European Online Journal of Natural and Social Sciences 2020;
Vol.9, No 1 pp. 197-218
ISSN 1805-3602

The Effect of Different Aids on Gross Domestic Product of European Union

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Received for publication: 29 December 2019.
Accepted for publication: 25 February 2020.

Abstract

State aid control can encourage the design of more effective growth-enhancing policies and it can ensure that competition distortions remain limited so that the European Union (EU) internal market remains open and contestable. The objectives of this paper are exhaustive in nature. One of them is to examine the impact of different aids on GDP of EU for time period of 2005 to 2015. Another is to evaluate the proportion of different aids in a year and their cross-year analysis. To achieve the objectives, descriptive as well as inferential analysis has been used and to assess the effect of different aids on GDP of EU, the Autoregressive Distributed Lag (ARDL) Model has been used. The descriptive analysis reveals that the aid in subsidies (SUB) and tax exemptions (TAX) have the larger proportion throughout the time period. The results of ARDL model conclude that the two aids SUB and TAX having the largest proportion do not have a significant impact on EU GD.

Keywords: ARDL Model; European Union; GDP; State Aids; Subsidies; Tax Exemptions

Introduction

In the second half of the 20th century, the nature and use of state aid underwent important transformations, as industrial policy has led to the support and promotion of strategic interest companies for national economies. (P. Bianchi și S. Labory, Empirical evidence on industrial policy using state aid data, International Review of Applied Economics, vol. 20, 2006, p. 603-621) In this context, trade liberalization has supported efforts to use state aid as an industrial policy tool to create "national champions" in strategic sectors for the economies of the Member States. (M. J. Trebilcock, M. Chandler și R. Howse, Trade and Transitions: A Comparative Analysis of Adjustment Policies, Routledge, London and New York, 1990, p. 130)

In the context of the recession that occurred with the oil crisis of 1973-1974, the economic and social context led to a redefinition of the importance and significance of the state aid policy and the possibility of using it as a positive instrument. (F. Andriessen, The Role of Anti-Trust in the Face of Economic Recession: State Aids in the EEC, European Competition Law Review, 1983, p. 340-350.) This perspective is confirmed by the possibility that State aid policy can contribute to increasing the mobility and efficiency of production factors by facilitating the process of price stabilization and moderation of inflationary pressures. On the other hand, State aid may fuel inflationary pressures if they are designed to ensure the survival of companies or sectors unable to adapt and operate autonomously within competitive structures.

In these situations, there is a possibility that State aid will ensure a high level of immobilization of the factors of production, stimulating inflationary leverage both directly, by artificially booming budgets, and indirectly by increasing the cost in terms of tax at the level sectors or industries affected by these measures.

Given that the aid for saving jobs has seen an upward trend, the Commission has made it clear that this is only possible in situations where it is possible to make structural changes that allow the transition to modernized production forms.

Since the second half of the 1980s, the acceleration and diffusion of the effects of the phenomenon of economic integration on a global scale as well as the technological transformations that have accompanied this phenomenon favored to a significant extent the failure of the interventionist policies by this bill, causing an essential transformation of the paradigm European industrial policy. In this context, the state aid policy reflects the gradual reduction of state intervention in the structures of the economy, which overlapped with the imposition of horizontal policy instruments, in order to structure a favorable and competitive economic environment for the entire economic and social actors of at a market level.

The European Commission has exclusive competence to declare such aid compatible with the internal market (under certain conditions, and acting unanimously, the Council may also to declare aid compatible with the internal market).

General Block Exemption Regulation - reduces the administrative burden of State aid by increasing the number of categories of State aid notified to the Commission by 26, as well as by strengthening in the form of a text and harmonizing the rules previously laid down by five different regulations.(Politica ue privind ajutoarele de stat: Regulament general de exceptare pe categorii de ajutoare, Aplicabil de la 29 august 2008 până la 31 decembrie 2013, disponibil pe http://ec.europa.eu/competition/state_aid/legislation/gber_citizen_summary_sheet_ro.pdf, p. 1.)

The 26 categories of state aid will effectively benefit Europe's job creation and competitiveness. The regulation not only reduces the administrative burden for public authorities and the Commission but also encourages Member States to use scarce resources in the most efficient way.

The General Block Exemption Regulation is particularly important for small and medium-sized enterprises (SMEs) because they can benefit from all 26 measures that they are specified in the Regulation and some measures have even been designed specifically for SMEs.

General principles of the General Block Exemption Regulation (Politica ue privind ajutoarele de stat: Regulament general de exceptare pe categorii de ajutoare, Aplicabil de la 29 august 2008 până la 31 decembrie 2013, disponibil pe http://ec.europa.eu/competition/state_aid/legislation/gber_citizen_summary_sheet_ro.pdf, p. 1-2.)

- To qualify for one of the 26 categories covered by the General Block Exemption Regulation, aid must fulfill certain conditions so as to guarantee that it will lead to new activities that would otherwise not have been achieved and will also promote economic development without unduly distorting competition.
- When these conditions are met, aid may be granted immediately by the Member State without prior notification to the Commission. Member States only need to inform the Commission - using a simple fact sheet - and only after the aid has been granted.
- The Regulation applies to "transparent" forms of aid, namely grants and interest rate subsidies, loans where the gross grant equivalent takes into account the reference rate, guarantee schemes, tax measures (capped) and certain types of advances refundable.
- The General Block Exemption Regulation applies to almost all sectors of the economy, excluding fisheries and aquaculture, agriculture and parts of the coal sector. Regional aid for the steel sector, shipbuilding and synthetic fibers and regional aid targeted to specific economic sectors is also excluded. The Regulation does not apply to export-related activities or the preferential use of domestic products in relation to imported products.

- The General Block Exemption Regulation does not apply to ad hoc aid to large enterprises (this exclusion does not apply to regional investment aid and employment aid).
- Cumulation of the various measures provided for in the General Block Exemption Regulation is possible, as long as they relate to different identifiable eligible costs. Cumulation is not allowed for overlapping or overlapping costs if such aggregation would result in exceeding the maximum admissible level applicable under the General Block Exemption Regulation.
- Aid measures which have not been included in the General Block Exemption Regulation may still be authorized. However, they remain subject to the traditional notification obligation: The Commission will analyze such notifications based on existing guidelines and frameworks.

The objectives of this paper are exhaustive in nature. One of them is to examine the flow of different aids with respect to time from 2005 to 2015. Another is to evaluate the proportion of different aids in a year and their cross-year analysis. The main objective is to study the effect of different aids on GDP of EU.

Literature Review

The economic and financial crisis has threatened the integrity of the EU internal market and increased the potential for anticompetitive reactions; crisis has increased the demand for a greater role of the State to protect the most vulnerable members of society and promote economic recovery. Stronger and better targeted State aid control can encourage the design of more effective growth-enhancing policies and it can ensure that competition distortions remain limited so that the EU internal market remains open and contestable. It can also contribute to improving the quality of public finances (Communication from the Commission “EU Modernization of the State Aid Rules”, COM (2012) 209, issued on May 8th 2012, to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions) (Sciskalová, 2013, p. 229).

State aid must be an appropriate policy instrument to address the de-fined objective, i.e. being a selective instrument should be referred to as a last re-sort option where there are no other less distortive, general instruments (such as an increase in funding of public research and education or general fiscal measures), which may achieve the same results; moreover, state aid must have an incentive effect, (must be capable of inducing undertakings to do things which they would not otherwise do without public support and not subsidized activities it would have carried out anyway) and finally, be proportional (a state aid measure does not fulfil this criterion when the same effect may be obtained with less aid) (Kubera, 2016, p. 82).

The European Union’s policy in the field of competition, founded on free, undistorted competition, is essential to the functioning of the internal market and is based, together with the fight against anti-competitive agreements between companies functioning within the internal market of the EU, on the prevention of the abuse of dominant position and the control of the aid provided by the state or throughout state resources (Alexe, 2017, p. 121). State aid expenditures had to be made transparent. (Atanasiu, 2001)

In addition, industrial subsidies are increasingly being directed towards horizontal measures, such as R&D and SMEs, rather than to specific sectors. The analysis has further shown that the intended target of the Commission’s SAAP (the State Aid Action Plan) of less and better aid could only partially be attained. Member States have, indeed, reduced their overall intensities of state aid, albeit no redirection in the EU-15 could be observed after 2005 when the SAAP was published. In CEECs, there has been an increase towards horizontal objectives in line with the Lisbon Strategy,

even if its share in total aid is still far below the standard in the EU-15 Member States and leaves room for improvement. The example of the steel industry has also shown, that sectoral aid is still being used in both the East and West, for example, where it supports R&D measures or serves environmental protection (Hölscher et al., 2017, p. 16).

Gross domestic expenditure on R&D (% of GDP) is a headline Europe 2020 Strategy indicator. The target level is 3% of GDP to be invested in the research and development activity by the year 2020. (Paulina Kubera, 2016)

Scope-wise, state aid that is admissible in the EU can be divided into sectoral and horizontal aid. Like sectoral policies, which focus on specific industries and services, sectoral aid targets specific sectors of industry ("picking winners"), while horizontal aid is interpreted as pro-development aid for all enterprises. The second group includes categories, such as aid for employment, training, environment, small and medium-sized enterprises (SME), regional development, as well as research, development, and innovation (Ambroziak, 2016, p. 75-76).

