

and lower tax increases resource gap in government budget which may hamper welfare objective of the state. So then, what should be the efficient or optimal level of tax revenue that maximizes growth? The answer might differ depending upon the country and its level of development. Different Scholars like Scully (1995, 2003), Amgain (2017), Kehe (2010) have examined for the optimal level of taxation for the US, Asian countries and Cote d'Ivoire, respectively. They have justified the need of optimal taxation. In this context, this paper examines the optimal tax burden rate for Nepali economy.

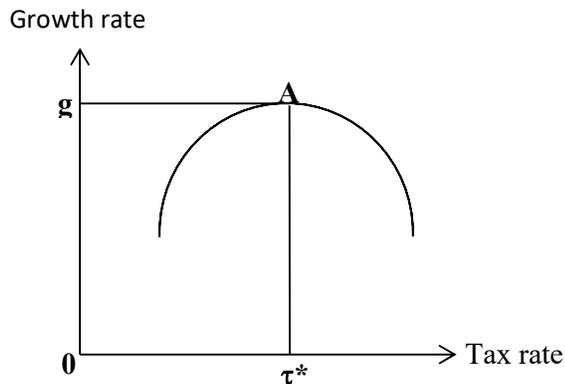
After the political transition period of 2006 the volume of government expenditure has been hiking. The total government expenditure share of GDP has reached from 15.54 percent in 2006 to 24.1 percent in 2015. Along with the increase in government size, the expenditure efficiency of the government has become a debatable issue. It has also drawn attention on the effective utilization of the increasing tax revenue. To meet the resource gap, several tax reforms have been made by the government for raising the volume of tax revenue. Changes in the level of taxation affect the economic activity of the nation and economic growth accordingly. Adaptive and rational expectation regarding changes in tax policies can be influential towards financial markets, consumer behaviour and investment decisions (Neog, 2018). So, excessive taxation might be costly to the government in terms of growth. In this scenario, it is rationale for determining the optimal tax rate that could promote sustainable growth. To the best of my knowledge, this research would be the first attempt to measure the optimal tax rate of Nepal.

2. Literature Review

After the emergence of Keynesian economics the vital role of government was realized for maintaining stability in the economy. Along with the increase in government activities the need of higher revenues were realized. Such higher revenues raised through taxation, was found unjust during late 1970s. By illustrating an inverted U-shaped curve, Arthur Laffer talked about the optimal level of taxation for an economy and made statement that "too much tax kills tax". The Irish success story of reducing corporate tax rates from 48% to 12.5% during 1990s strongly supported the Laffer curve. The Irish are the Celtic Tiger of Europe (just as Hong Kong, Singapore, and Taiwan were the "Asian Tigers" during the 1980s and 1990s) and low tax rates have played a critical role in this amazing economic rehabilitation (Laffer et. al., 2008).

Like Laffer (1981); Barro (1990), Armeiy (1995) and Scully (1996) have also supported the inverted U shaped relation between taxation and growth. Basically, Scully model is found widely popular for testing the inverted U-shaped tax growth relationship and finding optimal size of government.

Figure 1: Inverted U-shaped Tax Growth Relationship



As shown in figure 1 increase in taxation upto point A increases the growth rate but at decreasing rate and beyond that, taxation lowers the growth rate at an increasing rate. Thus, τ^* is the growth maximizing tax rate. The positive negative externality pattern of taxation affects the rate of economic growth (Scully 1995).

Numerous researches have been conducted to find optimal level of taxation. Scully (1995), did an empirical estimation of the optimal tax rate for United States over the period 1929-1989 and found the growth maximizing tax rate in the range of 21.5 to 22.9 percent of GNP. Such tax rate for United States for the period 1960-1990 was 19.3 percent of GDP (Scully, 2003). Following Scully model optimal tax rate was found 34 percent for Canada (Chao & Grubel, 1998) and 21.48 % for Pakistan (Husnain, 2011). Along with Scully model quadratic model was also used by some researchers. Use of both the Scully model and quadratic model resulted optimum level of tax between 21.2 to 22.3% of GDP for Cote d'Ivoire (Keho,2010), 18% for 32 Asian countries (Amgain, 2017) and between 12.8% and 19.6 percent of GDP for Tunisia (Terzi et.al, 2017). Similarly, long run analysis of optimal taxation and economic growth in Tunisia by Terzi et.al. (2017) found optimal tax rate as 14 percent of GDP.

