International Journal of Economic Research

ISSN : 0972-9380

available at http: www.serialsjournal.com

Volume 14 • Number 4 • 2017

An Empirical Study on the Effect of GST on GDP Growth, Evidences from Asia Pacific Region

Jayaram R.[1]

[1] *Assistant Professor, School of Business, Lovely Professional University, Punjab, India, Email: jayaram.fin@gmail.com*

Abstract: Indian economy is on final stage for implementing GST. Even though there are many hurdles before the final implementation of GST, it is clear that the shift from VAT system to GST will make radical changes in the Indian economy. The objective of this paper is to make an empirical analysis on GST implementation and its impact on GDP growth rate of Jordan, Singapore, New Zealand, Australia and Papua New Guinea. Such an investigation will through light to the impact of GST in these countries.

Keywords: Gross Domestic Product, Goods and Service Tax, Indirect tax, India.

INTRODUCTION

India is on the last stage of implementing GST. It is expected that GST will be reality by this fiscal or next. Goods and Service Tax (GST) is an indirect tax where the ultimate burden of tax will fall upon the final consumer.GST implementation will bring a lot of transparency and compliance to Indian tax system. Some of the major objectives of GST implementation in India are,

- Removing the cascading impact of indirect taxes
- Reducing corruption & better compliance.
- Improving the ease of doing business.
- Easing of indirect tax administration.
- Establishing uniformity of tax rates in India.

Following are some of the indirect taxes going to be subsumed with GST.

State taxes: Entertainment tax, luxury tax, tax on lottery, entry tax, Octroi, state cess, surcharges, purchase tax….

Central taxes: Excise duty, additional excise duty, service tax, customs duty…..

According to Empowered committee of finance ministers and reports of Thirteenth finance Commission, its sure that GST will bring radical changes in Indian economy. Migration from VAT to GST is a challenging task. The experience of implementation of GST in recent times has great importance, as we can learn from the post implementation problems. According to the estimates of Finance commission and various economists, it is expected that implementation of GST in India would help for an extra GDP growth rate of 0.9-1.7% from the current level. But this paper tries to find out answer the question "can the GST implementation give an extra boost to the GDP growth rate of a country? And what are the experiences of countries who had implemented it the in past?"

Goods and Service Tax (GST) - Global Scenario.

Over 150 countries are using GST in one form or the other. There is significant difference in the way of implementation of GST among countries. While Australia and Malaysia implemented GST all at once, Canada and New Zealand implemented stage by stage. Following is the GST rate of countries implemented GST in Asia Pacific region.

Table 1
GST rate of countries in Asia Pacific region.

Country	*GST rate*	*Year of implementation*
New Zealand	15	1986
Singapore	7	1993
Papua New Guinea	10	1999
Australia	10	2000
Jordan	16	2001
Malaysia	6	2015

RESEARCH METHODOLOGY

The objective of this study is to find out the impact of GST implementation on GDP growth rate. For this purpose average GDP growth rate of pre GST implementation period of five countries in the region are taken and they are analyzed with GDP growth rate after the implementation of GST.

$$H_{o=} u = x$$

$$H_{a=} U < X$$

Where $H_{o=}$ Null hypothesis, U= average GDP growth rate after in post GST implementation period, $H_{a=}$ alternative hypothesis, X= average GDP growth rate in pre GST implementation period.

Even though six countries had implemented full fledged GST, this study is limited to analysis of only five countries. Malaysia is a new entrant and had implemented GST on last year only. The data for the period is from 1980-2014.

The above said analysis is scientifically proven by t-test as there is only less than thirty observations for the five countries, namely New Zealand, Singapore, *Papua New Guinea*, Australia and Jordan. The test is done with a level of significance of 10%.

In this study, the average growth rate of GDP means arithmetic mean of ten previous years before GST implementation. As the sample size in all the following case less than or equal to 30, t test is used to test the hypothesis by using the formula

$$t = \frac{\bar{X} - \mu}{S}\sqrt{n}$$

Where,

t = one sample t-test value

μ = population mean

$$S = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{n-1}}$$

X = Sample mean

Where,

S = standard deviation

n = number of years after GST implementation.

For the analysis,

H_0 = the null hypothesis

$H_{a=}$ the alternative hypothesis

μ = 10 year average GDP growth rate before GST implementation,

X = Arithmetic mean of GDP growth rate after the GST implementation.