Aid can intervene in the market mechanism and can result in significant distortions of competition. In this context, aid causes economic costs. Since they are paid from tax revenues, they first of all represent a removal of income that is distributed to privileged branches or companies. In addition, bureaucratic costs and transaction costs on the part of the company (e.g., for aid consultation, application and reporting duties) are consequences of granting aid. In particular, the protection of a stagnant sector by the means of conservation aid takes away further funding from an economy. Moreover, aid causes undesirable side effects such as price distortions, which may lead to additional state-support payments (Haucap, 2011, p.13).

Government intervention is needed to implement projects that produce general social and economic benefits, which would not have been completed without aid being granted. (European Commission Community Framework for State Aid for Research and Development And Innovation, OJ C 323/01; European Commission Framework For State Aid For Research And Development And Innovation, OJ C 198/1; E. Cohn, Theoretical foundations of industrial policy, "EIB Papers", nr 11(1)/2006, p. 86.). The state aid to support cultural activities had existed before there was any evidence that creative industries could become an economic powerhouse that bring substantial economic benefits to the local economy (Mitkus, 2011, Mitkus & Nedzinskaite-Mitke, 2015).

In the EU all support mechanisms must comply with the European law that regulates state aid to ensure fair competition in the union (EU Regulations, 2015).

Table 1 gives the name of each aid and its abbreviation used in this paper.

Table 1. Names and Abbreviations of Different Aids

S. No	Complete Name of the Aid	Abbreviation
1	Regional Development	RED
2	Research and Development, inclusive Innovation	RDI
3	Environmental protection and energy saving	ENV
4	Small and medium enterprises (SMEs), including venture capital	SME
5	Employment	EMP
6	Training	TRA
7	Culture	CUL
8	Export promotion and internationalization	EXP
9	Compensation for damage caused by natural disasters	COM
10	Heritage conservation	HER
11	Social support to individual consumers	SOS

S. No	Complete Name of the Aid	Abbreviation
12	Sectoral development	SED
13	Rescue and Restructuring	RES
14	Closure aid	CLO
15	State aid for agriculture (EUR million, at prices of previous year)	SAI
16	Subsidies	SUB
17	Easy Loans	EAL
18	Tax Exemptions	TAX

Materials and Methods

In this paper to achieve the objectives, descriptive as well as inferential analysis has been used. First, the behavior of different aids over the time from 2005 to 2015 has been observed via scatter diagram. Secondly, using pie chart the proportion of different aids in each year has been evaluated.

To assess the effect of different aids on GDP of EU, the Autoregressive Distributed Lag (ARDL) Model has been used as it is the robust model in presence of autocorrelated residuals. For simplicity, let there are two set of variables, one is : a vector of dependent variable and the second is : a vector of independent variables, "T" representing the number of observations and "k" the number of independent variables. A general model is of the form

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i Y_{t-1} + \sum_{i=0}^{q} \theta_i X_{t-1} + \varepsilon_t \quad \text{----------(1)}$$

Where "p" and "q" are maximum lags of dependent and independent variables respectively and are residuals. In our analysis we have taken p=3 and q=3 and then General to Simple Model Selection procedure has been used to select a parsimonious model.

Results and Discussion

In Figure 1 RED scatter graph shows the RED aid in 2005 was 9112, 10412 in 2006, 9901 in 2007, 13250 in 2008, 16057 in 2009, 14234 in 2010, 13160 in 2011, 12333 in 2012, 12967 in 2013, 14751 in 2014 & 9990 in 2015. RED aid started increasing after 2007 from 9901 to 16057 in 2009 at which point it decreased from 16057 in 2009 to 12333 in 2012. From 2012 to 2014 the RED aid again experienced a sharp increase from 12333 to 14751 after which it declined again to 9990 in 2015.

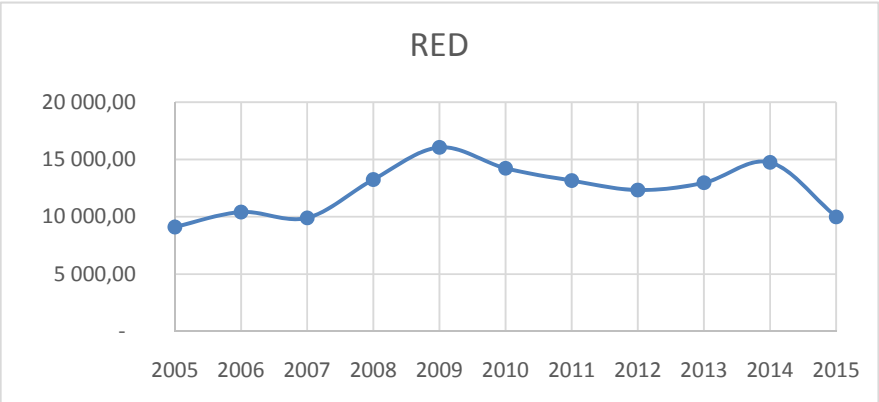

Figure 1. RED scatter graph

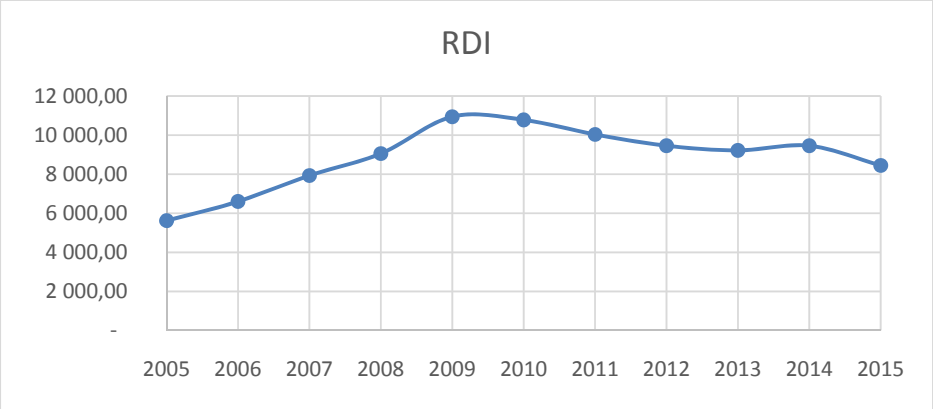

Figure 2. RDI scatter graph

In Figure 2 it can be observed that RDI aid continuously increased from 5624 in 2005 to 10942 in 2009 after which it experienced a downward trend to 8449 in 2015. RDI aid in 2005 was 5623, 6605 in 2006, 7933 in 2007, 9055 in 2008, 10942 in 2009, 10781 in 2010, 10034 in 2011, 9459 in 2012, 9220 in 2013, 9457 in 2014 & 8449 in 2015.

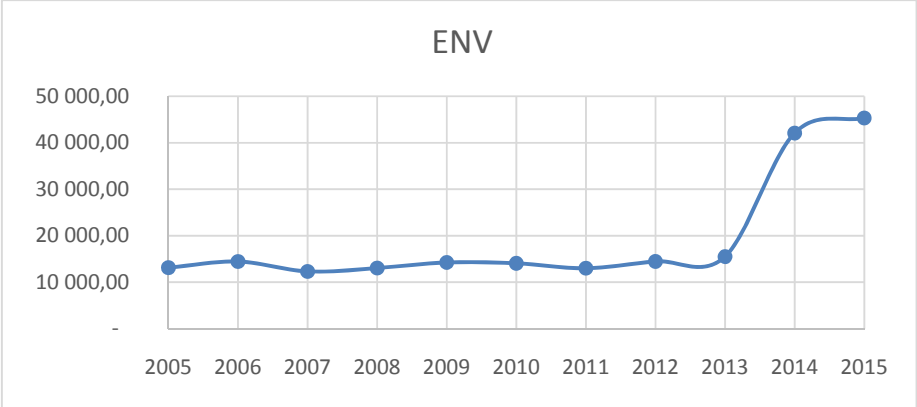

Figure 3. ENV scatter graph

In Figure 3, the scatter line shows that there was not much variation in ENV aid from 2005 to 2013 but after 2013 it experienced a sharp increase from 15504 in 2013 to 42086 in 2014 & 45343 in 2015.

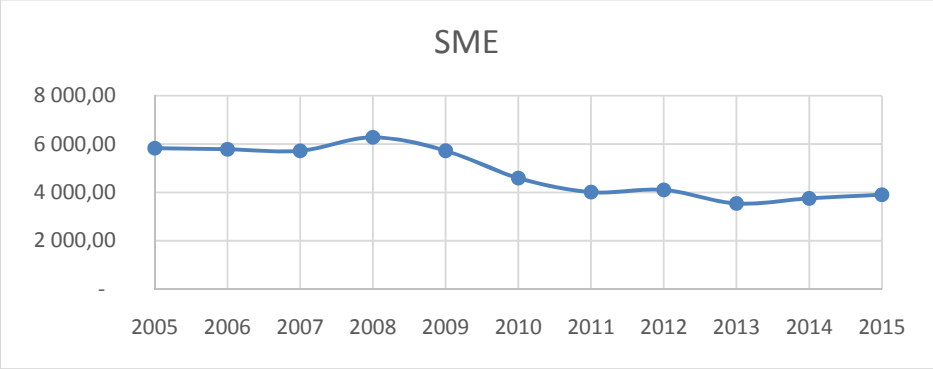

Figure 4. SME scatter graph

In Figure 4 SME scatter line shows the downward trend in SME aid year after year during the time period of 2005 to 2015. SME aid in 2005 was 5830, 5784 in 2006, 5721 in 2007, 6277 in 2008, 5723 in 2009, 4593 in 2010, 4012 in 2011, 4103 2012, 3543 in 2013, 3752 in 2014 & 3905 in 2015.

