

# **Cross Countries Comparison of Luxembourg, Germany and India on the Basis of Five Variables, i.e. GDP per Capita, GDP Growth Rate, Scientific and Technical Journals, R & D Spending, Patent Applications for the Years 2000 to 2009**

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## **Abstract**

In this paper we study about the cross countries comparison of Luxembourg, Germany and India on the basis of five variables , I.e. GDP per Capita, GDP growth rate, Scientific and technical Journals, R & D spending , patent Applications for the years 2000 to 2009. It is necessary that Luxembourg should do innovation (in the field of finance and Steel) to maintain its strength in the future. Germany should give focus on innovation as innovation and growth rate shows positive relationship in the country. On the other hand India should increase its R & D spending as that will further improve its GDP growth rate. So it is necessary for the countries that first they should identify fields/sectors and then decide about innovation. This paper shows that the GDP per Capita of Luxembourg is better from other two countries because it has a stable and solid

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growth, Low inflation, low unemployment, a strong financial sector, low tax rate and the most important an increasingly diversified in steel.

**Keywords:** GDP per Capita, GDP growth rate, Scientific and technical Journals, R & D spending, patent Applications, Luxembourg, Germany, India.

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## Introduction

The innovations may have positive, Negative as well as no impact on economic growth. If a country growth rate is high it doesn't mean it is just due to innovation. Even in micro level, in most of the cases innovation have no positive impact on growth rate because of the deficiency of good marketing, distribution and business networks and mismatch of the socio economic and institutional conditions According to Grossman and Helpman (1991) Most of the studies provide a positive relationship between innovation and economic growth. According to his views, innovation capacity and potential is a key factor behind differences in economic performance and wealth of different countries. Some economist like Rodriguez-pose and Crescenzi (2008) argued to look at the effect of innovation on economic growth, the social and institutional condition of an economy should be considered. Their study proved regional innovation capacity is the result of interaction between research, socio economic and institutional conditions. Wei and Liu (2006) Studied the impact of innovation on economic growth in china and dyconcluded that there is a positive relationship between the two. Wu (2006, 2009) Empirical study also showed that there is a direct relationship between innovation and Economics growth. Kuo And Yong (2008) used cross-regional data and got Significant results. Torun and Cicekci (2007) studied the impact of innovation on economic growth for Turkey, South korea, and Ireland and concluded that Innovation is a key contributor to economic growth for the countries. Wu (2010) measured innovation by patent statistics and studied both innovation, growth model and their link. The study used 31 Chinese regions for the period 1998-2007 and concluded that innovation has positive impact on economic growth of the country while R & D intensity has a positive impact on regional innovation. Heshmati and Lööf (2006) used 931 Swedish firms but find no significant impact of R & D expenditure on firm growth. Kirchoff et al. (2002) also find no significant result regarding increased expenditures on R & D of Universities on economic growth for the region. Oliveira and Fortunato (2005) showed that physical investment has more important in increasing growth than R & D investment. Bottazzi et al. (2001) concluded that sales growth of Pharmaceutical firms is not determined by innovations. Almus and Nerlinger (1999) find that firm growth is influenced by its size and age and not by the innovative activities of firm. Folkeringa et al., (2004) find negative impact of innovation on firm growth due to the inability of firms to cover its innovation cost by increased sales and profit. Coad and Rao's (2006, 2007) find positive impact of innovative activities (R & D and Patents) only for fastest growing firms but negative

impact for other firms as their costs of innovation were higher as compare to profit. Teece (1986) argued that there is not a solid reason on the basis of which we assume innovation will lead to higher revenue, market share and growth. He gives examples of many firms whose innovation were very important and also first to the market but still they could not able to maintain market share due to lack of “Complementary” assets like marketing, distribution and business networks.

### **Data and Methodology of the Study**

The study is about the cross countries comparison of Luxembourg, Germany and India on the basis of five variables, i.e GDP per Capita, GDP growth rate, Scientific and technical Journals, R & D spending , patent Applications for the years 2000 to 2009. The study used secondary data collected from different sources namely