Such an attempt of finding optimal tax rate has not been done earlier in case of Nepal. Though several articles related to structure of tax (Dahal, 2011), elasticity and buoyancy

of taxation (NRB, 2018), contribution of tax (Aryal, 2018) are found. Hence, this piece of work will try to motivate the researchers to find optimal government size for Nepal.

3. Methodology

This paper has used Scully model applied by Keho (2010) for estimating the growth-maximizing tax rate in this paper. Scully model is based on the two sector economy (government and private sector) where government provides the public goods and services which are solely financed by collecting taxes. It assumes the government with balanced budget which is represented by the equation: $G=\tau Y$. G is the public expenditure; Y is the national output and τ is the tax rate.

Private goods are produced by the use of the share of output left for private sector, $(1-\tau) Y$. Thus, public and private goods contribute for producing national output. National output can be expressed in the form of following Cobb-Douglas production function (Keho, 2010):

$$Y_t = \alpha(G_{t-1})^b [(1 - \tau_{t-1})Y_{t-1}]^c = \alpha(\tau_{t-1} Y_{t-1})^b [(1 - \tau_{t-1})Y_{t-1}]^c \quad (1)$$

Where α , b and c are constant parameters such that $b, c < 1$.

Considering equation (1) in logarithmic form, we have

$$\log(Y_t) = \log(\alpha) + b \log(\tau_{t-1} Y_{t-1}) + c \log[(1 - \tau_{t-1})Y_{t-1}] \quad (2)$$

The growth maximizing tax rate τ^* is obtained by differentiation of $\log(Y)$ with respect to τ , setting the result to zero, and solving for τ .

$$\frac{\partial \log(Y)}{\partial \tau} = \frac{b}{\tau} - \frac{c}{1 - \tau} \quad (3)$$

Solving for the growth-maximizing tax rate yields:

$$\tau^* = \frac{b}{b + c} \quad (4)$$

Thus, the following equation is used to estimate the optimum level of taxation:

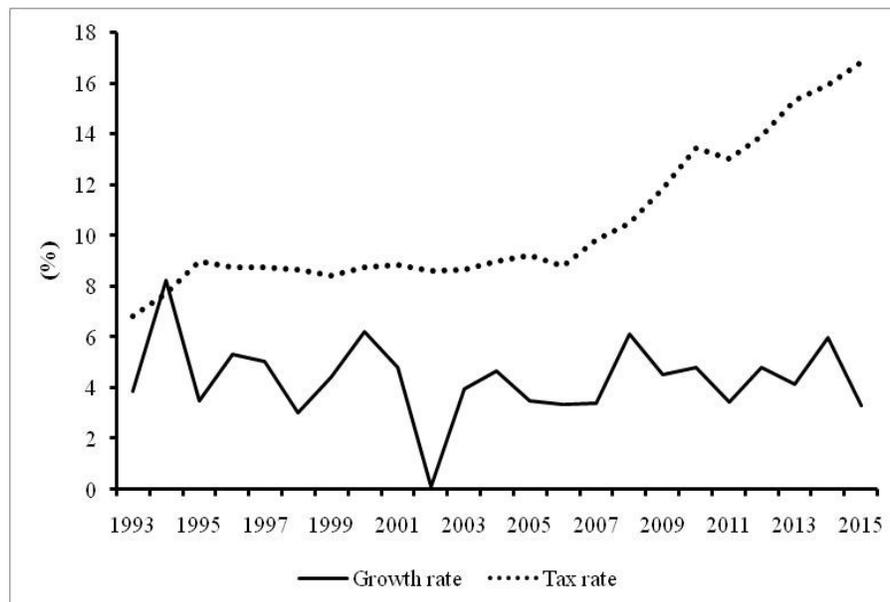
$$\log(y_t) = \log(\alpha) + b \log(\tau_{t-1} y_{t-1}) + c \log[(1 - \tau_{t-1})y_{t-1}] + \varepsilon \quad (5)$$

Where, y_t is the real GDP and ε is an error term assumed to be normally distributed with zero mean and constant variance.

The Data

The estimation covers the period 1993 to 2015. National output is measured by Real GDP and tax rate is measured in terms of tax revenue share of GDP. Real GDP (US\$ constant 2010) is drawn from World Development Indicator series 2018 and tax revenue share of GDP is extracted from Government Financial Statistics 2017, a publication of Central Bank of Nepal. The figure 2 shows the trend of real GDP growth and tax rate during the sample period 1993 to 2015.