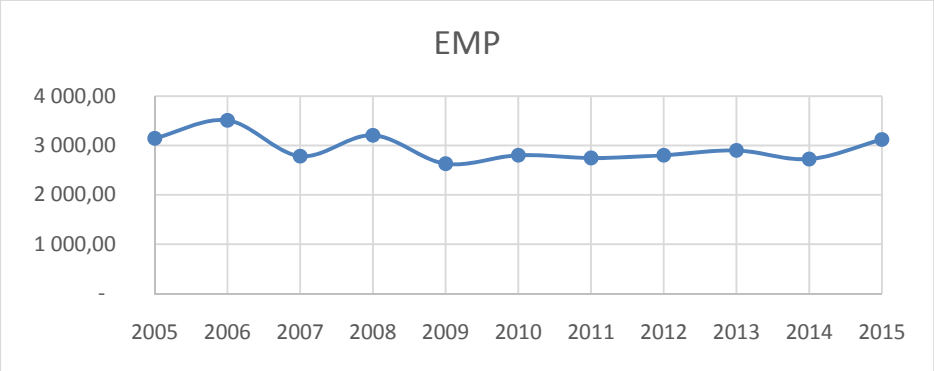

Figure 5. EMP scatter graph

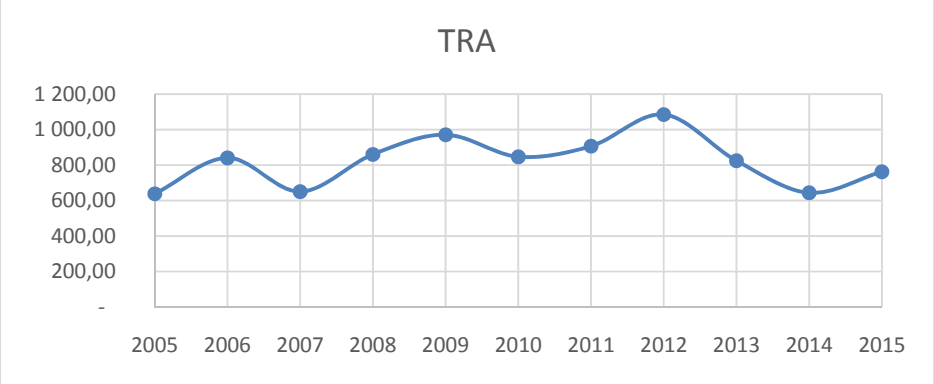

Figure 6. TRA scatter graph

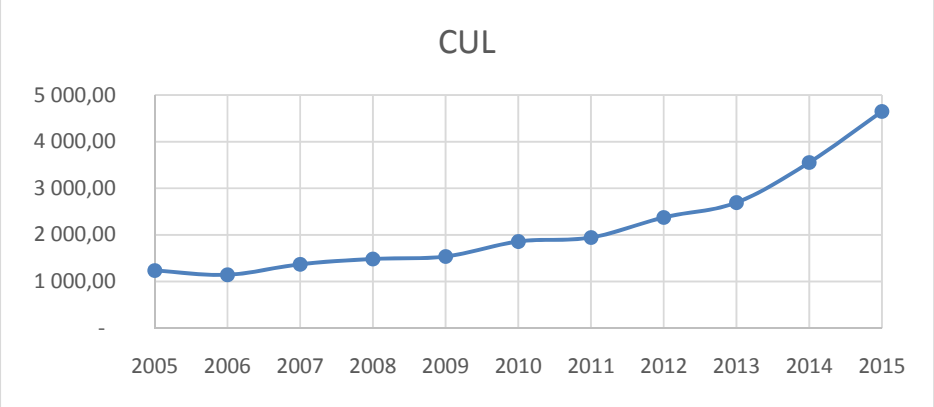

Figure 7. CUL scatter graph

In Figure 5 EMP aid experienced an increased variation from 2005 to 2009 after which it was roughly equal till 2014 but in 2015 it was slightly increased. EMP aid was 3145 in 2005, 3510

in 2006, 2784 in 2007, 3207 in 2008 & 2631 in 2009. From 2009 to 2014 it was static but rose again in 2015 to 3122.

In Figure 6 TRA aid in 2005 was 638, 840 in 2006, 650 in 2007, 860 in 2008, 971 in 2009, 847 in 2010, 906 in 2011, 1085 in 2012, 824 in 2013, 644 in 2014 & 762 in 2015. It can be observed that TRA aid experienced much variation during whole time period of 2005 to 2015.

In Figure 7, an upward trend is observed in CUL aid during the time period of 2005 to 2015. CUL aid in 2005 was 1237, 1145 in 2006, 1371 in 2007, 1485 in 2008, 1537 in 2009, 1859 in 2010, 1945 in 2011, 2375 in 2012, 2694 in 2013, 3554 in 2014 & 4647 in 2015.

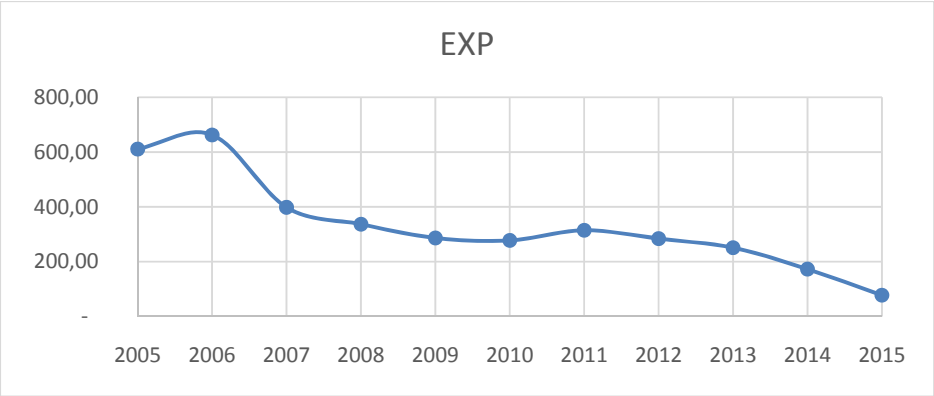

Figure 8. EXP scatter graph

In Figure 8 EXP aid increased from 611 in 2005 to 662 in 2006 but after 2006 it declined all the way to 2015. The EXP aid in 2007 was 398, 337 in 2008, 286 in 2009, 278 in 2010, 315 in 2011, 284 in 2012, 251 in 2013, 173 in 2014 & 74 in 2015.

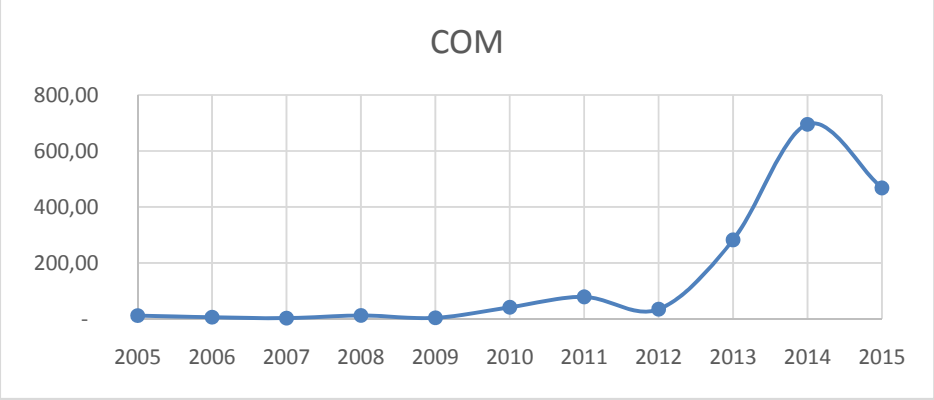

Figure 9. COM scatter graph

In Figure 9 COM aid was static from 2005 & has not experienced much variation during these years but after 2009 it increased a little from 4 in 2009 to 41 2010 & 78 in 2011 after which it decreased again in 2012 to 35. COM aid experienced a sharp increase in 2013 & 2014 but declined again in 2015. COM aid was 282 in 2013, 695 in 2014 & 468 in 2015.