- a) World Bank web site
- b) Research papers

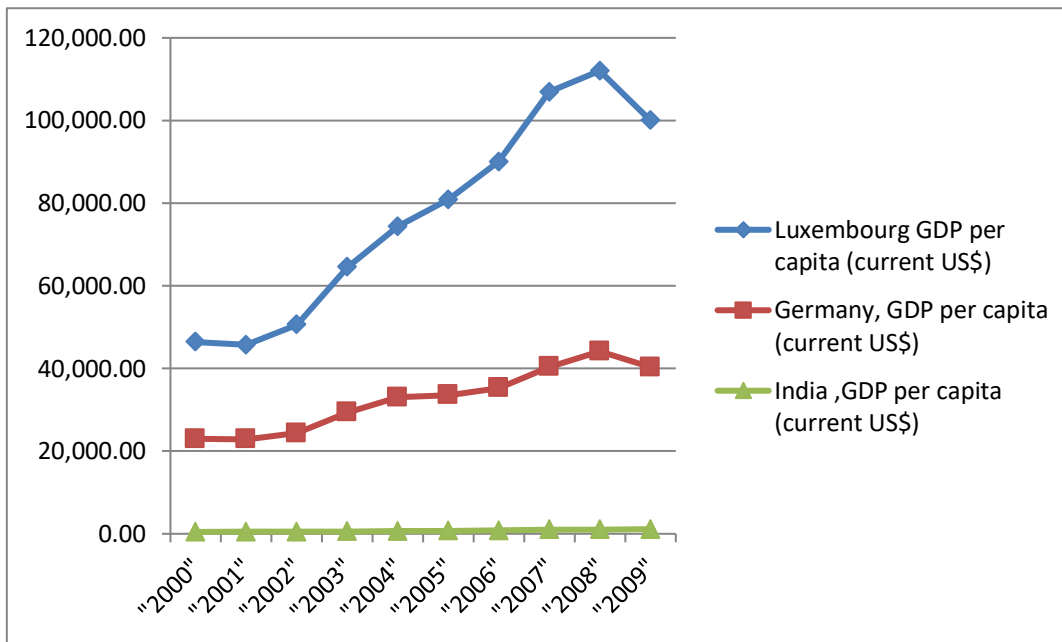
### **Methodology**

First the collected data are presented in tables then excel sheet is used for drawing graph and then data has being analyzed.

Table 1 GDP Growth RATE

Years	Luxembourg GDP per capita (current US\$)	Germany, GDP per capita (current US\$)	India ,GDP per capita (current US\$)
2000	46,453.25	22,945.71	450.42
2001	45,743.43	22,840.27	459.58
2002	50,582.83	24,325.67	480.21
2003	64,531.99	29,367.41	558.44
2004	74,388.71	33,040.05	642.56
2005	80,925.22	33,542.78	731.74
2006	90,015.53	35,237.60	820.30
2007	106,919.53	40,402.99	1,055.14
2008	112,028.53	44,132.04	1,027.91
2009	100,028.53	40,275.25	1,126.94

Source: World Bank



Graph 1 Cross- Countries Comparison of GDP per Capita (Current US \$)

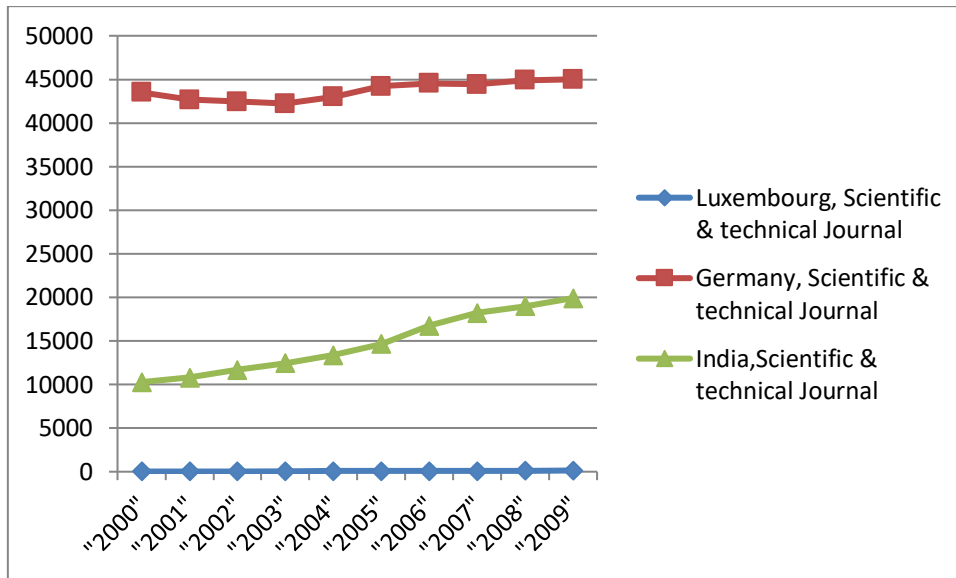
Table 2 Cross- Countries Comparison of Scientific & Technical Journal (Current US \$)