Figure 2: Growth Versus Tax Revenue on GDP over 1993-2015



As shown in figure 2, average economic growth rate for the period 1993-2015 is 4.37 and tax rate is 10.43 percent of GDP. During 2002 growth rate is near to zero and since last five years government is collecting large share of tax revenue. But the economic growth rate is low.

Tax revenue constitutes major share in total revenue of Nepal. During the time of absolute monarchy, the proportion of tax revenue was decreasing, while the proportion of non-tax revenue was increasing (Gyawali, 2017). Average tax revenue as share of GDP for 15 years before 1990 and after 1990 was only 6.57 percent and 8.14 percent respectively. During last 10 years of the sample period it was around 12.57 percent of

GDP. In comparison to Afghanistan, Bangladesh, and Srilanka tax revenue as share of GDP for Nepal is found almost continuously increasing but for these countries, it is found fluctuating over the years (Appendix-I).

Empirical Results

OLS estimation output of equation (5) is presented in the table below.

Table 1: Estimation Result

Estimation Method: Least Squares (Included sample: 22 after adjustments)	
Independent Variables	Dependent Variable: $\log(y_t)$
$\log(\tau_{t-1} Y_{t-1})$	0.12*** (0.03)
$\log[(1 - \tau_{t-1})Y_{t-1}]$	0.87*** (0.08)
C	0.45 (0.4)
R-squared	0.99
Prob (F-statistic)	0.000
Durbin-Watson stat	1.96

Figures in brackets are values for standard error. *** indicate significant at 1 percent level

The estimation result presented in table 1 shows both the independent variables highly significant. R^2 is 99% and DW test is 1.96. Coefficient of the independent variable $\log(\tau_{t-1} Y_{t-1})$ is 0.12 and $\log[(1 - \tau_{t-1})Y_{t-1}]$ is 0.87. The coefficient values (b & c) give us the optimal tax rate as 12.30 %. Thus, Scully model based optimal tax rate for Nepal is 12.30 percent of GDP. But in 2015 tax revenue share of GDP is 16.79 percent which is larger by around four percent than optimal tax rate. The estimated result is supported by the residual diagnostic test (Appendix-II).

4. Conclusion

In Nepal's tax structure, revenues are buoyant but inadequate to supplement development activities (Dahal, 2009). Government expenditure is increasing at a faster rate and to meet the resource gap, tax revenue is also increasing. In this scenario, this paper is an attempt of testing Scully model for determining optimal tax rate of Nepal. Based on the sample period 1993 to 2015 the estimation result suggests that growth maximizing optimal tax rate for Nepal is 12.30 percent of GDP. This tax rate is far

below the estimated tax rate by Scully (1995, 2003), Chao & Grubel (1998) and Husnain (2011). The low value of optimal tax rate seems to be the outcome of the weak taxable capacity and tax effort in Nepal during the last decade as Nepalese economy was mainly contributed by agriculture at that time. The actual tax rates in Nepal are found below optimal tax rate during the period 1993 to 2009 (less than 10 percent). Thereafter tax rate is more than the optimal rate. High tax collection in the recent years has raised the tax burden in Nepal. In this context, this paper only tries to suggest the tentative size of tax to maximize the economic growth of Nepal.

Reducing the tax burden is a more potent way of enhancing economic growth than is fine-tuning the tax mix (Branson & Lovell, 2001). So, government of Nepal should try to lower the tax rate in order to minimize damages of high tax rate on economic growth in the coming years. Regarding measuring the growth maximizing optimal level of tax, this paper is a small initiative to create intuition amongst the policy makers and researchers of Nepal.

Acknowledgement

My special thank goes to Dr. Jeeban Amgain for his valuable suggestion while preparing this article.