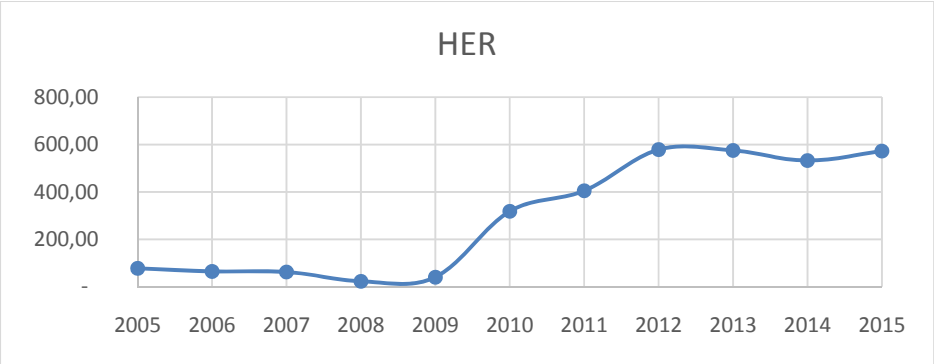

Figure 10. HER scatter graph

In Figure 10 HER aid declined from 2005 to 2009 but went upwards very quickly after 2009 to 2012 after which it declined again in 2013 & 2015 to be increased again 2015. HER aid in 2005 was 77, 64 in 2006, 62 in 2007, 23 in 2008, 40 in 2009, 318 in 2010, 405 in 2011, 579 in 2012, 575 in 2013, 532 in 2014 & 573 in 2015.

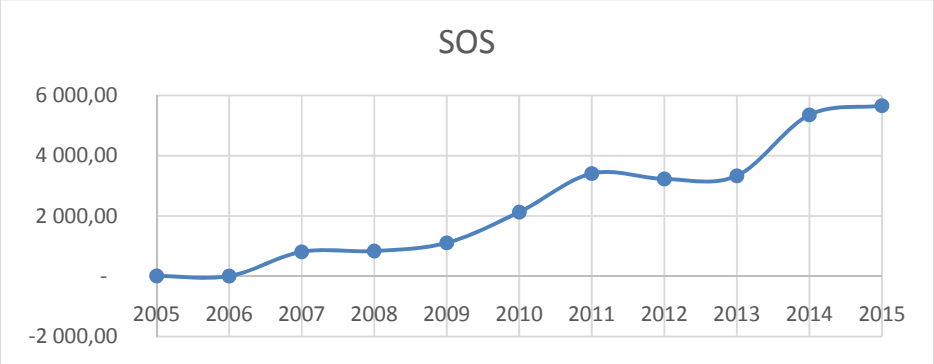

Figure 11. SOS scatter graph

In Figure 11 SOS aid in 2005 was 13, 9 in 2006, 811 in 2007, 839 in 2008, 1111 in 2009, 2131 in 2010, 3411 in 2011, 3232 in 2012, 3336 in 2013, 5356 in 2014 & 5663 in 2015. SOS aid decreased from 13 in 2005 to 9 in 2006 but increased in 2007 to 2011 after which it decreased in 2012 but increased again from 2012 to 2015.

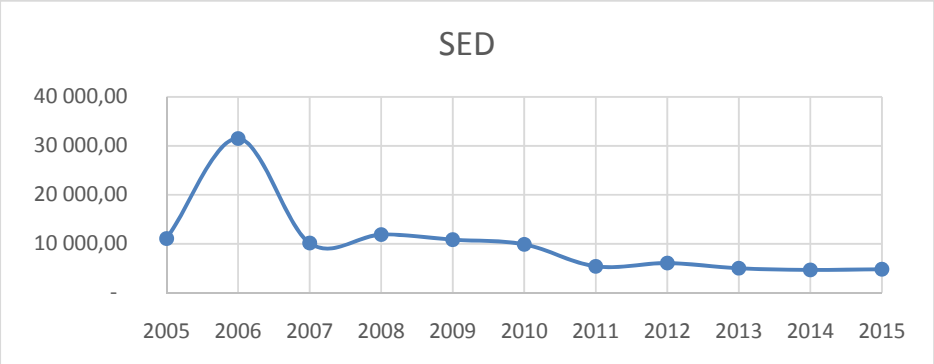

Figure 12. SED scatter graph

In Figure 12 the SED aid scatter graph shows that SED aid increased in 2006 from 11063 to 31507 in 2006 but decreased in 2007 to 10150 after which it slightly increased again in 2008 to 11871. After 2008 it decreased again in 2009 to 2015.

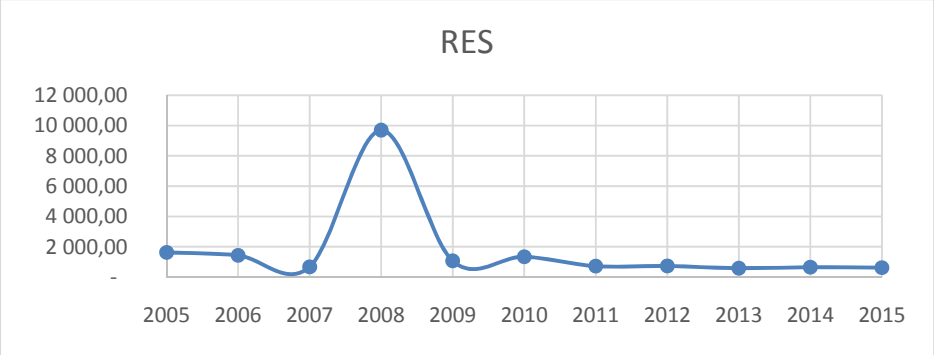

Figure 13. RES scatter graph

In Figure 13 it can be observed from above scatter graph that RES aid decreased from 1631 in 2005 to 1430 in 2006 & 674 in 2007 but increased very sharply in 2008, 2009 & 2010 after which it decreased again to 2015.

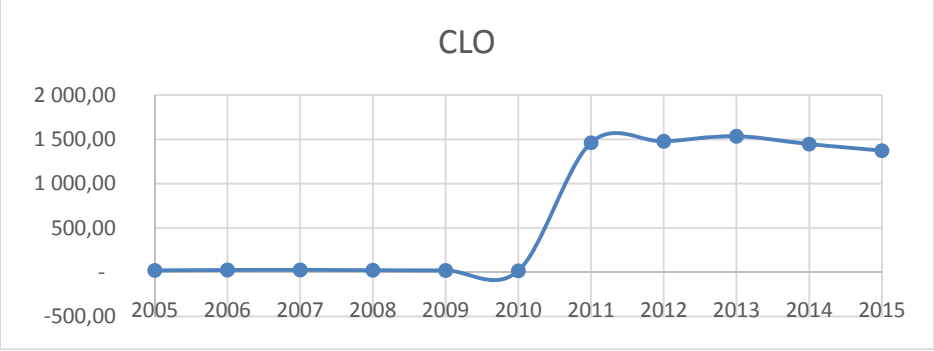

Figure 14. CLO scatter graph

In Figure 14 CLO aid did not experience much variation from 2005 to 2010 after which it rose up to 1461 in 2011, 1478 in 2012, 1534 in 2013, 1446 in 2014 & 1372 in 2015.

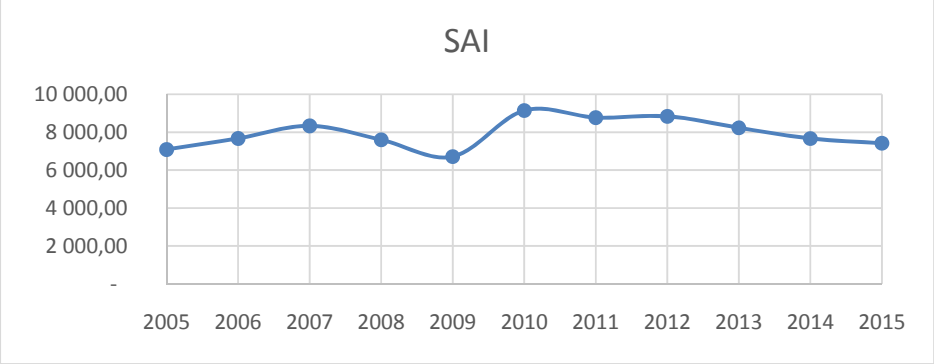

Figure 15. SAI scatter graph

In Figure 15 it can be observed that SAI aid increased from 2005 to 2007 but decreased from 2007 to 2009 after which it increased in 2010 & again declined from 2010 to onwards.

