public services provided by Government were fewer in rural areas than in urban areas. Illiterate villages thought that whatever Government provided was better than nothing. It was also found that private costs were real constraints for poor families. Hence, poor people availed themselves of less educational, medical and health service facilities as compared to the well to do people. Nichter (1980) conducted a Survey of South Karnataka. He made an empirical examination of 82 poor rural families who benefited from public expenditure in the study area. He divided study into 3 divisions and developed the hypotheses about the expenditure benefits. He found that families benefited from public expenditure always spend 2% of an average family

income. Whereas, the families who are not benefited from public expenditure spends relatively more.

Focussing exclusively on public expenditure on health, Reddy (1992) observes that Government expenditure on health in India stands at 2.36 per cent of its GDP in 1990-91, which is rather impressive by developing country standards. Eighty four per cent of the entire public expenditure on health is incurred by state and a Union Territories (UTs) Government, as health is on the state list. Both the state and the union Governments give top priority to medical and public health, which accounts for 49 per cent of the government's health budgets. Tulasidhar (1993) has shown that per -capita public expenditure has a significant effect on post-natal mortality rate. Jolly (1986) found that the performance of the family planning programmes was explained more by socio-economic variables, notably literacy, rather than programme input variables.

Duggal,Ravi (1995) in their comprehensive study on the public expenditure outcomes of health in eight states of India, selected forty districts samples consisting of 160, towns covering 1,20,000 populations on and including taluks and rural areas (to test variations . by using populations density, employment tertiary sector and family income as outcomes of expenditure on health . He found Punjab Kerala and Tamil Nadu have the highest expenditure on health in eight states and for most of the common function of expenditures health states, and also found wide differences in the results of expenditure across states. The major finding of his study is that health care provisions are heavily based against the rural sector and in favour of the urban sector. The extent of disparity varies from state to state. States with a high disparity in health provisions also display a high disparity in expenditure on health between rural and urban sectors.

1.2   Research Issues

Introduction of economic reforms in the country in 1991 necessitated Karnataka Government for proper allocation of resources to different sectors in order to accelerate the process of economic development. Trends of public expenditure especially during the reform phase suggest that the proportion of money spent on the revenue account has been far higher than that of capital account all along.

However by 1991, the states had identified this problem, some even resorted to corrective measures also, as recommend by the eleventh finance commission a fund called "Fiscal Reforms Facility" was created by the central government. This marks the beginning of state level fiscal reforms in India, having concern on the Deteriorating fiscal situation the Government of Karnataka entered into MOU (Memorandum of Understanding) with central Government and embarked on the fiscal reform path, and finally in the year 2000 the Government decided to bring out a white paper on state finances. This document brought out the fiscal crisis that the state was undergoing.

In 2001-02 the fiscal reforms were introduced and a 'Medium Term Fiscal Plan' (MTFP) was presented covering the period 2001-02 to 2004-05. Further, to correct the fiscal distress in 2002, Karnataka was the first State to pass the Fiscal Responsibility and Budgetary Management (FRBM) Act. The state achieved the stipulated targets of eliminating the revenue deficit, and lowering the fiscal deficit to below 3 per cent of the GSDP even before the proposed deadline of 2006. Karnataka can therefore be cited as a role model for all the other states which have embarked on a similar path of fiscal consolidation endorsed by the Centre and the Finance Commissions. Apart from the various incentives it received from the Union Government based on this success, the State has also been performing extremely well

on the revenue front with tax collections exceeding expectations, and an increase in transfers from the Centre. Thus, Karnataka's fiscal position over the last few years has been quite rosy.

Many studies on efficiency of public expenditure on education and health, the trends and pattern of public expenditure on education and health, inter-state disparities in expenditures, and also the impact of economic reforms on social sector expenditure in general and health in particular have been conducted and Most of these studies have produced mixed results. Some studies find that the relationship between public expenditure health and its outcomes are weak, and that factors such as per capita income, parental perceptions of costs and benefits, and intentions of the authorities matter as well. Whereas, some studies found very strong and outstanding development outcomes due to expenditure, the coverage of time of these studies is limited. Time period considered by many researchers is different for e.g. Mingat and Tan, from 1985-1992 (7 years); (Akinkugbe & Mohanoe, 2009; Gani, 2009; Kabir, 2008; Leiyu, 1997 each of the studies just mentioned examines a set of countries, making cross-country comparisons in the process.

Though the researchers have established a relationship between increase in health expenditure and economic development, fears have been expressed about an exact causal relationship between the two. This may be due to the data limitations as well as the influence of other factors like social class, potential trainability, employer's preferences, parental wealth etc.; nonetheless, if one cannot exactly separate out the contribution of health in this regard, these factors altogether cannot nullify the impact of health in fostering economic development.

Keeping in view, the above issues, in the present study, the following research question are deemed to hold great significance to the understanding of health sectors performance in Karnataka, and drawing up an appropriate policy response on questions like, what has been the pattern of public expenditure on health? Has the introduction of economic reforms led to structural changes in government spending in social sector in general and

health sector in particular? What is the impact of economic reforms on public health expenditure in Karnataka? Is there any links between economic reforms on public health expenditure and health sector performance in Karnataka?

