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Optimal Tax Rates for CDR growth and Economic Development: A National Collaboration

Dennis Ridley[1]

[1]*Professor, School of Business and Industry, Florida A&M University and Department of Scientific Computing, Florida State University, Tallahassee, FL. USA.*
E-mail: dridley@fsu.edu

A R T I C L E I N F O

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Abstract: *Economic development includes economic growth and social development. Infrastructure plays a critical role in economic growth and development. It is the result of direct investment in private industry and public facilities that include endogenous capital stock of knowledge, machines, computers, recordings, etc. Infrastructure requires maintenance and is subject to depreciation (the accounting companion of capital consumption allowance in economics) and obsolescence. The optimal reinvestment to maximize economic growth is derived and computed from the new capitalism, democracy, rule of law (CDR) model. Reinvestment is either private money that is tax deductible or government spending of taxation of private income. The optimal nominal reinvestment rate is found to be 21%. The optimal effective tax rate is calculated as equal to the optimal total reinvestment rate minus the private tax-deductible reinvestment rate. Economic reinvestment is a collaboration between private and government sectors.*

Keywords: *Taxation; Economic growth; Economic development; Reinvestment capital; Innovation; Entrepreneurship elasticity of growth.*

JEL classification: *E02, P16*

1. Introduction

The fundamental teaching of economics suggests that economics is concerned with production, distribution and consumption of goods and services. This can easily be misunderstood to mean that wealth just exists and is there for distribution to a population of human beings. This is not true (Ridley, 2018b, 2020a). Wealth does not just exist. Wealth must be created. The sole source of wealth is the exogenous human capital ideas of imagination and creativity. Human capital must be converted into endogenous capital stock of knowledge, machines, computers, recordings, etc. When this conversion process is related to invention, the conversion process relies on collaboration: the intentional plan and execution thereof by participants for their mutual benefit (Ridley, 2021; Tomasello, 2001) over and above economic cooperation for personal gain. In matters of

government, the conflicting individual goals that define cooperation will result in failure (Ridley and Nelson, 2022). Collaboration is essential. Gross domestic product is the market value of all domestic expenditures made on final goods and services, including consumption expenditures, investment expenditures, government expenditures, and net exports. Standard of living is measured by real per capita (GDP) adjusted for purchasing power parity (GDPppp). Annual GDPppp, after depreciation (capital consumption allowance) and obsolescence, and consumption, is one year's contribution to wealth. This contribution to aggregate living standard (material wellbeing) is the basis for economic growth and development. Economic development is concerned with both economic advancement and social development.

This process is expected to improve overall health, wellbeing, and academic level of the general population. Not just material wellbeing and not just of an elite subpopulation. The way that wealth is held across the population is a worthwhile consideration for development but there will be no development and no wealth for anybody if there is no GDP. Therefore, GDPppp is required but not sufficient for economic development. Reinvestment is either private money that is tax deductible or government spending of taxation of private income. This reinvestment is for growth and to cover infrastructure maintenance, and depreciation and obsolescence of capital stock required for both economic and social development. Depreciation is an accounting term whose companion in economics is capital consumption allowance. We are interested to know the role of reinvestment in economic growth. Specifically, the rate of reinvestment that will maximize GDPppp, and the optimal rate of taxation to be invested in the public sector of the economy. The amount to reinvest in the public sector is a fraction of GDPppp and is therefore endogenous. But the decision of what that fraction is, is an exogenous decision of government.

Significance

Optimal tax rate strategies are derived from first principles then computed from supply side empirical data and are found to be global time invariant for a given adoption of CDR policy.

The remainder of the paper is organized as follows. Section 2 is a review of relevant literature. Section 3 is a discussion on the relationship of taxation to economic growth and development. Section 4 derives the optimal investment rate. Section 5 relates reinvestment rate to taxation. Section 6 summarizes conclusions and suggestions for future research.

2. Related Literature

Taxation is not a natural state of society, it is an invention. The basic principle of taxation stretches back thousands of years, nearly to the beginning of human society. Before income tax was introduced in the early twentieth century, taxation took the form of excise taxes and tariffs. In 1861 the congress of the Unites States of America (US) introduced the first income tax to pay for the civil war. The maximum tax rate was 5%. After the war ended it was judged to be unconstitutional and was repealed. In 1913 the sixteenth amendment of the US constitution made income tax permanent.

One of the earliest writings on taxation was Petty's (1662) treatise of taxation and contributions. Smith (1776) is considered to be the father of scientific taxation theory. In his classic theory, he put forward four main principles of taxation as equity, determination, convenience and thrift of taxation administration. His work was further developed subsequently by Ricardo (1772-1823) and Mills (1806-1873). Cowperwaite (1915-2006) was a disciple of Adam Smith who as the financial secretary of Hong Kong, implemented Smithian ideas of peace, easy taxes and a tolerable administration of justice. Taxes were about half of that in the US. Hong Kong went from one of the poorest economies to one of great wealth.

Keynesian economic theory (Keynes, 1936) advocated state interventions in the processes of market economy regulation. He claimed that large amounts of savings hinder economic development as they are a source of passive income and are not invested in production. He suggested that high taxes stimulate economic activity and promote stability. So, the state must use taxation to reduce income savings and use the money to finance investments and cover state expenditures.