Years	Luxembourg, Scientific & technical Journal	Germany, Scientific & technical Journal	India, Scientific & technical Journal
2000	40.10	43,509.10	10,276.40
2001	45.50	42,674.20	10,800.50
2002	39.40	42,436.00	11,664.70
2003	38.40	42,229.90	12,462.20
2004	61.70	43,013.80	13,368.70
2005	58.80	44,194.10	14,635.30
2006	65.00	44,543.80	16,743.30
2007	73.40	44,428.20	18,202.90
2008	111.20	44,913.10	18,987.40
2009	136.80	45,002.80	19,917.30

Source: World Bank

Table 1 and graph 2 show the annual growth rate percentage for the countries from 2000 to 2009. The average GDP growth rate of Luxembourg 3.31 percent, highest (8.44) in 2000 and a record low of -4.08 in 2009 due to world economic recession of 2008. In the given years the average GDP growth rate of Germany was 0.83 percent ,highest in 2007 and a record low of -5.13 percent in 2009 because of world economic recession. For India the Average GDP growth rate was 6.12.it shows a slightly decline in 2008 due to world economic crisis but it recovered its growth very soon. The general overview of the

table shows that comparatively Indian GDP growth rate is high and the main reasons behind that are the high total factor productivity in the manufacturing and services sector and openness to trade and investment. Even after the global financial crisis, India followed the policy of liberalization that leads to high economic growth rate.



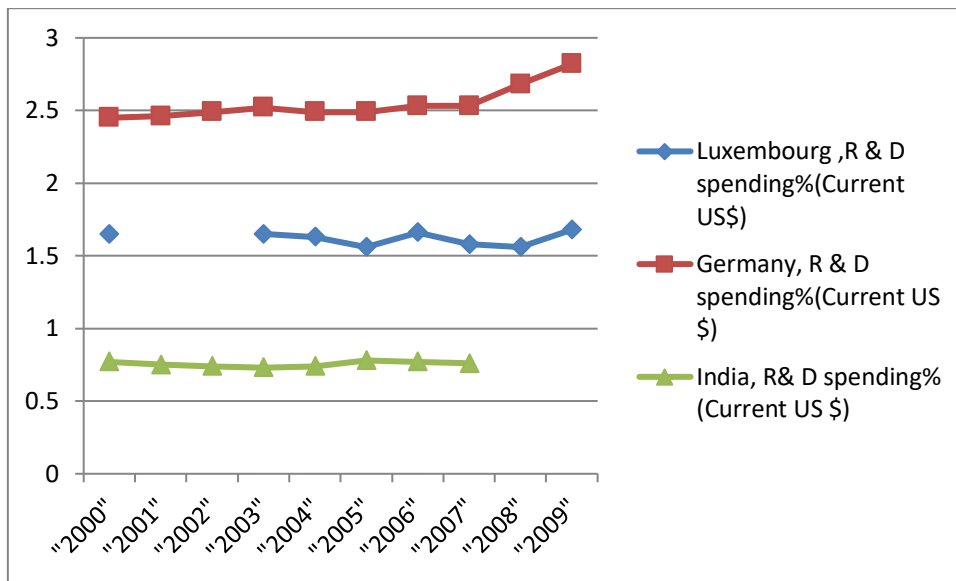
Graph 2 Cross- Countries Comparison of Scientific & Technical Journal (Current US \$)

Table 2 and graph 2 show the cost of the given countries on Scientific and Technical Journals. The data shows although the scientific and technical journal of Germany are higher but in given period the growth rate of such journals are positive for India and the reason is that in India education sector is a developed one.

Table 3 Cross- Countries Comparison of R & D spending (Current US \$)

Years	Luxembourg ,R & D spending%(Current US\$)	Germany, R & D spending%(Current US \$)	India, R& D spending% (Current US \$)
2000	1.65	2.45	0.77
2001	-	2.46	0.75
2002	-	2.49	0.74
2003	1.65	2.52	0.73
2004	1.63	2.49	0.74
2005	1.56	2.49	0.78
2006	1.66	2.53	0.77
2007	1.58	2.53	0.76
2008	1.56	2.68	-
2009	1.68	2.82	-

