

Analysis of Sectoral Trends and Patterns:

Kerala, Goa, Thailand, Bangladesh

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Abstract

The paper focuses on the economic growth and development of Kerala, Goa, Bangladesh and Thailand using various econometric methods in context of posited relationships across selected parameters.

Analysis of Data:

Manufacturing sector growth rate and growth rate in number of MSME in Kerala (derived from the data in Figure 6)

The data has been taken from the Economic Survey Reports of Kerala. By using a simple linear regression model –

$$Y = a + bX + e$$

Where Y= Dependent Variable, here manufacturing growth rate

X= Independent Variable, here MSME growth rate

The data has been analysed using Microsoft Excel

Year	Manufacturing growth rate	MSME growth rate
2008-09	8.26	0.439736176
2009-10	7.59	-0.246124882
2010-11	7.94	-0.151419296
2011-12	7.68	9.792623112
2012-13	7.74	-0.881376113

Conclusion :

The value of R squared is close to 0, so the numbers of MSME's do not impact the manufacturing sector growth rate to that extent.

For Goa data used for STATE DOMESTIC PRODUCTS IN GOA 2004-05 to 2013-14(P), DPSE Goa

The regression analysis of the data was done to find the relationship between the two variables with the following functional form:

$$(\text{PrimaryGSDP}) = \text{const} + \text{coeff}(\text{MiningGSDP}) + e$$

The R-squared value of the overall model is 0.9313. Hence the regression model is significance. The coefficient of the MiningGSDP is also significant. Hence the model is in the correct functional form.

$$(\text{PrimaryGSDP}) = 1201251.6 + 0.83325(\text{MiningGSDP}) + e$$

The result lead us to a conclusion that movements in Mining sector clearly has significant impact on the primary sector. Hence for a sustainable development of primary sector, mining is an important component

In Goa, The regression analysis of the data was done to find the relationship between the two variables with the following functional form:

$$(\text{SecondaryGSDP}) = \text{const} + \text{coeff}(\text{MiningGSDP}) + e$$

and the following results were obtained

The R-squared value of the overall model is 0.8484. Hence the regression model is significance. Although the overall significance is less than that of primary sector but, the value is quite significant. The coefficient of the MiningGSDP is also significant at 5% level of significance. Hence the model is in the correct functional form.

$$(\text{SecondaryGSDP}) = 373508.1 + 2.98288(\text{MiningGSDP}) + e$$

The above result leads us to the conclusion that Mining sector, not only impacts the primary but also the manufacturing sector. The high magnitude of correlation is due to the fact that Manufacturing industry uses the output of Mining industry for the further stages of production. The output of the mining industry like hematite ore and manganese ore go on for further processing to make the finished products. Thus the value added is a part of Secondary sector output. The rest of the output from mining is exported.

From 2011-15(BAN period)

$$\text{PrimaryGSDP} = \text{const} + \text{coeff}(\text{MiningGSDP}) + e$$

Source	SS	df	MS	Number of obs	=	5
Model	2.8356e+11	1	2.8356e+11	F(1, 3)	=	112.35
Residual	7.5717e+09	3	2.5239e+09	Prob > F	=	0.0018
Total	2.9113e+11	4	7.2783e+10	R-squared	=	0.9740
				Adj R-squared	=	0.9653
				Root MSE	=	50239

PrimaryGSDP	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
MiningGSDP	1.003225	.0946479	10.60	0.002	.702013 1.304437
_cons	190883.9	28990.24	6.58	0.007	98624.07 283143.8

and the following results were obtained:

The R-squared value of the overall model is 0.9740. The value of this is considerably large. The P value for the overall significance of the model based on F-Test is 0.0018. This value is safely low and thus the hypothesis of insignificance of the model can be safely rejected at 5% level of significance. The value of constant and the coefficient of Mining GSDP are also significant at 5% Level of significance. Hence the model is valid.

$$\text{(PrimaryGSDP)} = 190883.9 + 1.003225(\text{MiningGSDP}) + e$$

Hence we can see that Mining sector as a whole has a significant correlation with the primary sector. Infact it can be noted that as the output of the mining sector reduced during the period of BAN, there was stark increase in the output of Agriculture, Forestry and Fishing sector. The possible explanation for this kind of phenomena may be that:

1. As the ban on the mining persisted starting from 2012, The large amount of unskilled labour that was previously employed in the mining industry was rendered jobless.
2. Hence the unemployed population resorted to engagement in farming activities and animal husbandry or fishing. Due to a lack of immediate jobs, the labour force to sustain themselves and support themselves economically, took up jobs in other activities in the primary sector.