$u_{Ho=}$ Average GDP growth rate of 10 years preceding GST implementation

Table 2
GDP growth rate of countries (part 1)

Year	*New Zealand*	*Singapore*	*Papua New Guinea*
1980	1.009	10.027	-2.309
1981	2.961	10.684	1.149
1982	2.878	7.172	0.832
1983	-0.124	8.54	3.438
1984	6.858	8.801	-0.983
1985	1.213	-0.687	3.578
1986	1.81	1.328	5.654
1987	2.436	10.757	2.762
1988	0.555	11.115	2.909
1989	0.421	10.183	-1.424
1990	-0.016	10.044	-2.996

(*contd...Table 2*)

Year	*New Zealand*	*Singapore*	*Papua New Guinea*
1991	-1.314	6.687	9.55
1992	0.716	7.088	13.828
1993	5.234	11.537	18.206
1994	5.581	10.925	5.946
1995	4.773	7.028	-3.446
1996	4.048	7.532	6.599
1997	2.443	8.291	-6.343
1998	0.082	-2.225	4.682
1999	4.576	6.095	1.856
2000	4.202	8.898	-2.455
2001	2.458	-0.952	-0.045
2002	4.899	4.212	2.008
2003	4.44	4.435	4.388
2004	4.584	9.549	0.57
2005	3.21	7.489	3.924
2006	2.749	8.86	2.294
2007	3.404	9.112	7.152
2008	-0.503	1.788	6.614
2009	-1.407	-0.603	6.134
2010	1.586	15.24	7.68
2011	1.831	6.207	10.669
2012	2.353	3.4141	8.091
2013	2.219	4.443	5.53
2014	3.239	2.918	5.837
2015	2.5	2	9.9

Source: IMF data resource

Table 3
GDP growth rate of countries (Part 2)

Year	*Australia*	*Jordan*
1980	2.894	11.173
1981	4.127	17.183
1982	0.063	7.026
1983	-0.474	-2.213
1984	6.346	4.285
1985	5.456	-2.703
1986	2.448	5.504
1987	4.893	2.325
1988	4.253	1.461
1989	4.569	-10.734
1990	1.503	-0.28
1991	-1.113	1.62
1992	2.652	14.351

(*contd...Table 3*)

Year	*New Zealand*	*Singapore*	*Papua New Guinea*
1993	3.949		4.485
1994	4.888		4.979
1995	2.955		6.189
1996	4.298		2.075
1997	4.164		3.322
1998	4.866		3.012
1999	4.244		3.382
2000	3.086		4.252
2001	2.576		5.269
2002	3.996		5.786
2003	3.021		4.18
2004	4.036		8.559
2005	3.213		8.136
2006	2.654		8.093
2007	4.52		8.176
2008	2.675		7.232
2009	1.565		5.477
2010	2.259		2.311
2011	2.721		2.587
2012	3.6		2.651
2013	2.057		2.829
2014	2.709		3.1
2015	2.26		2.4

Source: IMF data resource

Analysis of GDP data- New Zealand

Table 3
Analysis table (New Zealand)

10 years average GDP growth rate before implementation of GST (1976-1985)[1]	1.6
Average GDP growth rate after the implementation of GST (1986-2015)	2.436
Number of years in which GDP growth rate exceeded the pre implementation growth rate	22
Number of years in which GDP growth rate is less than the pre implementation growth rate	8
Probability of recording high GDP rate than 10 years average GDP growth rate during GST pre implementation period.	73.33 %
Probability of recording low GDP rate than 5 years average GDP growth rate after implementation of GST	26.67 %
Average GDP growth rate in first five years after GST implementation	1.04
Average GDP growth rate in first ten years after GST implementation	2.02
Average GDP growth rate in last 5 years	2.43
Average GDP growth rate in last 10 years	1.79

New Zealand had implemented GST in 1986. The 10 year average GDP growth rate before implementation is 1.6%. It is taken that the null hypothesis that the average growth rate after GST implementation is 1.6% and alternative hypothesis that the average growth rate after GST implementation is less than 1.6%.

$H_0 = \mu = 1.6\%$

$H_a = \mu < 1.6\%$

Degree of freedom = (n-1) = 30-1=29

Standard deviation =

$$S = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{n-1}}$$

$$= \sqrt{\frac{111.413}{29}}$$

$$= 1.96$$

T test=

$$t = \frac{\bar{X} - \mu}{S}\sqrt{n}$$

$$= \left(2.43 - 1.6\right) / \left(1.96\right) / \sqrt{30}$$

$$= 2.335$$

Table value of T distribution at Degree of freedom 29 and level of significance 10% = 1.311

Here table value is less than calculated value, so null hypothesis is rejected and alternative hypothesis is accepted. Result is that GST implementation does not result in increase in GDP rate.