Thus, the **first objective** of this paper is to analyze the trends and pattern of public expenditure on health in Karnataka, and to examine whether the financial allocation to health sector has increased in real terms in the reform period vis-a-vis the post-reform period in Karnataka. **The second objective is to explore the relationships and the impact of health expenditure on the health performance in Karnataka.**

The rest of the paper is organized as follows. Section-2 analyzes the trends and pattern of public expenditure on health in current and constant terms of Karnataka, Section-3 describes the econometric analysis used for this study. Empirical analysis and results are discussed in section-4. Section-5 offers concluding remarks.

2. Trends and patterns

2.1 Public expenditures on medical and public health

Financing of health by government would refer to the amounts spent towards health care by central, state and union territory governments (in case of India). It would also include revenues raised by local bodies, public sector enterprises, autonomous and semi-autonomous institutions for financing health care.

The state level budgetary expenditures on health have been examined for the period 1990-91 to 2012-13. The period from 1991-2000 has been considered as the reforms period and 2001- 2012-13 is considered as the post reform period. The trends in [1]total public

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[1] To analyse the pattern of public expenditure on medical and public health, the present study has included plan and non-plan expenditure of revenue and capital accounts on medical and public health; loans and advances have been excluded. Expenditure on family welfare has not been included here within the health expenditure as it concentrates mainly on family planning programmes. Also the allocation of central government expenditure to

expenditure (Revenue + Capital Account) on medical and public Health in the state, during the past two decades, are discussed here. Public expenditure incurred on the medical and public health services category has realized a considerable amount of increase during the study period. The public expenditure on medical and public health of Karnataka state as revealed in Table 1 has increased from Rs 24959 Lakh in 1990-91 to Rs. 364072 lakh in 2012-13; it amounts to phenomenal 125 fold increase in its level over the initial value. The mean plan and non plan expenditure of revenue account for medical and public health was Rs 103129.2 lakh. The standard deviation for revenue expenditures on health was Rs 77714.82 lakh. The co-efficient of variation (%) was 7.3 per cent. Similarly, the mean plan and non plan expenditure of capital account for medical and health was Rs 115098.9Lakh. The standard deviation for plan expenditures on health of capital account was Rs 90416.9 Lakh. The co-efficient of variation (%) of the plan expenditure on health of capital account was 78.0 per cent.

The interesting aspect of public expenditure on medical and public health is that, in case of Karnataka, a major portion of the total expenditure on health is under the Revenue account which has been increasing. On the contrary, a very meager portion of total expenditure is disbursed under the Capital account.

individual states and private and household expenditure on health have been excluded from the scope of this study.

Table 1
Pattern of Public Expenditure on Medical & Public Health of the State Government from 1990- 91 to 2012-13 at current prices

year	Revenue expenditure				Capital expenditure			Total	CV
	Plan(a)	*Non plan(b)*	*Total c=a+b*	cv	*plan(d)*	*Non plan(e)*	*Total f=d+e*	*G=c+f*	
1990-91	7685	16617	24302	51.3	657	-	657	24959	88.9
1991-92	8977	20560	29537	52.3	363	-	363	29900	91.2
1992-93	10789	25231	36020	52.7	712	-	712	36732	90.4
1993-94	12202	26922	39124	51.7	1025	-	1025	40149	89.1
1994-95	16384	29391	45775	48.3	1111	-	1111	46866	88.1
1995-96	11954	28544	40498	53.1	1382	--	1382	41880	88.7
1996-97	14426	30062	44488	50.7	879	--	879	41377	88.4
1997-98	15772	35421	51193	52	6816	--	6816	58009	77.6
1998-99	14747	46840	61587	58.3	8788	--	8788	70375	79.2
1999-00	14024	58112	72136	63.1	9417	--	9417	81553	82.3
2000-01	18761	57915	76676	57.8	7161	--	7161	83837	83.8
2001-02	18589	60032	78621	58.6	7903	--	7903	86524	83.4
2002-03	17458	70976	88434	62.7	3357	--	3357	91791	92.3
2003-04	12392	75291	87683	69.1	2165	--	2165	89848	96.9
2004-05	20657	98246	118903	65.3	3341	-	3341	122244	94.7
2005-06	26315	74091	100406	56.1	769	-	769	101175	93.3
2006-07	32283	88986	121269	55.7	16883	-	16883	138152	78.5
2007-08	34441	109037	143478	58.3	28340	-	28340	171818	74.5
2008-09	41737	108966	150703	54.7	33402	3338	30065	180768	89.8
2009-10	48517	118621	167138	53.5	35071	---	35071	202209	71.8
2010-11	69989	134516	204505	55.5	43686	-	248191	248191	87.9
2011-12	85425	173509	258934	58.7	35938	-3.5	35903	294837	98
2012-13	117383	213179	330562	67.1	33510		33510	364072	94.8
Total	670907	1701065	2371972		282676	3355	279304	2647266	95.9
Mean	29169.87	73959.35	103129.2		12143.6		12143.6	115098.9	
Std.dv	27544.17	51284.38	77714.82		14318.1		14318.1	90416.9	
Co.ef.vr	94.4	69.3	75.3		118.4		117.9	78	

Source: *Compiled From data available in Various Issues of Handbook of Statistics on State Government   Finances, Reserve Bank of India; 2004,*

, 2007 and 2010-11, and from data available in Various Issues of Statistics Directorate of Economics and Statistics, Government of Karnataka
Note: **1.**Expenditure is in Rs lakh. **2**. Reform Period 1991 to 2000-01. Post-Reform Period 2001 TO 2012-13.