Secondary Sector

The regression analysis of the data was done to find the relationship between the two variables with the following functional form:

$$\text{(SecondaryGSDP)} = \text{const} + \text{coeff}(\text{MiningGSDP}) + e$$

Source	SS	df	MS	Number of obs	=	5
				F(1, 3)	=	26.86
Model	1.7111e+11	1	1.7111e+11	Prob > F	=	0.0139
Residual	1.9109e+10	3	6.3696e+09	R-squared	=	0.8995
				Adj R-squared	=	0.8661
Total	1.9022e+11	4	4.7555e+10	Root MSE	=	79810

SecondaryG~P	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
MiningGSDP	.7793144	.1503592	5.18	0.014	.3008042 1.257825
_cons	1393600	46054.36	30.26	0.000	1247034 1540165

and the following results were obtained

The R-squared value of the overall model is 0.8995. The value of this is considerably large. The P value for the overall significance of the model based on F-Test is 0.0139. This value is safely low and thus the hypothesis of insignificance of the model can be safely rejected at 5% level of significance. The value of

constant and the coefficient of Mining GSDP are also significant at 5% Level of significance. Hence the model is valid.

$$(\text{SecondaryGSDP}) = 1393600 + 0.7793144(\text{MiningGSDP}) + e$$

From the above results it can be inferred that the BAN on mining did infact affect the secondary sector. Interestingly it can be observed that although the ban on mining had profound impact on the manufacturing sector, the shock on the overall Secondary sector was relatively dampened. This was primarily due to growth of output of intrasectoral activities in other sectors like construction and energy. But the manufacturing sector faced major setbacks with overly negative growth rates (Refer **TABLE 3**).

Results :

On primary sector:

- a) In the pre-ban period (2004-11), the slope of the regression line (coefficient of MiningGSDP) = 0.833, whereas in the period from 2011-16 during which the ban was exercised, the slope increased to 1.00.
- b) This suggests that ban on mining impacted the output of primary sector adversely as compared to the pre-ban period due increase in the slope which means that a unit change in Mining output caused a greater change in the overall output of primary sector.

On secondary sector:

- a) In the pre-ban period (2004-11), the slope of the regression line (coefficient of MiningGSDP) = 2.982, whereas in the period from 2011-16 during which the ban was exercised, the slope increased to 0.7793.
- b) This suggests that in pre-ban period output of secondary sector had greater correlation with the output of mining sector due to concerted growth of both the sectors together and their interrelated activities. However during the period of ban and after that, the close link between the Manufacturing sector and the mining industry was severely affected with low output of mining sector. This was further accompanied with improvement in the other sectors like Energy and Construction.

The value of R2 obtained from the regression is 0.9877 which indicates that almost the entire variance in the Agriculture sector has been explained by the parameters used in the regression analysis.

$P > |t|$ is an indicator of the significance of the parameter and can be regarded as a direct measure of it's importance in determining the independent variable. A value less than 0.05 suggests that the parameter is statistically significant. Agricultural land (P = 0.00) is therefore seen to have a direct correlation with the GDP contribution of the agriculture sector. Data collected shows a gradual decrease in productive land used for agricultural purposes which directly contributes to the decline in the agricultural sector. Government expenditure on education (P=0.015) is seen to play a statistically significant role in agriculture .Government expenditure is positively correlated to the percentage of the population that

has completed primary education .Data shows that an increase in expenditure on education improves academic qualifications and increases demand for jobs in the services and manufacturing sectors,as opposed to agriculture which does not require a primary level of education .Manufacturing sector value addition to GDP (P=0.012) is seen as the most important parameter in explaining the growth trends in the agriculture sector .Steady growth in this sector is observed to be one of the primary reasons for the decline in agricultural sector contribution to GDP.

Agricultural exports(P=0.124),FDI inflows into the agriculture sector(P=0.318) and value added to GDP by services (P=.707) are observed to be statistically insignificant to explaining the decline in agriculture .The insignificance of the services sector is supported by data showing that it’s contribution to GDP (%) has not changed much in the time period for which the data has been analyzed(1991-2013).

Among the r values ,it is important to observe that GDP contribution of the manufacturing sector has an almost perfectly negative correlation(-0.966) to GDP contribution of agriculture .Strong positive correlations of agriculture GDP contribution with land(0.702),agricultural exports(0.768) and FDI (0.837) are observed as expected while education shows a weak negative correlation to agriculture(-0.267).

A correlation analysis of GDP valued added of Manufacturing and Services sectors shows a very high degree of positive correlation between both sectors. However ,this generalized approach is based on the output data of these sectors alone.