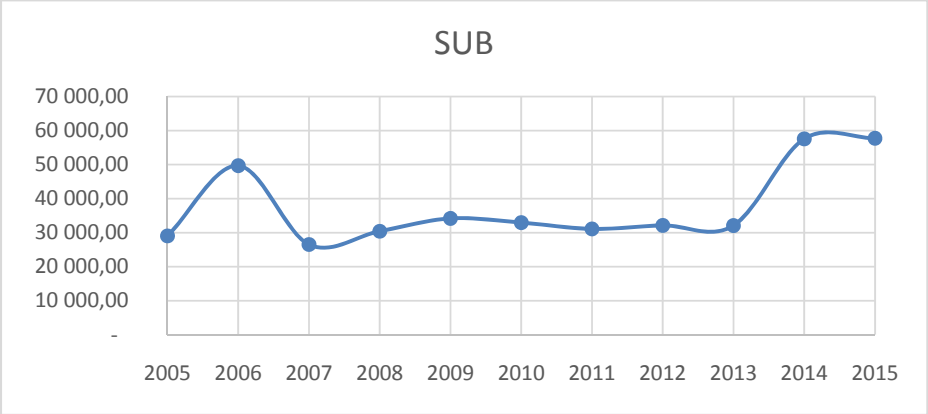

Figure 16. SUB scatter graph

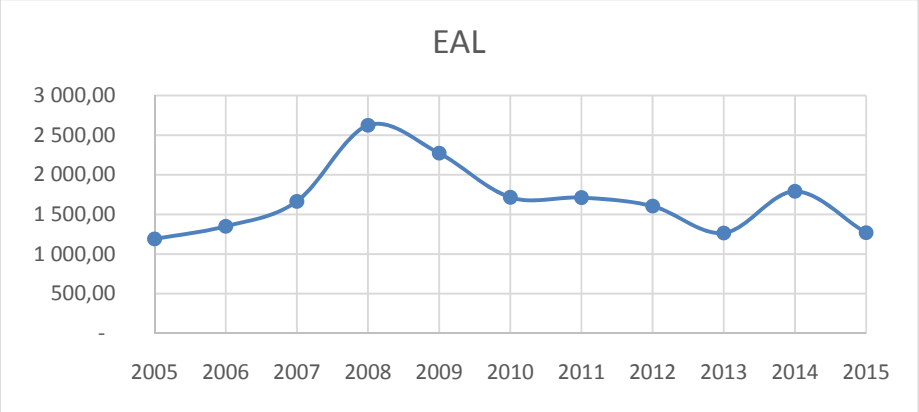

Figure 17. EAL scatter graph

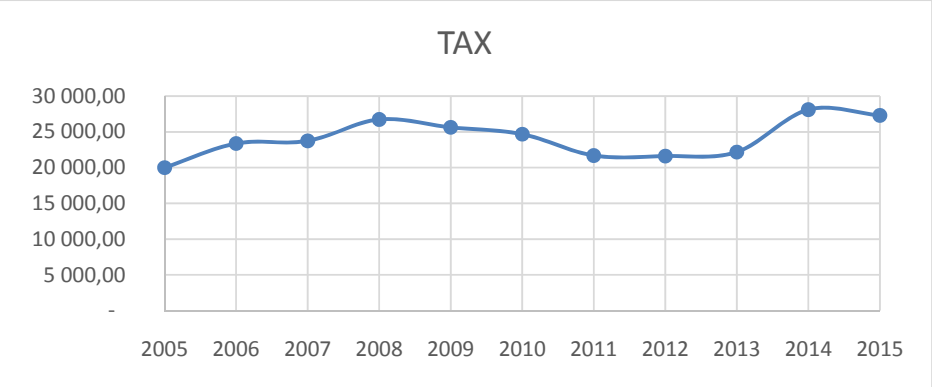

Figure 18. TAX scatter graph

In Figure 16 SUB aid rose up in 2006 from 29037 in 2005 to 49704 in 2006 but decreased to 26527 in 2007 & increased again to 30419 in 2008 & 34186 in 2009. SUB aid was 32961 in 2010, 31104 in 2011, 32132 in 2012, 32080 in 2013, 57565 in 2014 & 57752 in 2015.

In Figure 17 EAL scatter graph shows that EAL aid increased from 2005 to 2008 but after 2008 it decreased all the way to 2013 & increased again in 2014 but decreased in 2015.

In Figure 18 TAX aid increased from 2005 to 2008 but decreased after 2008 to 2011 & went static for next two years. In 2014 it increased again but decreased immediately in 2015.

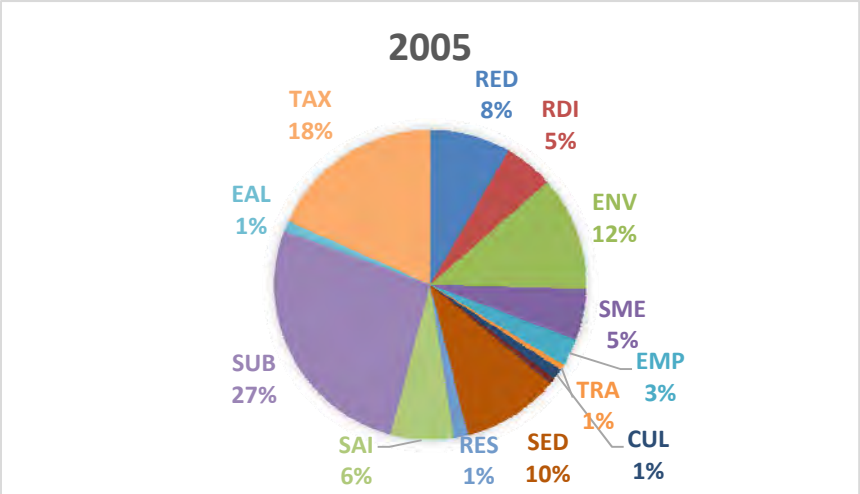

Figure 19. 2005 PIE Chart

In Figure 19 2005 PIE chart shows the percentage of different aid for the year 2005. SUB aid has the highest percentage of 27% during 2005. TAX is 18%, ENV 12%, SED 10%, RED 8%, SAI 6%, RDI 5%, SME 5% & EMP 3%.

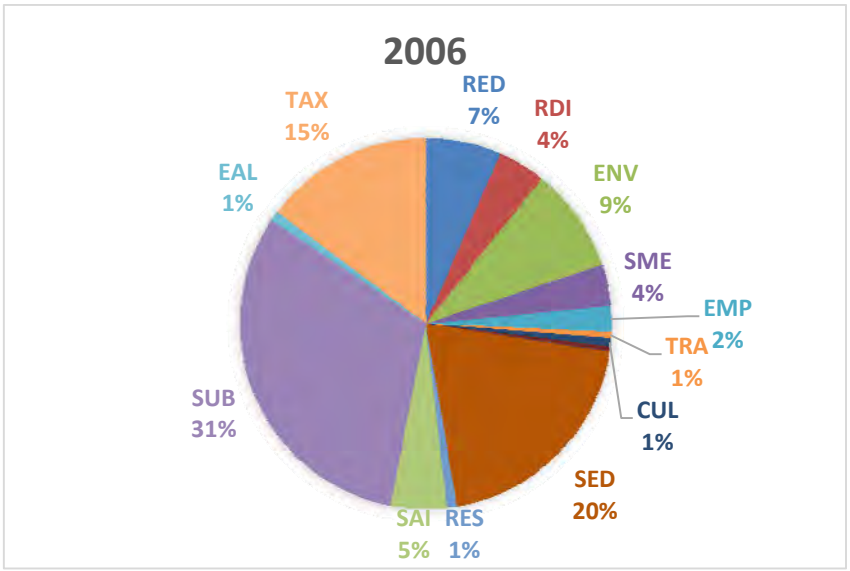

Figure 20. 2006 PIE Chart

As in previous year the SUB aid has the highest percentage of 31% during 2006 then SED 20%, TAX 15%, ENV 9%, RED 7%, SAI 5%, SME 4%, RDI 4% & EMP 2%.

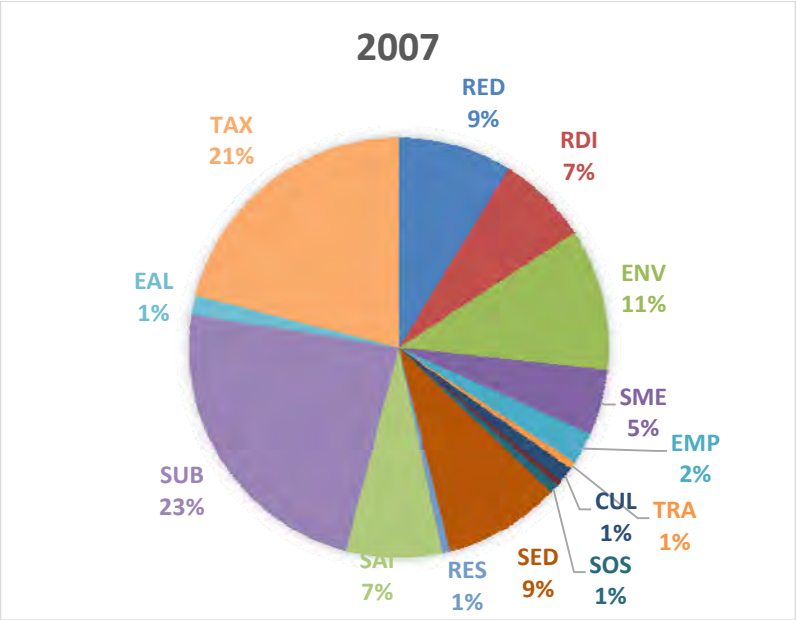

Figure 21. 2007 PIE Chart

In Figure 21 2007 pie chart shows that SUB again has the highest percentage of 23% after which TAX has 21%, ENV 115, RED 9%, SED 9%, RDI 7%, SAI 7%, SME 5% & EMP 2%.