2.2 Analysis of trends and pattern of government expenditure health in Karnataka at constant prices

An attempt is made in this section to analyze the trends and patterns of public expenditure on health by the State Government for the period of two decades –may be broadly classified   as Reform period (1991 to 2000) and post-reform period (2001 to 2013).The calculations have been presented in both current prices, and in constant (2004-05) prices. To reduce the expenditure figures to constant rupees, the [2]implicit deflator is used from the national income accounts of India. The answers may not be very clear, yet it adds weight to the debate over the efficacy of the public expenditure for creating better social infrastructure in terms of better education and health outputs.

Table 2 shows the pattern of public expenditure on health at constant (real) 2004-05 prices as well as current prices in the state of Karnataka. The trend in public expenditure on health at current prices shows that the state government expenditure on health has risen over the years. However, at constant prices   (2004-05), the picture is different, [3]Real expenditure on health decreased from Rs 224024 lakh in 1990-91 to Rs 185647 lakh in 2000-01. In 2012-13, it has decreased sharply to Rs 103216 lakh at a negative average [4]annual growth rate of -1.7 per cent. The mean expenditure at constant prices (2004-05) for total health   was 183854 lakh. The standard deviation for expenditure on health at constant prices (2004-05) was 36143 lakh. The co-efficient of variation was 19.7 per cent. It can be clearly seen from the Table that

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[2] Implicit deflators calculated are NSDP current/ NSDP constant x 100 are calculated using the figures available for Karnataka and all figures are deflated to 2004-05 prices.

[3]   Real expenditure in current year = (nominal Expenditure in current year x Implicit deflator for base   year)/ (Implicit Deflator for current year).

[4] Calculations of annual growth rates at current and constant prices are in Appendix Table 2

the annual growth rate of total expenditure has been positive across the study period, whereas annual growth rates of expenditure on health were negative. It is clear that excepting the total expenditure, which has experienced low 28.2 per cent average growth rates in the pre-reform period as compared to post-reform percentage of 32.8 per cent, health has registered negative annual as well as average annual growth rates in post-reform periods. Thus, it can be concluded that economic reforms have had negative effect on health expenditures.

The budgetary health expenditures in Karnataka have been examined in the following manner,

➢ Expenditure on health as percentage of total expenditure
➢ Expenditure on health as Percentage to NSDP
➢ Per capita expenditure on health and its compound annual growth Rate

2.2.1 **Expenditure on health as percentage of total expenditure of state**

Table 2 also reveals that expenditure on expenditure on health as a percentage of total expenditure of the state. The expenditure at current prices has actually increased from 5.0 in 1990-91 to around 3.5 per cent in 1996-97; again, it decreased considerably to 1.0 in 2012-13. Thus, the share of expenditure on health at current prices during reform period was 6.58 per cent, which was more as compared to post-reform period of 4.78 per cent. It can be concluded that in terms of expenditure on health as Percentage of total expenditure on economic reform has positive effect on health in the ten years of reform period at the same time it has negative impact   on   health   during   post-reform   period.

Table 2

Expenditure on Health as a percentage to NSDP, and as share of total expenditure from 1990-91 to 2012-13

Year	Total per capita Expenditure(TPCE)		Total Expenditure on health(TEOH)		Total Per capita expenditure on health(TPCEH)		As share of total expenditure(ASTE)		As % to NSDP(APNSDP)	
	Current	*Constant	Current	*Constant	Current	*Constant	Current	*Constant	Current	*Constant
1990-91	1114	154	24959	224024	56	501	5	0.4	*1.5*	10.9
1991-92	1392	250	29900	211680	67	471	4.8	0.3	1.4	7.9
1992-93	1540	302	36732	235495	80	410	5.2	0.3	1.5	8
1993-94	1714	427	40149	208540	85	441	5	0.2	1.4	5.6
1994-95	1842	534	46866	223627	97	464	5.3	0.2	1.5	5.1
1995-96	2124	716	41880	217714	85	444	4	0.2	1.4	4.3
1996-97	2406	942	41377	201936	83	405	3.5	0.1	1.3	3.4
1997-98	2495	1066	58009	216274	115	428	4.6	0.1	1.4	3.4
1998-99	2907	1546	70375	197468	137	385	4.7	0.1	1.3	2.5
1999-00	3440	2099	81553	182568	157	352	4.6	0.1	1.2	2
2000-01	3745	2433	83837	185647	160	353	4.3	0.09	1.2	1.9
2001-02	4155	2863	86524	192479	164	364	3.9	0.08	1.2	1.9
2002-03	4659	3745	91791	169602	171	315	3.7	0.06	1.1	1.6
2003-04	4949	4888	89848	195580	165	358	3.3	0.05	1.3	1.7
2004-05	5562	5562	122244	122244	220	220	0.4	0.4	0.9	0.9
2005-06	5980	7296	101175	126761	179	224	3	0.03	0.8	0.7
2006-07	10359	10552	138152	128433	241	223	3.2	0.02	0.8	0.6
2007-08	11394	13476	171818	146869	294	251	3.6	0.03	0.9	0.6
2008-09	12611	16976	180768	146857	304	247	3.1	0.02	0.9	0.5
2009-10	12889	21254	202209	133871	335	238	3.9	0.02	0.8	0.2
2010-11	18543	29831	248191	121123	394	205	3.8	0.02	1	0.2
2011-12	26479	32114	294837	112744	292	175	3.8	0.01	0.7	0.2
2012-13	36421	40127	364072	103216	328	130	4.3	0.01	0.8	0.1
CAGR	19.84	37.18	14.99	-4.38	11.17	-6.24				

Source: Author's calculation using data available in Various Issues of Handbook of Statistics on State Government Finances, Reserve Bank of India; 2004, 2007, and 2010-11 and from data available in Various Issues of Statistics Directorate of Economics and Statistics, Government of Karnataka

Note: 1.Expenditure is in Rs. 2. Reform Period 1991 to 2000-01. Post-Reform Period 2001 TO 2012-13.