3 Sector Simplified I/O Table

	Agriculture	Manufacturing	Services	Total Demand	Consumption	Capital Formation	Exports	Total
Agriculture	55326	603978	69547	728851	205945	8255	140471	1812373
Manufacturing	208102	5487169	2027896	7723167	1514788	8882032	3232032	29075186
Services	91059	1568547	2844346	4503952	3170267	902402	135996	13216569
Final Output	358316	7659694	4941790	12959800				

From the data above,demand functions for sectors were found to be:

Agriculture :0.154A + 0.079M + 0.014S

Manufacturing:0.581A + 0.716M + 0.411S

Services:0.2541A + 0.205M + 0.516S

Where **A – Agriculture, M- Manufacturing , S- Services**

With relation to the sectoral linkages between manufacturing and services sectors,it is seen that 71.6% of the output of the manufacturing sector goes into the manufacturing sector while 20.5% of it’s output goes into services.41.1.% of services output goes into manufacturing while 51.6% goes into services itself.

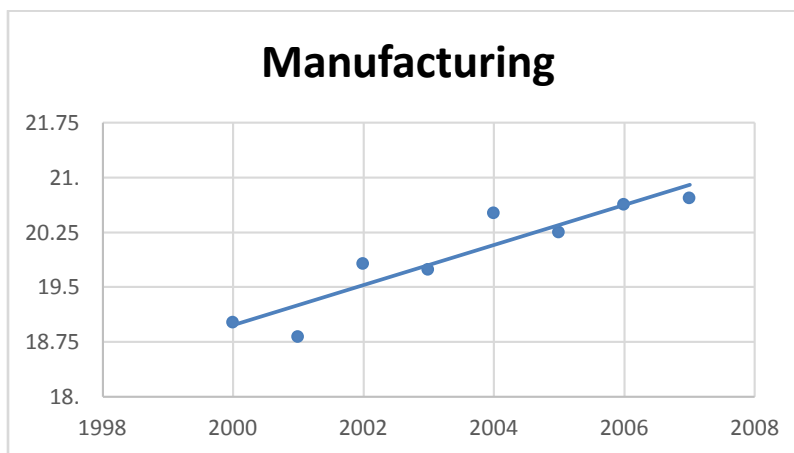
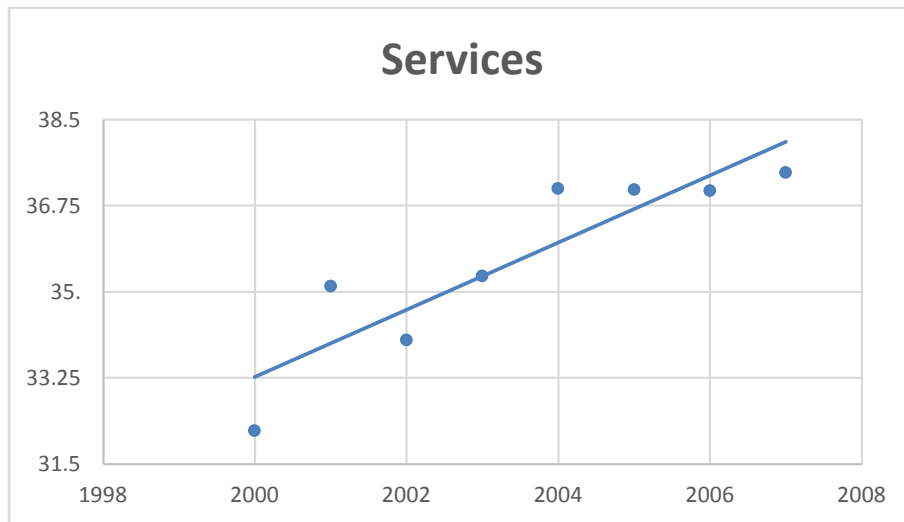
The output of manufacturing to meet the needs of services will be 41.1% of what services produces while the output of services to meet the needs of manufacturing will be 20.5% of what manufacturing produces.

On solving the system of equations, the following relation is obtained:

$$S = 0.575 M$$

This shows that the services sector, based on data from 2007, should produce 57.5% of what the manufacturing sector produces.

The graphs of employment by sector as percentage of total employment(2000-2007)generated the following scatter plots:



The line of best-fit for services has a slope of 0.68 while that of manufacturing has a slope of 0.3. This indicates that the rate of employment growth in services during the period 2000 – 2007 was much more than that of manufacturing during the same period. While services sector employment grew from 32% to 37.5%, the simultaneous growth in manufacturing was from 18.8% to 20.7%. It is to be noted that growth in both sectors was as a result of shift in employment from the agricultural sector, among other

factors such as better education programmes, increase in FDI, skilling of the labour force and increased contributions to GDP of the manufacturing and services sectors.