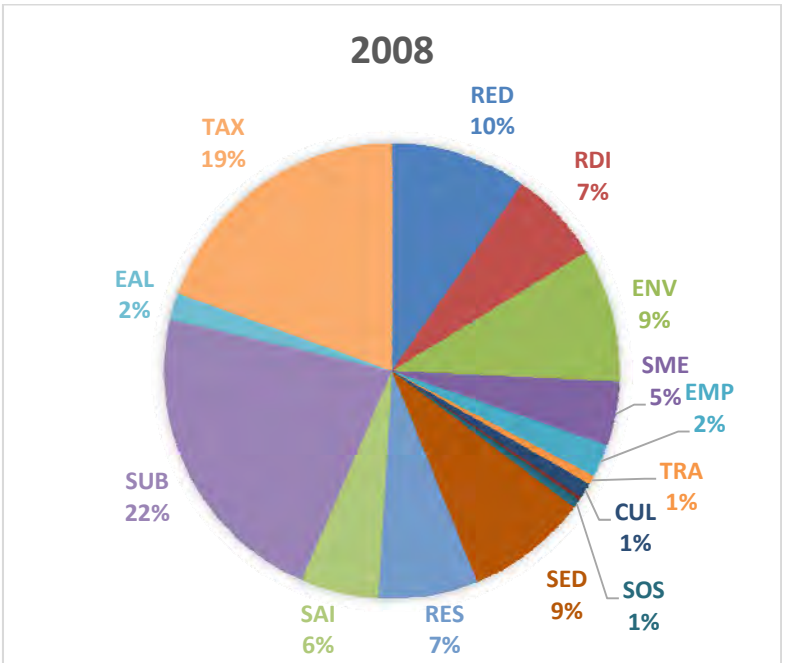

Figure 22. 2008 PIE Chart

In Figure 22 it is given that during 2008 SUB percentage is 22%, TAX 19%, RED 10%, ENV 9%, SED 9%, RDI 7%, RES 7%, SAI 6%, SME 5%, EMP 2% & EAL 2%.

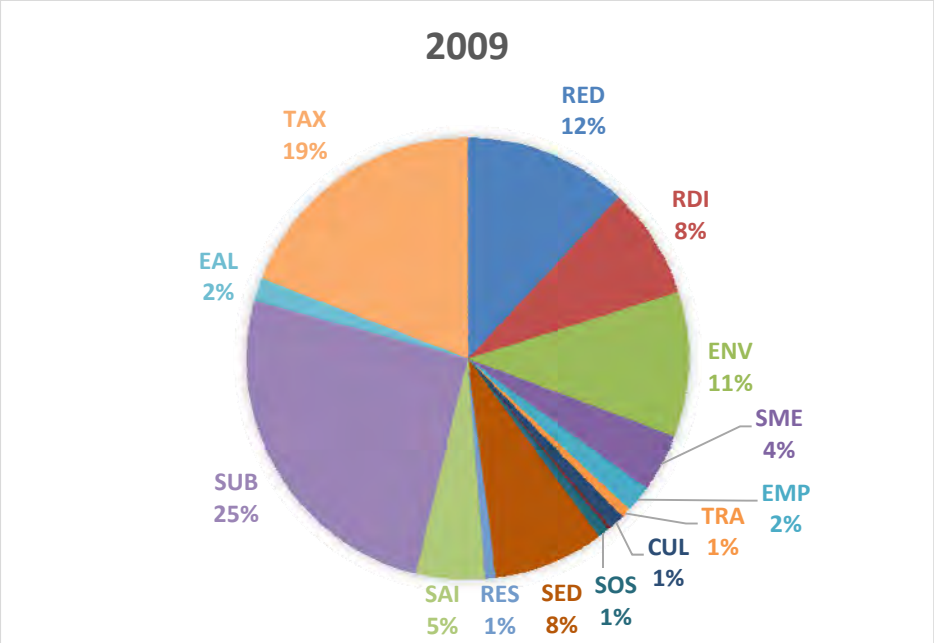

Figure 23. 2009 PIE Chart

In Figure 23 2009 pie chart shows the SUB percentage is 25%, TAX 19%, RED 12%, ENV 11%, RDI 8%, SED 8%, SAI 5%, EMP & EAL 2%.

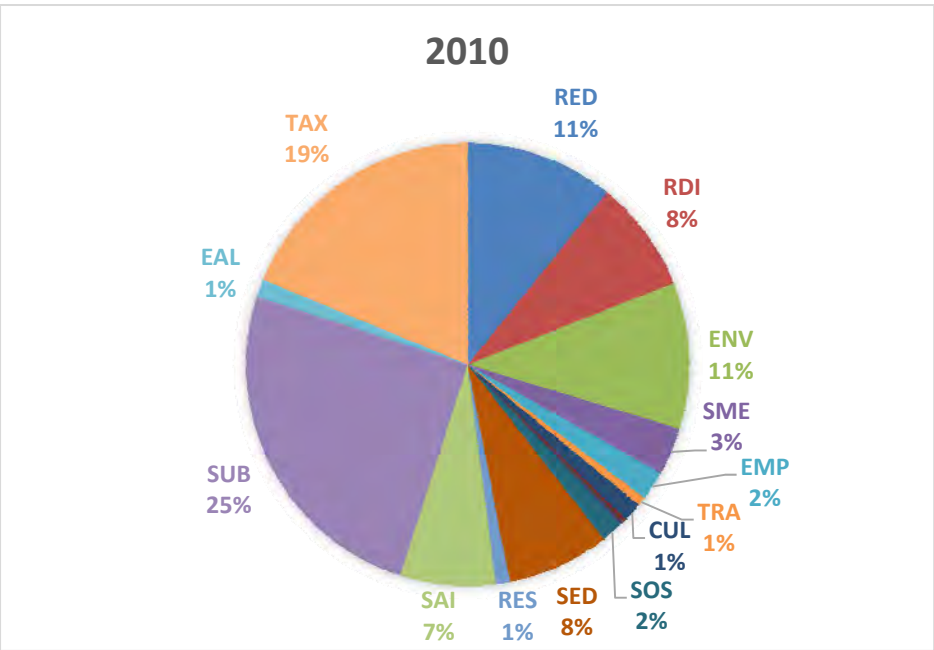

Figure 24. 2010 PIE Chart

In Figure 24 during 2010 SUB percentage is 25%, TAX 19%, ENV 115, RED 11%, RDI 8%, SED 8%, SAI 7% & SME 3%.

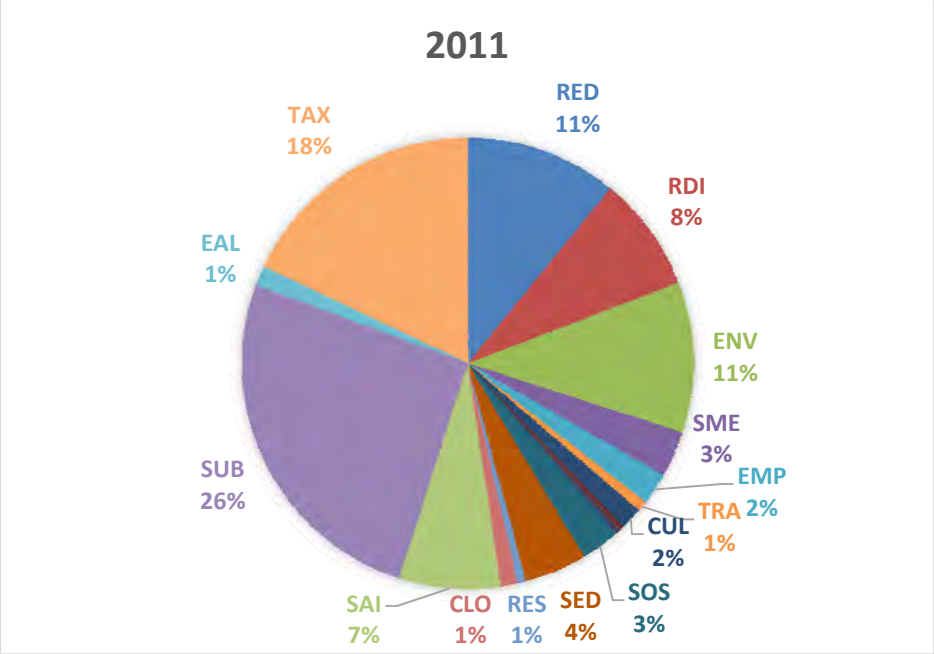

Figure 25. 2011 PIE Chart

In Figure 25 it is shown that in 2011 SUB percentage is 26%, TAX 18%, ENV 11%, RED 11%, RDA 8%, SAI 7%, SED 4%, SME 3%, SOS 3% & EMP 2%.

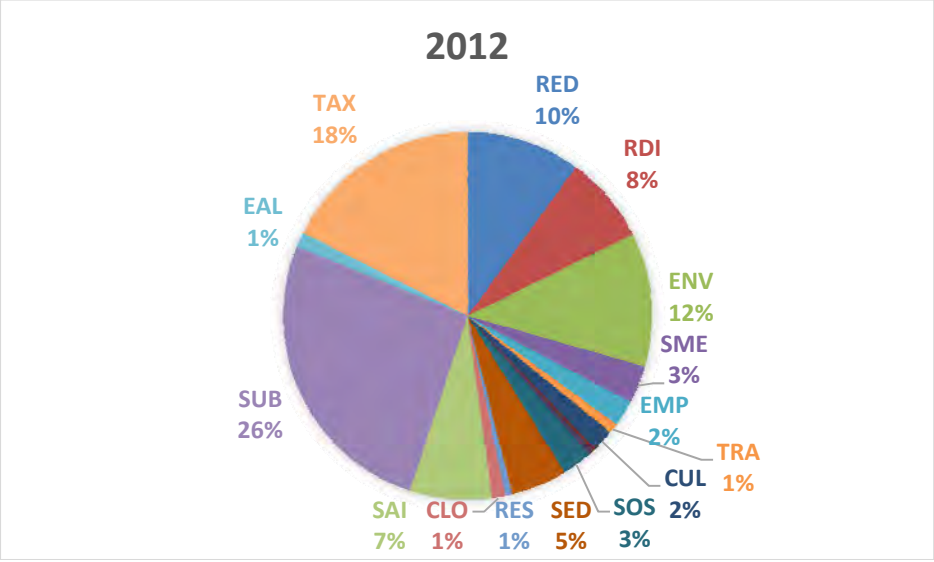

Figure 26. 2012 PIE Chart

In Figure 26 2012 pie chart shows Sub percentage is 26%, TAX 18%, ENV 12%, RED 10%, RDI 8%, SAI 7%, SED 5%, SME 3%, SOS 3%, EMP 2% & CUL 2%.