2.2.2. Expenditure on health as percentage to [5]NSDP

Table 2 also presents Karnataka state government expenditure on health as percentage to NSDP at both current and constant prices (2004-05) over a period of twenty three years (reform and post-reform period). The share of expenditure on health as percentage to NSDP at current prices over twenty three years was 2.77 per cent (reform and post-reform period). In the same way, the share of health at current prices was 1.5 per cent in 1990-91, which decreased to 1.2 per cent in 2000-01; considerably increased to 1.3 per cent in 2009-10, again decreased to 1.1 per cent in 2012-13. Interestingly the share of health as percentage to NSDP at constant prices (2004-05) has decreased over the study period from 10.9 per cent in 1991 to 0.2 per cent in 2012-13. The share of expenditure on health as percentage of the NSDP at current prices during reform period was only 1.5 per cent, which has decreased to 1.01 per cent during post-reform period. However, at Constant prices (2004-05) expenditure on health as a percentage of the NSDP during reform period was 5.3 per cent, which has decreased to 1.1 per cent during post-reform period.

2.2.3   Per capita expenditure on health and compound annual growth Rate (CAGR %)

To understand the exact trends and growth rate of expenditure, our analysis considers an insight into the expenditure on health per-person per-year in the state in terms of both current and constant prices (2004-05) which are also presented in the Table 2. The per capita expenditure on health at current prices has also increased from small sum of Rs 56 in 1990-91 to   Rs 338 in 2012-13 (About 9 times) with a CAGR (%) of 11.17 per cent. But at constant prices (2004-05) per capita expenditure on health has decreased from Rs 501 in 1990-91 to Rs 238 in 2009-10 with a negative CAGR (%) of -6.24 per cent. The per capita average expenditure on health at current prices during

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[5]   The estimates of Net State Domestic Product (NSDP) are derived from the Gross State Domestic Product (GSDP) by deducting Consumption of Fixed Capital (CFC)

reform period was Rs 141, which has increased to Rs 440 during the post- reform period. However, at constant prices (2004-05) it has decreased from Rs 313 in reform period (1991-2000) to Rs 282 during the post-reform period of 2012-2013.

Thus, the share of expenditure on health at current prices during reform period was 6.58 per cent, which was more as compared to post-reform period of 4.78 per cent; It can be concluded that in terms of expenditure on health as Percentage of total expenditure economic reform has positive effect on health in the ten years of reform period at the same time it has negative impact on health during post-reform period.

2.2.4. Compound annual growth rate (CAGR %) of public expenditure on Health in Karnataka

In Appendix table 1 the annual growth rate of public expenditure on health and total expenditure are worked out, and huge variations can be seen if calculated in nominal as well as real terms, however, in this section to arrive at better results the compound annual growth rate (CAGR (%) method has been adopted for constant prices and shown in table 3.

Table 3 Compound annual growth rate (CAGR %) of public expenditure on Health in Karnataka at constant 2004-05 prices

Total expenditure			Health expenditure		
Reform Period	**post Reform Period**	**Total Period**	**Reform Period**	**post Reform Period**	**Total Period**
32.4	30.1	29.8	-1.90	-4.52	-3.29

Source: *Compiled from the Table 2*

Note: Reform period 1991 to 2000-01, post-reform period 2001 to 2009-10

Table 3 clearly indicts that health expenditures at constant prices (2004-05) had experienced negative growth rates in the reform period and during post reform period. The CAGR (%) for total expenditure of state during the study period was 29.8 per cent. At the same time, the CAGR (%) of expenditure on health over the study period and during reform period was negative i.e. -1.90 per cent as compared -4.52 per cent during post reform period.

It can be concluded that though the economic reform has positive effect on health at current prices, but in constant prices (2004-05), it has negatively affected the state government expenditure on health.

3. Impact of economic reforms: an econometric analysis

Data and methodology

The study depends purely on secondary data collected from data available in various issues of handbook of statistics on state government finances, Reserve Bank of India and from data available in various issues of statistics Directorate of Economics and Statistics, Government of Karnataka. The study is divided into two parts. In **the first part,** with the help of simple average, mean, standard deviation (SD), and coefficient of variation (CV), the trends and imbalances in the health expenditures for the state of Karnataka were estimated.

In the **second part** we have adopted three different methods to carry out the analysis. **In the first method**, with the help of a set of sector specific fiscal indicators for the state of Karnataka derived from [6] cluster analysis, the pattern and structural shift in expenditure on health has been analyzed. To carry out cluster analysis, **six** fiscal indicators were selected which are presented in the table 4. (The pattern in which, fiscal indicators change will measure the degree of changes in reform as well as post reform period). To analyze the effect of economic reforms on public expenditure on health, cluster has been built for reform period (1990-91 to 1999-2000) and post reform period for (2001 to 2012-13). However, to understand the nature of shift and **trend impact;** only changes in non-plan revenue health expenditures in relation to total expenditures normalised with respect to Gross disbursement (AGD) is chosen, and to analyse **sector specific relative impac**t, total non- plan expenditure on health has been chosen.