The analysis also finds that, out thirty years of GST implementation, in 22 years the GDP rate was higher than the 10 years average GDP growth rate before implementation of GST. In 10 years GDP growth rate was lesser than the 10 years average GDP growth rate before implementation of GST.

A detailed study of the GDP growth rate after the GST implementation shows that the average GDP growth rate was poor for first five years after GST implementation and later on the average rate is higher than rate before GST implementation.

Analysis of GDP data- Singapore

Table 4
Analysis table Singapore

10 years average GDP growth rate before implementation of GST (1983-1992)	7.385
Average GDP growth rate after the implementation of GST (1993-2015)	5.921
Number of years in which GDP growth rate exceeded the pre implementation growth rate	10

(*contd...Table 4*)

Number of years in which GDP growth rate is less than the pre implementation growth rate	13
Probability of recording high GDP rate than 10 years average GDP growth rate during GST pre implementation period.	43.48 %
Probability of recording low GDP rate than 5 years average GDP growth rate after implementation of GST	56.52 %

Singapore had implemented GST in 1993. The 10 year average GDP growth rate before implementation is 7.385%. It is taken that the null hypothesis that the average growth rate after GST implementation is 7.385% and alternative hypothesis that the average growth rate after GST implementation is less than 7.385%.

$H_0 = \mu = 7.385\%$

$H_a = \mu < 7.385\%$

Degree of freedom = (n-1) = 23-1=22

Standard deviation=

$$S = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{n-1}}$$

$$= \sqrt{\frac{407.507}{22}}$$

$$= 4.304$$

T test =

$$t = \frac{\bar{X} - \mu}{S}\sqrt{n}$$

$$= (5.921\text{-}7.385)/\ (4.304)/\ \sqrt{23}$$

$$= -1.6305$$

Table value of T distribution at Degree of freedom 22 and level of significance 10% = 1.321

Here table value is less than calculated value, so null hypothesis is rejected and alternative hypothesis is accepted. Result is that GST implementation does not result in increase in GDP rate.

The analysis also finds that, out twenty three years of GST implementation, in 10 years the GDP rate was higher than the 10 years average GDP growth rate before implementation of GST. In 13 years GDP growth rate was lesser than the 10 years average GDP growth rate before implementation of GST.

A detailed study of the GDP growth rate after the GST implementation shows that the average GDP growth rate was good for first five years after GST implementation and later on the average rate is lesser than rate before GST implementation.

Table 5
Analysis table *Papua New Guinea*

10 years average GDP growth rate before implementation of GST (1989-1998)	4.460
Average GDP growth rate after the implementation of GST (1999-2015)	4.715
Number of years in which GDP growth rate exceeded the pre implementation growth rate	9
Number of years in which GDP growth rate is less than the pre implementation growth rate	8
Probability of recording high GDP rate than 10 years average GDP growth rate during GST pre implementation period.	52.94%
Probability of recording low GDP rate than 10 years average GDP growth rate after implementation of GST	47.06%

Papua New Guinea had implemented GST in 1999. The 10 year average GDP growth rate before implementation is 4.46%. It is taken that the null hypothesis that the average growth rate after GST implementation is 4.46% and alternative hypothesis that the average growth rate after GST implementation is less than 4.46%.

$H_0 = \mu = 4.46\%$

$H_{a=} \mu < 4.46\%$

Degree of freedom = (n-1) = 17-1=16

Standard deviation=

$$S = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{n-1}}$$

$$= \sqrt{\frac{396.076}{16}}$$

$$= 4.975$$

T test =

$$t = \frac{\bar{X} - \mu}{S}\sqrt{n}$$

$$= (6.916\text{-}4.46)/\ (4.975)/\ \sqrt{17}$$

$$= 2.0356$$

Table value of T distribution at Degree of freedom 16 and level of significance 10% = 1.337

Here table value is less than calculated value, so null hypothesis is rejected and alternative hypothesis is accepted. Result is that GST implementation does not result in increase in GDP rate.

The analysis also finds that, out seventeen years of GST implementation, in 9 years the GDP rate was higher than the 10 years average GDP growth rate before implementation of GST. In 8 years GDP growth rate was lesser than the 10 years average GDP growth rate before implementation of GST.