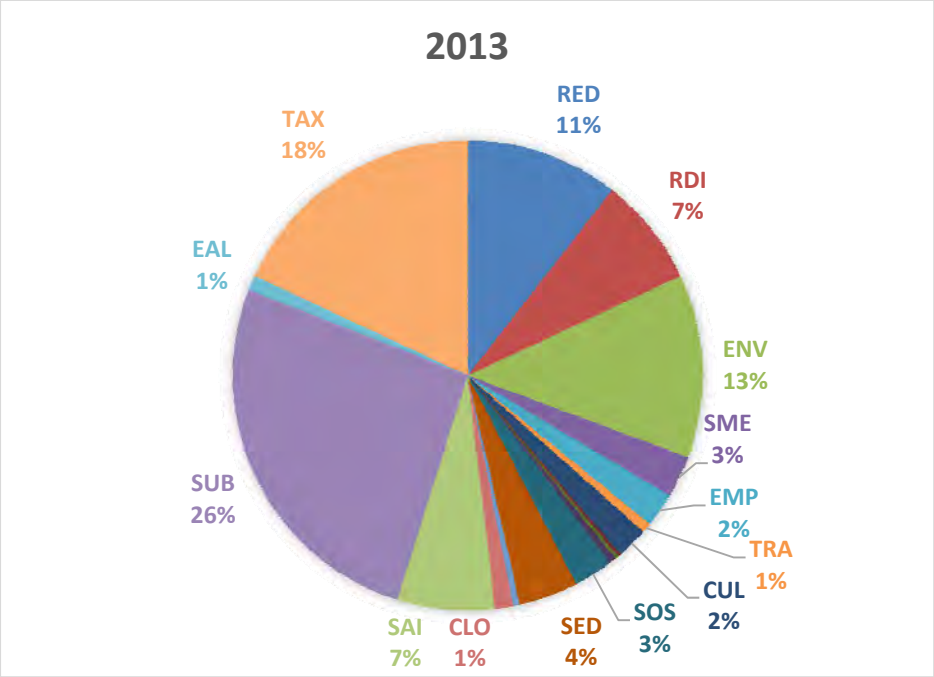

Figure 27. 2013 PIE Chart

In Figure 27 it is shown that during 2013 SUB aid was 26%, TAX 18%, ENV 13%, RED 11%, RED 7%, SAI 7%, SED 4%, SOS 3%, SME 3%, EMP 2% & CUL 2%.

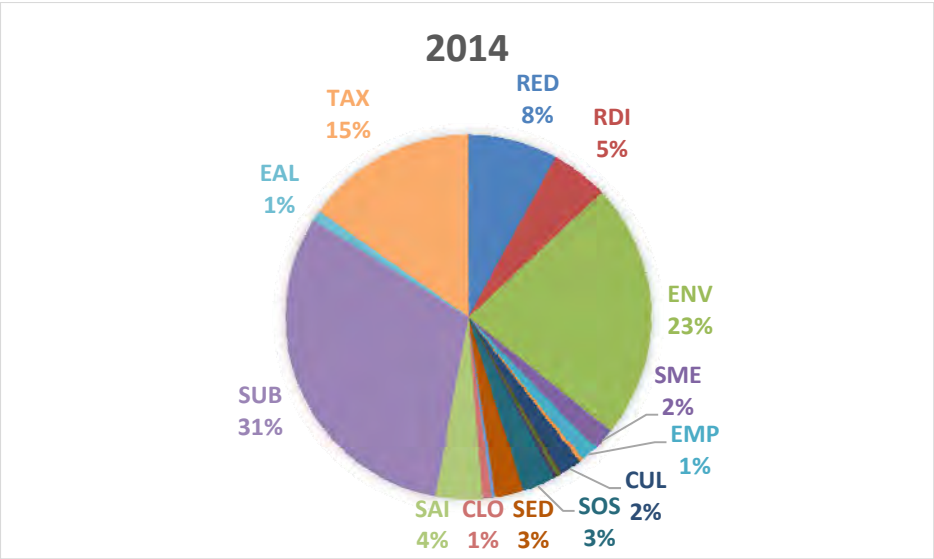

Figure 28. 2014 PIE Chart

In 2014 SUB percentage is 31%, ENV 23%, TAX 15%, RED 8%, RDI 5%, SAI 4%, SED 3%, SOS 3%, SME 2% & CUL 2%.

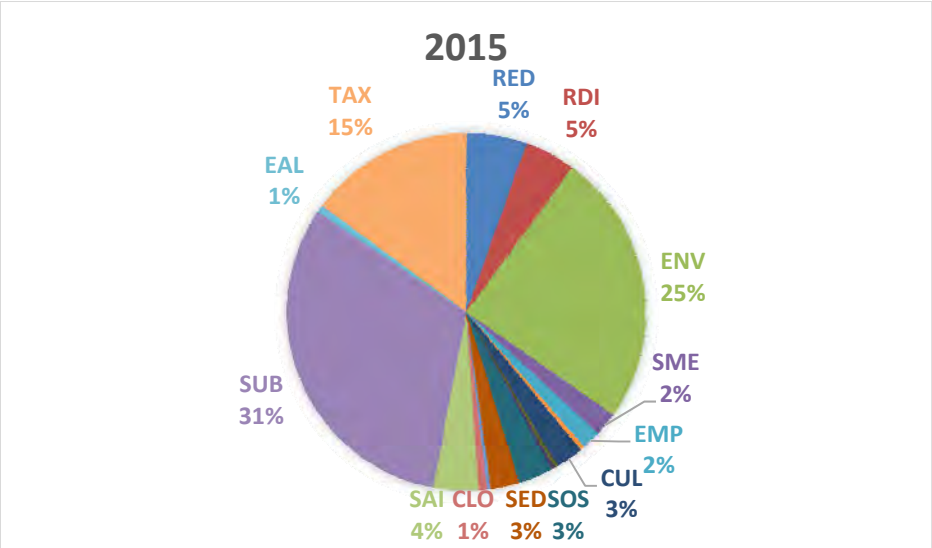

Figure 29. 2015 PIE Chart

SUB aid in 2015 was 31%, ENV 25%, TAX 15%, RED 5%, RDI 5%, SAI 4%, SED 3%, CUL 3%, SOS 3%, EMP 2% & SME 2%.

Effect of different aids on EU GDP has been analyzed by ARDL model separately for each aid due to smaller length of time. The results are stated in Table 2.

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Table 2: Effect of Different Aids on GDP of EU using ARDL Model

Effect of RDI						
R-squared	**F-statistic**	**C**	**GDP (-1)**	**RDI**	**RDI (-2)**	
0.846	9.15** (0.02)	-30.24** (0.03)	-0.54** (0.04)	4.59 (0.17)	5.74** (0.01)	
Effect of RED						
R-squared	**F-statistic**	**C**	**GDP (-1)**	**RED**	**RED (-2)**	
0.704	3.99* (0.09)	-33.02** (0.04)	-0.28 (0.33)	4.73* (0.1)	5.48* (0.05)	
Effect of SME						
R-squared	**F-statistic**	**C**	**GDP (-1)**	**SME**	**SME (-1)**	**SME(-2)**
0.44	0.78 (0.59)	34.04 (0.10)	-0.71 (0.25)	-9.96 (0.26)	5.57 (0.57)	-1.71 (0.79)
Effect of TRA						
R-squared	**F-statistic**	**C**	**GDP (-1)**	**TRA**	**TRA(-1)**	
0.28	0.79 (0.54)	-3.82 (0.74)	0.02 (0.96)	4.85 (0.17)	-1.22 (0.71)	
Effect of ENV						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**ENV**	**ENV(-2)**	**ENV(-3)**
0.96	18.48** (0.02)	4.92*** (0.003)	0.004 (0.42)	0.05** 0.04	0.23 (0.11)	0.24* (0.08)