Secondly, We have also analyzed the association of sector specific expenditures association with a particular sector using Principal Components Analysis (PCA), derived on the basis of Kaizer criteria; Principal Components with Eigen values greater than unity have been taken into account.

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[6] Cluster analysis Is a multivariate statistical procedure that reorganize a set of data into relatively homogeneous groups

Table- 4 Fiscal indicators of sect oral expenditures used for analysis

Fiscal indicators
NPEHNPRE: non-plan expenditure on health services as % of total expenditure of non plan revenue account
NPESSNRE: non plan expenditure on social services as % of total expenditure on revenue account
EHAPTE:expenditure on health as percentage of total expenditure
REHTRE:revenue expexpenditure on health of revenue account expenditures
RESSTRE: revenue expenditure on social services of revenue account expenditures
***NPESSGD**: non plan expenditure on social services as % gross disbursement
***NPEHGD**: non plan expenditure on health services as % of total gross disbursement
**RDGSDP: revenue deficit as a portion of gross state domestic product

Note: *Excluded to assess the trend impact, as only non plan expenditures were   considered,

**included to asses impact of economic reforms

    In the third method, to get factor scores of principal components, [7]Factor analysis method is used. Indicators selected under cluster method above are used here to extract factor scores. Using the factor scores for different set of indicators, the aggregated indices have been worked out. To study the exact shift and impact during and after reforms mean values and compound annual growth rate of factor values of health fiscal indicators is calculated and presented in table-5.

    The impact of reforms and performance of the health sector is analyzed in the **third part**. Since the study seeks to assess the impact and to establish a link between public spending on health and the health performance of a state, We have worked out the aggregated indices using the factor scores for different set of indicators such as ***human man power capital* (HM), health infrastructure (HI), and health performance (HP) in health services, which are shown in Appendix table 3.** *The health performance (HP), is aggregated indices of human man power capital (HM), health infrastructure (HI), stated the other way, the ratio of these two is an indicator of this substitution possibility, quite often referred to as **scale factor i**n health productivity performance (HP). Likewise, the expenditure on health as percentage of total expenditure (**EHAPTE**), Per capita spending on health (PCHE) , and ratio of revenue deficit to   Gross state domestic product (RSGDP) (shown in table App.3)   is an **allocative efficiency factor or variable** to be reckoned with. Both the scale and the allocative efficiency factor can explain the performance of the health. (HP)*

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[7] factor analysis attempts to identify underlying variables, or **factors**, that explain the pattern of correlations within a set of observed variables. It is often used in data reduction to identify a small number of factors that explain most of the variance that is observed in a much larger number of manifest variables.

TABLE-5 Means, CAGR of health sector fiscal indicators during reforms and post reform period for Karnataka and Expected Shift due to reforms and its Impact

Indicators	Cagr (%)			Mean values			Expected shift due to reforms	Impact of reforms
	Reforms	Post-reforms	Total period	Reforms	Post-reforms	Total period		
NPEHNPRE	-2.9	-3.3	-3.2	4.9	3.7	4.2	↓	− , <
NPESSNRE	-2.1	0.5	-0.9	31.2	28.4	29.0	↓	− , >
*REHTRE	-3.6	-5.8	-4.9	5.4	3.6	4.4	↓	− , >
*RESSTRE	-1.3	0.6	-0.66	37.8	37.6	37.1	↓	− , >
NPESSGD	-1.4	3.2	0.79	21.4	22.4	21.1	↓	− , >
NPEHGD	-1.8	-2.6	-1.2	3.1	3.1	3.2	↓	− , <

Note: + and − sign denote s percentage increase or decrease in average Value of expenditure indicators >, < indicates percentage change is greater or smaller.

*excluded to assess the trend impact, as only non- plan expenditures were considered.

Source: **same as table 2**

Table 6. Health related input- output indicators for Karnataka

Input variables		Output variables
1. Health Infrastructure indicators(HI)	2.Health Man Power Indicators (HM)	3.Health Performance Indicators (HP)
1. No of dispensaries 2. No of Hospitals 3. No of sub-centers 4. No of PHCs 5. No of hospital Beds	1. No of Doctors at PHC 2. No of Health workers – Male/Female 3. No of Health Assistant Male/Female 4. No of Lab Technicians 5. No of Nurses	1. Crude Birth rate 2. Crude Death rate 3. Net Growth rate 4. Infant Mortality rate 5. Total Fertility rate 6. Couple Protection

With this analytical background, using the time series-wise estimated composite indices; we have analyzed the results with the help of two econometric models. To construct these models,

here an attempt is made to look at the input indicators as well as output Indicators (table 6). The behavior of such indicators and their interpretations over the period of time would help us to know the probable impact of expenditures on health status and performance.

Definitions of the variables used in the model:

→ **Input Scale Factor (ISF)** = health man-power/health infrastructure, (HM/HI)
→ **Health performance scaled (HPI)** = Health performance/ health infrastructure, (HP/HI)

→ **Budget allocative efficiency (PCHI)** = Per capita spending on health /Health

Infrastructure (PCHE /HI); in addition, the HP and PCHE are also used as

Additional variables.