To assess growth in Bangladesh regression analysis to find the effect of parameters like rural population, land used for agriculture, unemployment, government expenditure on education on economic value added by the agriculture, industry and service sectors to the nation as a percentage of the GDP from year 1999 – 2015. Based on the regression results, the paper will try to give some recommendations on how the current problems can be removed/reduced depending on what factor affects the growth of the nation to what extent.

Value added by Agriculture (% of GDP) = -46.51316 + 0.00024(Agricultural land) + 0.0249(percentage of unemployment) – 4.1806(govt. expenditure on education) + 0.7276(Rural Population)

R-square and Adjusted R-square values are high, hence the model is a good fit. Agriculture output does not depend much on area of agricultural land and the number of people unemployed. It highly depends on the number of people living in the rural area. As the rural population is decreasing over the years, the value added to the GDP is also decreasing over the years. This implies that more people are now employed in the other two i.e. industry and service sectors which is helping the nation to grow.

References:

1. K. K. Subrahmanian (1990) in “Development Paradox in Kerala Analysis of Industrial Stagnation” Source: Economic and Political Weekly, Vol. 25, No. 37 (Sep. 15, 1990), pp. 2053-2055+2057-2058
2. K. P. Kannan 2005- “Kerala's Turnaround in Growth: Role of Social Development, Remittances and Reform”, Source: Economic and Political Weekly,
3. K.P. Kannan in “Kerala Economy at the Crossroads”, Source: Economic and Political Weekly
4. <http://planningcommission.nic.in>
5. State Profile of Kerala 2014-15
6. Economic Survey of Kerala – 2015
7. ApisekPansuwan(2010) “Policies and pattern of industrial development in Thailand”,
8. Economic Survey of Goa 2015-16, DIRECTORATE OF PLANNING, STATISTICS AND EVALUATION, GoaGeoJournal (2011) 76:25-46 DOI 10.1007/S10708-010-9400-8
9. Gouri K. Manerkar “ IMPACT OF MINING BAN ON THE GOAN ECONOMY- A CASE STUDY” Source: IJCISS Vol.2 Issue-06, (June, 2015)
10. KhorshedChowdhury (1992) “Sectoral Lead and Economic Growth in Bangladesh: Evidence from Granger Causality Test”, Bangladesh Institute of Development Studies

11. Md. Rifayat Islam, AfrojaRehan Rima (2017) "A case study on Macro Economic Conditions of Bangladesh", Euro-Asian Journal of Economics and Finance
1. Mohammad Shahidul Islam, Md. Musa, RajibKanti Das (2012) "The Comparative Growth of Service Sectors in Bangladesh", Research Journal of Finance and Accounting, ISSN 2222-1697(Paper)
12. Muhammad ShariatUllah, Inaba Kazuo "Patterns of comparative advantage of Bangladesh's export"
13. Peter G. Warr(2002) "Poverty Reduction and Sectoral Growth : Evidence from South East Asia" , WIDER Discussion Paper No.2002/20
14. Peter G. Warr,Will J. Martin(1994) "Determinant of Agriculture's Relative Decline: Thailand",Agricultural Economics 11 (1994) 219-235
15. PisitPuapan (2014) " Assessment of FDI Impact on Thailand's Production Sectors: Implications for Investment Promotion Activities",IDE Discussion Paper No.443
16. PRANAB MUKHOPADHYAY and GOPAL K KADEKODI "Missing the Woods for the Ore: Goa's Development Myopia" Source: Economic and Political Weekly, Vol. 46, No. 46 (NOVEMBER 12, 2011), pp. 61-67
17. RadhikaShrikantNayak in "Regional Disparities in Economic Development of Goa"(January 2008)
18. State Domestic Products in Goa 2004-05 to 2013-14, DIRECTORATE OF PLANNING, STATISTICS AND EVALUATION, Goa
19. Terence Jorge,Hagen De Se, Pushp Jain "Survey of Environmental & Socio-Economic Impacts of Interim Ban on Mining in Goa" EIA Resource and Response Centre (ERC) Goa, India.
20. WaleeratSuphannachart (2012) "Foreign Direct Investment in the Agricultural Sector of Thailand and its Effect on Productivity",European Journal of Scientific Research ISSN 1450-216X Vol. 91 No 3 November, 2012, pp.393-403