Source: World Bank



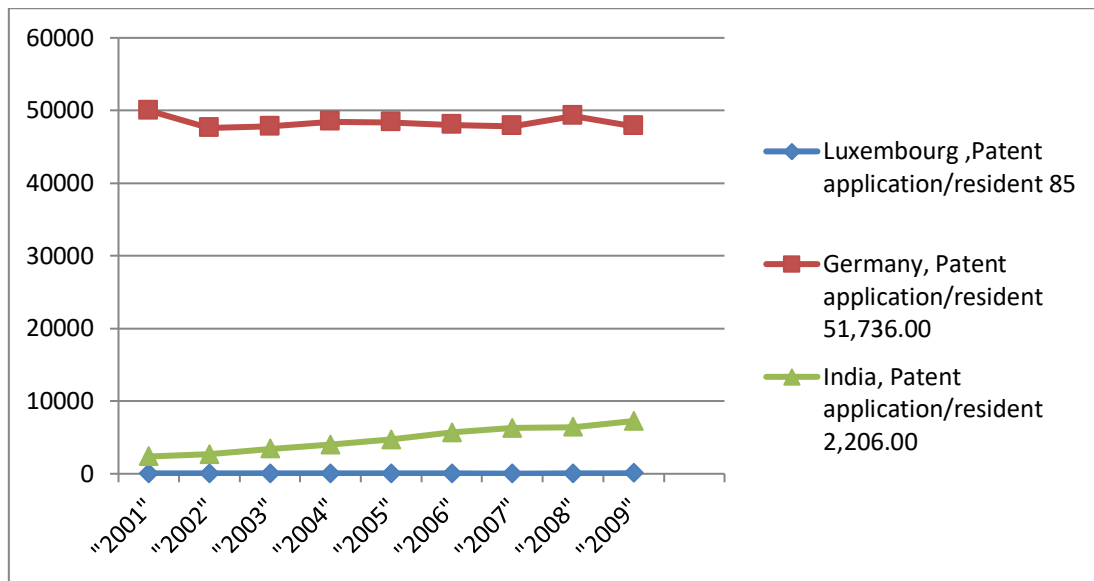
Graph 3 Cross- Countries Comparison of R & D spending (Current US \$)

Table 3 and graph 3 show R& D spending of the countries (current and capital expenditure on creative work for the purpose to increase knowledge and use the knowledge for new applications.) in this context the table clarify that Germany spending on R & D are much higher than the other two countries and the reasons behind that are Germany has a strong research infrastructure, growing industrial leaders in the automotive, chemical, aerospace, pharmaceutical and industries for energy. Five of the top R & D companies of Europe are German.

Table 4 Cross-Countries Comparison of Patent Application/resident (Current US \$)

Years	Luxembourg ,Patent application/resident	Germany, Patent application/resident	India, Patent application/resident
2000	85.00	51,736.00	2,206.00
2001	51.00	49,989.00	2,379.00
2002	41.00	47,598.00	2,693.00
2003	16.00	47,818.00	3,425.00
2004	23.00	48,448.00	4,014.00
2005	24.00	48,367.00	4,721.00
2006	26.00	48,012.00	5,686.00
2007	15.00	47,853.00	6,296.00
2008	48.00	49,240.00	6,425.00
2009	60.00	47,859.00	7,262.00

Source: World Bank



Graph 4 Cross-Countries Comparison of Patent Application/resident (Current US \$)

Table 4 and graph 4 shows the patent application (a request for the grant of patent for the invention & claimed by the application) for the given countries here again Germany is on the lead but the increasing trend is again in India. Patent filling in India has increased threefold in the given years showing increase in innovation and people trust on the economy.

### Motivation behind countries Selection

The countries have different strength like Luxembourg is the richest country of the world; Germany is famous in the field of innovation and very close to Luxembourg while India is a developing country but here the innovation is progressive and its growth rate is also good as compare to many other developing countries.

### Conclusions and Suggestions

It is concluded from the study that the GDP per capita for Luxembourg is much higher than Germany and India but the reasons is not innovation it might be its strong financial sector. The GDP annual growth rate for India is better than the other two countries but here R & D spending are not improving which is a strong indicator of innovation. In Germany GDP per capita is quite good but its annual growth rate is not improving despite of the fact that the variables used as indicators for innovation are positive in the country. So in general it is concluded that innovation is not a single factor behind GDP growth rate for the countries. The growth rate might be the result of some other factors not mention in the study. It is recommended that Luxembourg should do innovation (in the field of finance and Steel) to maintain its strength in the future. Germany should do focus on innovation as innovation and growth rate shows positive relationship in the country. India should increase its R & D spending as that will further improve its GDP growth

rate. So it is recommended for the countries that first they should identify fields/sectors and then decide about innovation.

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