→**Efficiency of government health facilities (EHAPTE)** = i.e. expenditure on health as

Percentage to total expenditure and per capita income (PCI) is also used as variables

Along with the above variables another important variable which influences public

Spending   on health is **deficit in government finances**.

As put forth by P.R. Panchamukhi (2000), Introduction of economic reforms in any country will have impact on resource   allocation, i.e. bringing down the size of the budgetary deficits to the level of 5 per cent of GDP. The direct impact of this would be on social sector, which has to withstand the worst of deficit reduction, as the chance of this sector getting more funds increases. Thus, the state Government feels encouraged to create budgetary deficits when there are deficits in the central budget. This happens mainly due to direct relationship between Government deficit and Government expenditure. These relationships have influence on deficit constraints on government finances. All governments are forced to restrict its fiscal deficit.

So, we have added revenue deficit measure variable 'RDGSDP' (ratio of revenue deficit to gross state domestic product) to measure the impact of economic reforms. (RSGDP) along with the above variables

With the set of above variables we have attempted two basic econometric models:

HPI = a0 + a1 ISF + a2 PCHI+ a3 EHAPTE …………… (1)

Hp = a0 + a1 ISF + a2 PCI+ a3 EHAPTE+ a4 RDGSDP….(2)

We have estimated two separate ordinary least squares regressions for two models of different dependent variables, (with linear and log-linear specifications). Using these estimated

models, regressions are estimated for health performance productivity. These are shown in Table-7 and Table 8.

4. Empirical analysis and findings

      The pattern and structural shift in expenditure on health, sector specific shift and impact of expenditures on particular sector in Karnataka is captured by three different methods.

Starting with a cluster analysis with a set of fiscal indicators for the state of Karnataka, (as given in table-A2 in appendix.) with 1990-91 to 2000-01 as the reform period and 20012 to 13 as the post reform period, expenditure on health sector's year-wise cluster membership and shift in the chosen set of health sector indicators is analyzed. *Year-wise cluster membership definitely establishes that the shifts have occurred in the health sector fiscal indicators during reform and post reform periods.*

      Karnataka has witnessed 3 shift points, i.e. in the year 1994-95, 2002- 03, and 2009-10 (table -A2 in appendix). The state has witnessed shifts in sector specific expenditure from 1993- 94 , but the trend has again changed during post reforms period as cluster shifts towards lower cluster from 2002-03, indicating shift having taken place in post-reforms as well. This shows Karnataka has also experienced the effect of economic reforms in the health sector expenditures in the form of resource shift. (This can also be seen in table 5) Again we have conducted factor analysis to assess the exact priority assign to health sector during the study period. The factor scores from principal components that are extracted from a factor analysis of expenditure related indicators for Karnataka. In line with the above findings the factor scores extracted here, reveal the same trends. Year- wise factor score measures of priority show a continuous negative decline up to 1993-94. (Table- A2 in appendix) In 1994-95 regarded as reform period, the trend increases, however, after 1996-97 the trend is negatively decreasing till 2008-09. Whereas, in the last five years the trend has shown positive rising trends indicating some gains for health sector. Thus one can argue that over the study period health sector got negligible priority while allocating resources and secular cutback in non–plan expenditure on this sector.

      In the **second method** we have computed compound annual growth rates (CAGR%) to assess the exact impact and shift of the sectoral expenditure indicators of health sectors, (Table- 5) The CAGR (%) of NPEHNPRE , NPESSNRE, NPESSGD and NPEHGD have witnessed negative growth rate during the reform period. However in the post reform period except NPEHNPRE and

NPESSGD all other indicators witnessed negative growth rates. This trend continued during the study period indicating that reforms in Karnataka does not seem to have helped health sector.

In the **third** method we have used mean values of non-plan health expenditures in terms of NPEHNPRE, NPESSNRE, NPESSGD and NPEHGD to assess the nature of shift in health expenditures which are presented in table-5. It seems the state has witnessed positive changes. But the changes in mean values of health indicators, during post reform period are less than reform period indicating a decline in health expenditures. *Thus, the results clearly indicates that the impact of economic reforms on health expenditure in the state, though have positive effect for revenue side, i.e. (REHTRE AND RESSTRE), but under non- plan expenditure category the state has had witnessed negative growth rate as well as smaller changes.*

In a state like Karnataka in which public and private health delivery system function side by side, it is important to know the contribution and performance of the public health sector. Here an attempt is made to assess the impact and to establish a link between public spending on health and the health performance of a state. On the basis of correlogram specification (autocorrelation and partial correlation) all the series of variable are non-stationary. The variables are stationary at the first differences i.e., all the series are integrated of order 1 [I (1)]. When all the series (both dependent and independent variables) are I (1), there is a chance of co-integration among the variables. In our model, we have run the regressions of all the variables as it is (i.e., nonsationary). Then, we have checked the correlogram of the residuals which shows the variables are co-integrated. So, it is confirmed that there exist long run equilibrium relationship among the variables.

Two ordinary least squares regressions are estimated for two econometric models and results are presented in the table 7 and table 8.

From the table-7, it is seen that the ISF is positively associated with health performance productivity over the study period. The high positive elasticity of ISF with respect to health performance productivity shows that, there may exist substantial scale economies to exploit public sector health spending. However, PCHE has positive influence on the HPI. But, co-efficient estimate is less than unity. (0.065) the coefficient of EHPTE is turn out to be (2.893) with a high level of statistical significance, this suggests possibility of improvements.