A detailed study of the GDP growth rate after the GST implementation shows that the average GDP growth rate was good for first five years after GST implementation and later on the average rate is lesser than rate before GST implementation.

Table 6
Analysis table Australia

10 years average GDP growth rate before implementation of GST (1990-1999)	3.241
Average GDP growth rate after the implementation of GST (2000-2015)	2.934
Number of years in which GDP growth rate exceeded the pre implementation growth rate	4
Number of years in which GDP growth rate is less than the pre implementation growth rate	12
Probability of recording high GDP rate than 10 years average GDP growth rate during GST pre implementation period.	25%
Probability of recording low GDP rate than 10 years average GDP growth rate after implementation of GST	75%

Australia had implemented GST in 2000. The 10 year average GDP growth rate before implementation is 3.241%. It is taken that the null hypothesis that the average growth rate after GST implementation is 3.241% and alternative hypothesis that the average growth rate after GST implementation is less than 3.241%.

$H_0 = \mu = 3.241\%$

$H_{a =} \mu < 3.241\%$

Degree of freedom = (n-1) = 16-1=15

Standard deviation =

$$S = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{n-1}}$$

$$= \sqrt{\frac{9.3325}{15}}$$

$$= .7887$$

T test =

$$t = \frac{\bar{X} - \mu}{S}\sqrt{n}$$

$$= (2.934\text{-}3.241)/\ (.7887)/\ \sqrt{16}$$

$$= -1.5555$$

Table value of T distribution at Degree of freedom 15 and level of significance 10% = 1.341

Here table value is less than calculated value, so null hypothesis is rejected and alternative hypothesis is accepted. Result is that GST implementation does not result in increase in GDP rate.

The analysis also finds that, out sixteen years of GST implementation, in 4 years the GDP rate was higher than the 10 years average GDP growth rate before implementation of GST. In 12 years GDP growth rate was lesser than the 10 years average GDP growth rate before implementation of GST.

A detailed study of the GDP growth rate after the GST implementation shows that the average GDP growth rate was good for first five years after GST implementation and later on the average rate is lesser than rate before GST implementation.

Table 7
Analysis table Jordan

5 years average GDP growth rate before implementation of GST (1991-2000)	4.767
Average GDP growth rate after the implementation of GST (2001-2015)	5.119
Number of years in which GDP growth rate exceeded the pre implementation growth rate	8
Number of years in which GDP growth rate is less than the pre implementation growth rate	7
Probability of recording high GDP rate than 10 years average GDP growth rate during GST pre implementation period.	53.33
Probability of recording low GDP rate than 10 years average GDP growth rate after implementation of GST	46.67

Australia had implemented GST in 2001. The 10 year average GDP growth rate before implementation is 4.767%. It is taken that the null hypothesis that the average growth rate after GST implementation is 4.767% and alternative hypothesis that the average growth rate after GST implementation is less than 4.767%.

$H_0 = \mu = 4.767\%$

$H_{a=} \mu < 4.767\%$

Degree of freedom = (n-1) = 15-1=14

Standard deviation=

$$S = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{n-1}}$$

$$= \sqrt{\frac{153.778}{14}}$$

$$= 3.3141$$

T test=

$$t = \frac{\bar{X} - \mu}{S}\sqrt{n}$$

$$= (5{,}119\text{-}4.767)/\ (3.3141)/\ \sqrt{14}$$

$$= 0.4114$$

Table value of T distribution at Degree of freedom 14 and level of significance 10% = 1.345

Here table value is higher than calculated value, so null hypothesis is accepted and alternative hypothesis is rejected. Result is that GST implementation had resulted in increase in GDP rate.

The analysis also finds that, out fifteen years of GST implementation, in 8 years the GDP rate was higher than the 10 years average GDP growth rate before implementation of GST. In 7 years GDP growth rate was lesser than the 10 years average GDP growth rate before implementation of GST.

A detailed study of the GDP growth rate after the GST implementation shows that the average GDP growth rate was good for first ten years after GST implementation and later on the average rate is lesser than rate before GST implementation.

CONCLUSION

From the analysis of GDP growth rate, before and after GST implementation in Asia Pacific region shows a different picture. Only Jordan was successful in increasing the GDP growth rate higher than the ten year average before GST implementation. Some other countries were also successful in increasing GDP rate in initial period but later on lost their momentum. In short there is a mixed trend in GDP growth rate patterns after GST implementation. From the above analysis it can be assumed that GST implementation will not be helpful in recording a higher growth rate.

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