References

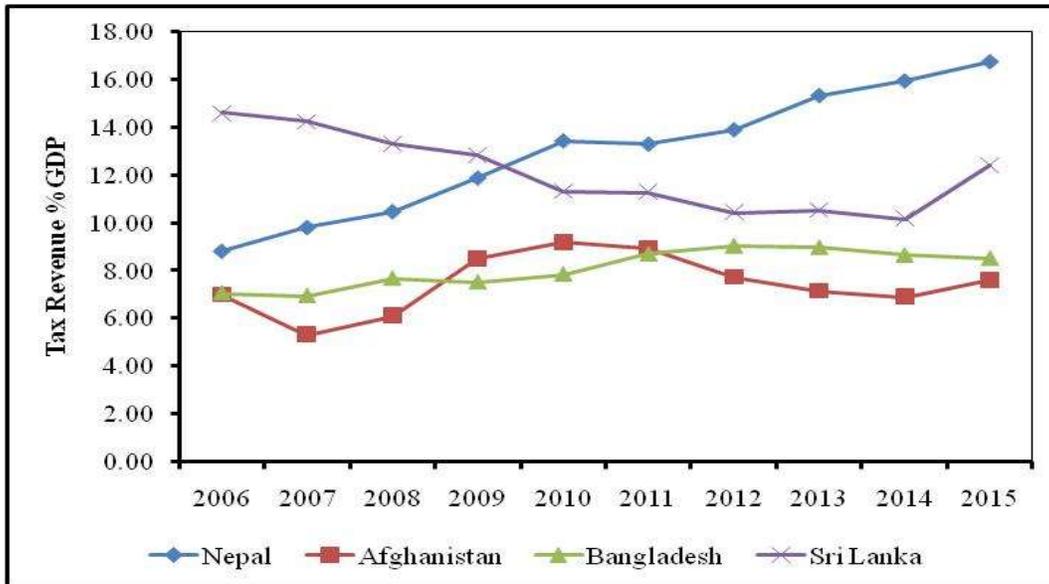
- Amgain, J. (2017). Estimating Optimal Level of Taxation for Growth Maximization in Asia. *Applied Economics and Finance*, 4(3).
- Aryal, K. P. (2018). Contribution of Income Tax to Tax Revenue and GDP in Nepal. *The Journal of Economic Concerns*, 9(1).
- Branson, J. & Lovell, Knox C. A. (2001). A Growth Maximising Tax Structure for New Zealand. *International Tax and Public Finance*.
- Chao, J.C.P & Grubel, H. (1998). *Optimal Levels of Spending and Taxation in Canada*. The Fraser Institute, Vancouver.
- Chokri, T., Anis E.A. & Ali B. (2018). Optimal Taxation and Economic Growth in Tunisia: Short and Long Run Analysis. *Journal of Reviews on Global Economics*, 7, 157-164.
- Dahal, M. (2011). Taxation in Nepal: Structure, Issues and Reforms. *Economic Journal of Nepal*, 32(1), 1-13.

- Gyanwaly, Ram Prasad (2017). Macroeconomic Performance of Nepalese Political Economy (1975-2014). *Political Economy of Nepal Ch. II, Central Department of Economics, TU, and Friedrich Ebert Stiftung.*
- Laffer, A.B. (1981). Supply-side economics. *Financial Analysts Journal*, September/October, 37(5).
- Laffer, A.B; Moore, S. & Tanous J.P. (2008). The End of Prosperity: How Higher Taxes Will Doom the Economy—If We Let It Happen. *Threshold Editions*, New York.
- Neog, Y. (2018). Taxation and Economic Growth- A Critical Assessment Of Literatures Specially Related To India. *International Journal of Research in Social Sciences*, 8(6), June 2018.
- NRB. (2017). *A Handbook of Government Financial Statistics*. Vol.5, March 2017.
- NRB. (2018). Elasticity and Buoyancy of Taxation in Nepal: A Revisit of the Empirical Evidence. *NRB Working Paper No. 40, April 2018.*
- Scully, G.W. (1995). The ‘growth tax’ in the United States. *Public Choice*, 85,71-80.
- Scully, G.W. (1996). Taxation and economic growth in New Zealand. *Pacific Economic Review* 1(2), 169-177.
- Scully, G.W. (2000). The growth-maximizing tax rate. *Pacific Economic Review*, 5(1) (2000), 93-96.
- Scully, G.W. (2003). Optimal taxation, economic growth and income inequality. *Public Choice*, 115(3/4) (Jun., 2003), 299-312.
- Husnain, M. I. ul (2011). *Is the Size of Government Optimal in Pakistan?* *Journal of Economics and Economic Education Research*, 12.

Appendices

Appendix: I

Trend of Tax Revenue as Percentage of GDP of Selected SAARC Countries



Source: World Development Indicators, 2019, World Bank

Appendix: II

Residual Diagnostic Test

Diagnostic Test	Method	Test-statistics	p value
Normality	Jarque-Bera	3.76	0.15
Serial Correlation (LM Test)	Breusch-Godfrey	0.32	0.57
Heteroskedasticity	Breusch-Pagan-Godfrey	1.86	0.39