Table -7 Determinants of Health Performance- Productivity of Karnataka: estimation of regression model

			Dependent variable= HPI		
UN Standardized Coefficients			**Standardized Coefficients**	**t- stat**	**significance**
	B	**STD ERROR**	**beta**		
constant	-2.799	0.380		-3.366	0.301
ISF	0.469	0.153	0.748	3.057	0.007
PCHE	0.065	0.001	0.106	0.314	0.757
EHPTE	2.893	1.623	0.707	1.783	0.092

Note: r square=0.474; adjusted r square =0.35

To capture the performance and functional efficiency of the health sector (HP) linkages we have estimated the equation (2), Like the previous regression estimation, we have checked the stationary of all the variables through correlogram specification (autocorrelation and partial correlation). All the variables are stationary at the first differences i.e., all the series are integrated of order 1 [I (1)]. Thus, there is a chance of co-integration among the variables. In this model also we have run the regressions of all the variables as it is (i.e., nonsationary). Then, we have checked the correlogram of the residuals which shows the variables are co-integrated. So, it is confirmed that there exist long run equilibrium relationship among the variables. The results are shown in table-8. It is seen from the table-8 that the ISF is positively associated with health performance over the study period. The high positive elasticity of ISF with respect to health performance efficiency it is EHPTE that is seen to have a strong positive influence on health performance, so there is a sufficient scope for more utilization of health services. The income variable PCI though has positive relationship, its elasticity is low (0.002) with a fair level of statistical significance.

Table- 8 Determinants of Health Performance- Karnataka: estimation of regression model

			Dependent Variable HP		
UN Standardized Coefficients			Standardized Coefficients	t- stat	significance
	B	STD ERROR	beta		
constant	-1.053	0.407		-0.130	0.098
ISF	0.013	0.390	0.007	0.035	0.973
PCI	0.002	0.067	0.224	0.521	0.071
EHPTE	1.479	0.375	1.032	3.945	0.001
RDGDSP	0.505	0.051	0.628	2.678	0.016

Note: r square=0.682; adjusted r square =0.583

An important finding is with regard to RDGSDP an explanatory variable which has a high statistical significance with positive coefficient estimate. This suggests that when more resources are allocated during expansion of deficit constraints, the health sector may gain. The result from above regression definitely establishes a positive relationships and shifts in health performance and public expenditures on health.

5. Concluding observations

In Karnataka different revenue divisions have different characteristics and there is great disparity in terms of fiscal strength and stability, public and private health delivery systems work side by side. It is important to study contribution of public sector. In this study a modest attempt Is made to analyze the trends and pattern of public expenditure on health the study also tries explore the relationships and impact of health expenditure on the health performance in Karnataka. The interesting aspect of public expenditure on medical and public health is that, in case of Karnataka, a major portion of the total expenditure on health is under the Revenue account which has been increasing. On the contrary, a very meager portion of total expenditure is disbursed under the Capital

account. It can be concluded that in terms of expenditure on health as Percentage of total expenditure on economic reform has positive effect on health in the ten years of reform period at the same time it has negative impact on health during post-reform period. The study also found that though the economic reform has positive effect on health at current prices, but in constant prices (2004-05), it has negatively affected the state government expenditure on health. We also found that over the study period health sector got negligible priority while allocating resources and secular cutback in non–plan expenditure on this sector. The result from regression definitely establishes a positive relationships and shifts in health performance and public expenditures on health. Keeping in mind the above findings we can say that much has not been done in terms of real expenditures on health. The governments must encourage public participation in the provision of health services. In spite of the state's role in the overall administration and implementation to cover the whole population in health matters nothing has changed. Rather, the state has a key role to play in ensuring that health services of adequate standard are available to citizens. The policy requirements for government intervention in such a context may be delivery in terms of health outcomes in quantum, and quality.

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APPENDIX

Table A-1

Annual Growth Rates (%) of expenditure on health of Karnataka from 1990-91 to 2012-13

Year	Total Expenditure		Total Health Expenditure	
	Current prices	***Constant prices (2004-05)**	**Current prices**	***Constant prices (2004-05)**
1990-91	--	---	---	---
1991-92	25.50	63.28	22.93	-5.51
1992-93	13.63	23.94	21.34	11.25
1993-94	13.93	44.48	12.30	-11.45
1994-95	9.52	27.54	24.87	7.23
1995-96	17.46	36.45	13.10	-2.64
1996-97	15.13	33.64	7.66	-7.25
1997-98	5.17	14.85	16.96	7.10
1998-99	18.13	46.94	13.56	-8.70
1999-00	19.70	37.39	6.12	-7.55
2000-01	10.36	17.45	8.22	1.69
2001-02	15.31	18.36	6.42	3.68
2002-03	24.23	33.02	-5.65	-11.89
2003-04	23.01	32.69	24.39	15.32
2004-05	3.06	33.80	-5.96	-27.56
2005-06	-2.06	15.24	5.28	-10.53
2006-07	26.05	47.18	18.30	1.32
2007-08	9.13	29.93	36.16	14.35
2008-09	12.72	28.13	13.66	-0.01
20009-10	15.09	27.31	12.22	-13.62
20010-11				
2011-12				
2012-13				
Total	14.48	32.19	13.32	-2.36