Effect of EMP						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**EMP**	**EMP(-1)**	
0.56	2.56 (0.15)	38.69 (0.14)	0.09 (0.77)	2.66 (0.60)	-12.01** (0.03)	
Effect of CUL						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**CUL**	**CUL(-1)**	**CUL(-3)**
0.99	120.74*** (0.001)	6.87*** (0.00)	-0.008** (0.01)	O.07 (0.14)	0.22** (0.01)	-.020** (0.02)
Effect of EXP						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**EXP**	**EXP(-1)**	
0.74	5.80** (0.033)	16.30*** (0.001)	-0.21 (0.35)	3.04** (0.03)	-6.07*** (0.008)	
Effect of COM						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**COM(-1)**	**COM(-3)**	
0.90	13.00** (0.015)	7.13*** (0.000)	-0.007 (0.27)	-0.023** (0.019)	0.004 (0.59)	
Effect of HER						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**HER(-1)**	**HER(-3)**	
0.80	5.33* (0.07)	7.04*** (0.000)	0.001 (0.82)	0.016 (0.16)	0.022* (0.08)	
Effect of SOS						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**S0S**	**SOS(-3)**	
0.81	5.73* (0.06)	6.78*** (0.000)	-0.013 (0.18)	0.14** (0.04)	-0.023 (0.15)	
Effect of SED						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**SED(-1)**	**SED(-2)**	
0.79	6.56** (0.03)	7.48 (0.29)	0.38 (0.40)	-2.91*** (0.009)	2.08 (0.17)	
Effect of RES						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**RES**	**RES(-1)**	**RES(-2)**
0.76	3.18 (0.14)	-52.59** (0.04)	6.05** (0.02)	10.93** (0.025)	-2.16** (0.03)	-2.75** (0.03)
Effect of CLO						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**CLO(-1)**	**CLO(-3)**	
0.87	9.01** (0.029)	7.08*** 0.000	-0.0005 (0.92)	-0.009* (0.09)	0.014** (0.04)	
Effect of SAI						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**SAI**	**SAI(-1)**	**SAI(-3)**
0.45	0.328 (0.86)	5.74 (0.12)	0.002 (0.11)	-0.087 (0.76)	0.128 (0.66)	0.197 (0.52)
Effect of SUB						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**SUB**	**SUB(-1)**	**SUB(-3)**
0.31	3.21 (0.18)	6.27*** (0.0007)	-0.0024 (0.78)	0.104 (0.16	0.08 (0.34)	0.0007 (0.92)

Effect of EAL						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**EAL**	**EAL(-2)**	**EAL(-3)**
0.53	3.94 (0.14)	7.76*** (0.0001)	0.007 (0.55)	-0.07 (0.30)	-0.15* (0.07)	0.023 (0.71)
Effect of TAX						
R-squared	**F-statistic**	**C**	**GDP(-1)**	**TAX**	**TAX(-1)**	**TAX(-3)**
0.47	0.80 (0.64)	11.42 (0.27)	0.02 (0.58)	-0.29 (0.75)	0.11 (0.71)	-0.48 (0.72)

Note: *, ** and *show significance at 1%, 5% and 10% level respectively.**

Effect of RDI

As the value of R-squared is 0.846 so it means that 84.6% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP(-1)), RDI and 2nd lag of RDI (RDI(-2)). Furthermore, the Prob(F-statistic) is 0.018 (less than .05), so it means that the model is a good fit at 5% level of significance. As the p-value of RDI is 0.1742 which is greater than 0.1 so it means that RDI has an insignificant impact on GDP. However, as p-value of RDI(-2) is 0.0126 which is less than .05 so it means that two years back aid on RDI has a significant impact on current GDP at 5% level of significance.

Effect of RED

As the value of R-squared is 0.70 so it means that 70.4% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP(-1)), RED and 2nd lag of RED(RED(-2)). Furthermore, the Prob(F-statistic) is 0.09 (less than 0.1), so it means that the model is a good fit at 10% level of significance. As the p-value of RED is 0.10 which is greater than 0.1 so it means that RED has an insignificant impact on GDP. However, as p-value of RED(-2) is 0.05 which is less than .10 so it means that two years back aid on RED has a significant impact on current GDP at 10% level of significance.

Effect of SME

A low value of R-squared (0.44) and insignificant F stats indicate that SME has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Effect of TRA

A low value of R-squared (0.28) and insignificant F stats indicate that TRA has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Effect of ENV

As the value of R-squared is 0.96 so it means that 96% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP (-1)), ENV and 2nd lag of ENV (ENV (-2)). Furthermore, the Prob(F-statistic) is 0.02 (less than 0.05), so it means that the model is a good fit at 5% level of significance. As the p-value of ENV is 0.04 which is less than 0.05 so it means that RED has a significant impact on GDP at 5% level of significance. However, as p-value of ENV(-3) is 0.08 which is less than .10 so it means that three years back aid on ENV has a significant impact on current GDP at 10% level of significance.

Effect of EMP

A low value of R-squared (0.56) and insignificant F stats indicate that EMP has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Effect of CUL

As the value of R-squared is 0.99 so it means that 99% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP (-1)), CUL, 1st lag of CUL(CUL (-1)) and 3rd lag of CUL(CUL (-3)). Furthermore, the Prob(F-statistic) is 0.001 (less than 0.01), so it means that the model is a good fit at 1% level of significance. As the p-value of CUL is 0.14 which is greater than 0.10 so it means that CUL has an insignificant impact on GDP. However, as p-value of CUL(-1) is 0.01 which is less than .05 so it means that one year back aid on CUL has a significant impact on current GDP at 5% level of significance and as p-value of CUL(-3) is .02 which is less than .05 so it means that three years back aid on CUL has a significant impact on current GDP at 5% level of significance.

Effect of EXP

A high value of R-squared (0.74) shows that 74% of variations in EU GDP has been explained by the independent variables. As F stats is significant at 5% so the model is a good fit. The constant is significant at 1% level as it has p-value of 0.001. EXP has significant impact on EU GDP as both its level and lags are significant having p-values 0.03 and 0.008.

Effect of COM

As the value of R-squared is 0.90 so it means that 90% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP (-1)), COM, 1st lag of COM(COM (-1)) and 3rd lag of COM(COM (-3)). Furthermore, the Prob(F-statistic) is 0.015 (less than 0.05), so it means that the model is a good fit at 5% level of significance. As the p-value of COM is 0.27 which is greater than 0.10 so it means that COM has an insignificant impact on GDP. However, as p-value of COM(-1) is 0.019 which is less than .05 so it means that one year back aid on COM has a significant impact on current GDP at 5% level of significance and as p-value of CUL(-3) is .59 which is greater than .10 so it means that COM(-3) has an insignificant impact on GDP.

Effect of HER

As the value of R-squared is 0.90 so it means that 90% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP (-1)),1st lag of HER(HER (-1)) and 3rd lag of HER(HER (-3)). Furthermore, the Prob(F-statistic) is 0.07 (less than 0.10), so it means that the model is a good fit at 10% level of significance. As the p-value of HER(-1) is 0.16 which is greater than 0.10 so it means that HER(-1) has an insignificant impact on GDP. However, as p-value of CUL(-3) is .0.08 which is less than .10 so it means that three years back aid on HER has a significant impact on current GDP at 10% level of significance.

Effect of SOS

As the value of R-squared is 0.81 so it means that 90% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP (-1)), SOS and 3rd lag of SOS(SOS (-3)). Furthermore, the Prob(F-statistic) is 0.06 (less than 0.10), so it means that the model is a good fit at 10% level of significance. As the p-value of SOS is 0.04 which is less than 0.05 so it means that SOS has a significant impact on GDP at 5% level of significance However, as p-value of SOS(-3) is .15 which is less than .1.0 so it means that has an insignificant impact on GDP

Effect of SED

A high value of R-squared (0.79) shows that 79% of variations in EU GDP has been explained by the independent variables. As F stats is significant at 5% so the model is a good fit. The constant is insignificant as it has p-value of 0.29. SED(-1) has significant impact on EU GDP as it has a p-value of 0.009.

Effect of RES

A high value of R-squared (0.76) shows that 76% of variations in EU GDP has been explained by the independent variables. The constant is significant at 5% level as it has p-value of

0.04. RES has significant impact on EU GDP as both its level and lags are significant having p-values 0.025, 0.03 and 0.03.

Effect of CLO

As the value of R-squared is 0.87 so it means that 87% of variations in GDP are explained by the above regressors i.e. C (constant), lag of GDP (GDP (-1)),1st lag of CLO(CLO (-1)) and 3rd lag of CLO(CLO (-3)). Furthermore, the Prob(F-statistic) is 0.02 (less than 0.05), so it means that the model is a good fit at 5% level of significance. As the p-value of CLO(-1) is 0.09 which is less than .10 so it means that one year back aid on CLO has a significant impact on current GDP at 10% level of significance and as p-value of CUL(-3) is .0.08 which is also less than .10 so it means that three years back aid on HER has a significant impact on current GDP at 10% level of significance.

Effect of SAI

A low value of R-squared (0.45) and insignificant F stats indicate that SAI has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Effect of SUB

A low value of R-squared (0.31) and insignificant F stats indicate that SUB has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Effect of EAL

A low value of R-squared (0.53) and insignificant F stats indicate that EAL has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Effect of TAX

A low value of R-squared (0.47) and insignificant F stats indicate that TAX has no significant impact on GDP of EU. These measures also point out that model is not a good fit and other better models may be used for this purpose.

Conclusions and Recommendations

The scatter diagrams show that different aids tend to increase with time with varying rates. The pie charts show that SUB has the largest proportion of aid throughout from year 2005 to 2015. The second larger proportion is of TAX, the third is of SED, the fourth is of ENV, the fifth and sixth are of RED and RDI. The inferential analysis shows that the two aids having larger proportion i.e. SUB and TAX do not have a significant impact on EU GDP. However, the remaining four aids i.e. SED, ENV, RED and RDI having collectively a larger proportion throughout the years 2005 to 2015 have significant impact on EU GDP. Therefore, it is recommended that proportion of these four aids i.e. SED, ENV, RED and RDI may be increased to ensure an increase in production.

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