Source: same as table 1

Table-A-2: Principal Component Analysis scores in different years and Year wise cluster membership of health sector indicators for Karnataka

year	PCA Analysis scores	Case number	Cluster
1990-91	- 0.155	1	1
1991-92	-0.279	2	1
1992-93	-0.051	3	1
1993-94	-0.163	4	1
1994-95	0.138	5	2
1995-96	-0.339	6	2
1996-97	-2.087	7	2
1997-98	-1.645	8	2
1998-99	-1.653	9	2
1999-00	-1.309	10	2
2000-01	-1.234	11	2
2001-02	-1.033	12	2
2002-03	-3.233	13	3
2003-04	-2.338	14	3
2004-05	-1.980	15	3
2005-06	-1.578	16	3
2006-07	-1.642	17	2
2007-08	-0.123	18	3
2008-09	-0.945	19	2
2009-10	0.765	20	3
2010-11	0.987	21	3
2011-12	0.923	22	2
2012-13	1.234	23	2

Table A.3 composite indices of health performance, human man power capital, health infrastructure, hpi, and data on variables used in health productivity model

year	HPI	PCHE	HI	HM:HI	EHPTE	RDGSDP	HM	PCI
1990-91	1.8	501	0.9	0.654	0.4	0.9	1.02	154
1991-92	1.85	471	0.8	0.675	0.3	0.9	0.99	250
1992-93	1.05	410	0.7	0.987	0.3	0.7	0.97	302
1993-94	1.07	441	0.9	1.342	0.2	0.6	0.96	427
1994-95	1.7	464	0.8	1.564	0.2	0.5	0.99	534
1995-96	1.2	444	0.7	1.432	0.2	1.2	0.54	716
1996-97	*1.0*	405	0.9	2.061	0.1	1.1	0.65	942
1997-98	1.0	428	0.8	2.135	0.1	2.1	0.87	1066
1998-99	1.0	385	0.7	2.856	0.1	2.7	0.99	1546
1999-00	1.1	352	1.0	2.342	0.1	2.5	0.98	2099
2000-01	1.2	353	1.1	2.653	0.09	2.1	0.92	2433
2001-02	1.3	364	1.2	2.432	0.08	2.7	1.12	2863
2002-03	1.8	315	1.0	2.432	0.06	2.4	1.02	3745
2003-04	1.8	358	0.9	1.987	0.05	1.1	1.23	4888
2004-05	1.9	220	0.8	1.567	0.04	0.5	1.34	5562
2005-06	1.9	224	0.7	1.984	0.03	-0.7	1.23	7296
2006-07	1.9	223	0.7	1.786	0.02	-1.5	1.34	10552
2007-08	1.8	251	0.9	1.098	0.03	-1.4	1.44	13476
2008-09	1.9	247	1.2	2.015	0.02	-0.2	1.48	16976
2009-10	1.9	238	1.3	2.325	0.02	-0.5	1.48	21254
2010-11	1.6	205	1.1	2.123	0.02	-0.4	1.38	29300
2011-12	1.3	175	1.1	2.345	0.01	-1.0	1.27	34521
2012-13	1.3	130	1.0	2.759	0.01	-0.2	1.26	39218

Table A-4 Factor analysis scores with sectoral expenditures indicators for health sector in Karnataka

Indicators	COMPONENT 1	COMPONENT 2
	% of Variance 52.6%	% of variance 30.1%
NPEHNPRE	0.960	-0.005
NPESSNRE	0.479	0.813
REHTRE	0.940	0.167
RESSTRE	-0.049	0.843
NPESSGD	-0.624	0.656
NPEHGD	0.855	-0.017

Principal components extracted after varimax rotation with Kaiser Normalization.

TableA- **5 Sectoral Fiscal Indicators Indicators Used To Extract Pca, Factor Scores And CAGR**
(In %)

	NPEHNPRE	NPESSNRE	REHTRE	`RESSTRE	NPESSGD	NPEHGD
1990-91	5.4	35.1	6.1	38.8	23.5	3.7
1991-92	5.2	35.5	6.0	38.8	24.1	3.5
1992-93	5.8	32.5	6.4	39.6	21	3.4
1993-94	5.8	32.8	6.3	38.3	20.8	3.5
1994-95	5.4	31.1	6.3	39.3	21.4	3.3
1995-96	4.4	29.7	4.8	39.1	20.8	3.5
1996-97	3.8	28.6	4.4	38	21.4	3.3
1997-98	4.1	29.7	4.7	38.8	20.1	2.8
1998-99	4.7	28.8	4.9	34.3	20.9	3
1999-00	4.7	29.4	4.7	33.4	20.1	3.2
2000-01	4.4	27.3	4.6	34.7	19.8	3.3
2001-02	4.2	29.3	4.2	38.8	19.7	3.5
2002-03	4.2	29.5	4.3	37.3	20.1	3.6
2003-04	4.2	27.6	4.0	38.3	21	3.4
2004-05	4.9	24.5	4.8	33.3	19.9	3.3
2005-06	3.2	27.3	3.6	37.6	19.1	3.2
2006-07	3.3	27.4	3.4	37.3	21	3.1
2007-08	3.7	29.6	3.7	38.8	23.4	3
2008-09	3.5	29.8	3.6	38.1	25.3	3.1

2009-10 E	3.6	30.3	3.6	39.1	23.6	3.1
2010-11	3.5	30.1	3.8	39.8	25.1	2.8
2011-12	0.8	29.1	2.1	37.3	25.1	2.9
2012-13	0.9	28.1	2.0	38.8	28.1	2.4