Neo-classical theory developed by Laffer, *et. al.* (2008, 2010, 2014) argues that the state must encourage free market competition to achieve economic equilibrium. So, taxation should be as low as possible, corporations should be granted significant exemptions, and government should adopt a passive role in regulation of the economy. Laffer, Moore, Sinquefield and Brown (2014) compiled American data on the impact of state taxes on the economic growth and movement of people between states. Their data showed that states that tax and spend more exhibit less growth. Although not the inventor, Laffer became known for the Laffer curve. The curve implies that it possible that reducing taxes from a high level can increase tax revenues. But Laffer does not derive the optimal rate. Blum (1953), Diamond (1968), Feldstein (2006), Mirrlees (1971) and Vickrey (1947) explored theories of optimal income taxation. But these are related to optimal tax progressions and brackets and redistribution not the overall average. Feldstein (2006)

commented on the effects of tax rates on efficiency and growth. He discusses the adverse effects of high marginal tax rates on labor income and investment income. He suggests that high marginal tax rate depresses working hours. Lee and Gordon, R. (2005) found that statutory corporate tax rates are significantly negatively correlated with cross-sectional differences in average economic growth rates.

Ridley (2020a) and Ridley (2018a) used a CDR economic growth model to derive optimal reinvestment rates for the maximization of GDPppp. That analysis found natural resources and geography to contribute only 6% and 4% respectively to GDPppp. It therefore suggested that poor countries should turn their focus from bemoaning their lack of natural resources and geography that they cannot change, to raising their CDR index. Ridley and Nelson (2022) show that the rule of law (R) in the CDR model requires collaboration. People working together selflessly.

3. Taxation for Reinvestment

Table 1 shows Real per capita GDPppp and Corporate income tax rates for year 2014 for 79 countries. These are the countries for which there is a complete set of data. Other countries do not report data or have populations of less than one million. The corporate tax rates range from 2% to 39%. Clearly there is no understanding or consensus that there is an optimal tax rate and what it is. Hence the potential for this paper to make a significant contribution.

To study the relationship between GDPppp and corporate tax rate, we fit a curve to the data as follows.

$$\text{GDPppp} = \beta_0 + \beta_1 \text{ Tax rate} + \beta_2 \text{ Tax rate}^2 + \varepsilon,$$

Where the intercept β_0 is set to zero when the tax rate is zero. If the tax rate is zero, there can be no investment and the GDPppp will collapse to zero. β_1 is the coefficient of tax rate, β_2 is the coefficient of the square of tax rate and $\varepsilon \sim \mathbb{N}(0, \sigma^2)$ is a normally distributed random error with a mean of 0 and constant variance σ^2. The first attempt to find a relationship was based on $\text{GDPppp} = \beta_0 + \beta_1 \text{ Tax rate} + \varepsilon$, but this equation yielded statistically insignificant values for R^2 and β_1. The least squares curve fit is as follows.

$$\text{Fitted GDPppp} = 1985.60 \text{ Tax rate} - 38.24\, \beta_2 \text{ Tax rate}^2,$$

$$t = (5.25) \qquad (-2.85) \qquad R^2 = 0.64$$

The coefficient of multiple determination adjusted $R^2 = 0.64$ indicates that tax rate explains 64 percent of GDPppp. We can test the significance of this relationship as follows. Our regression computation gives us an estimate for β_1, $\beta_1 = 1985.60$ with standard error of estimate $s_{b_1} = 378$. Since $t = b_1/s_{b_1}$

Table 1: Real per capita GDPppp and Corporate income tax rates by country (2014).

Country	*Real per capita GDPppp*	*Corporate Income Tax Rate*	*Country*	*Real per capita GDPppp*	*Corporate Income Tax Rate*
Argentina	22,302	35.00	Latvia	23,793	15.00
Armenia	8,164	20.00	Lebanon	18,052	15.00
Australia	46,550	30.00	Lithuania	27,259	15.00
Austria	46,640	25.00	Macedonia	13,398	2.00
Bangladesh	3,391	27.50	Malawi	1,112	30.00
Belgium	43,139	33.99	Malaysia	25,145	25.00
Bolivia	6,224	25.00	Mauritius	18,689	15.00
Botswana	17,050	22.00	Mexico	17,950	30.00
Brazil	16,155	34.00	Mongolia	11,919	25.00
Bulgaria	17,926	10.00	Morocco	7,813	30.00
Canada	44,967	26.20	Namibia	10,656	33.00
Chile	23,057	21.00	Netherlands	47,960	25.00
China	13,224	25.00	Nigeria	6,054	30.00
Colombia	13,480	25.00	Norway	67,166	27.00
Cote d'Ivoire	3,101	25.00	Oman	43,847	12.00
Croatia	20,947	20.00	Panama	19,546	25.00
Denmark	44,625	24.50	Peru	11,860	30.00
Dominican Republic	14,014	28.00	Philippines	6,974	30.00
Egypt	10,918	25.00	Poland	25,247	19.00
El Salvador	8,060	30.00	Portugal	27,069	31.50
Estonia	27,880	21.00	Romania	19,744	16.00
Finland	40,661	20.00	Russia	24,449	20.00
France	40,538	37.99	Saudi Arabia	52,311	20.00
Germany	46,216	30.18	Serbia	13,378	15.00
Ghana	4,137	25.00	Singapore	83,066	17.00
Greece	25,954	26.00	Slovakia	28,279	22.00
Hungary	25,019	19.00	Slovenia	29,867	17.00
India	5,808	33.99	South Africa	13,094	28.00
Indonesia	10,651	25.00	Spain	33,835	30.00
Iran	17,443	25.00	Sweden	46,219	22.00
Ireland	51,284	12.50	Switzerland	58,149	21.15
Israel	33,136	26.50	Thailand	15,579	20.00
Italy	35,131	31.29	Trinidad and Tobago	32,170	25.00
Jamaica	8,610	25.00	Turkey	19,698	20.00
Japan	37,519	36.99	Uganda	1,939	30.00
Jordan	11,971	20.00	Ukraine	8,681	18.00
Kazakstan	24,108	20.00	United Kingdom	39,826	21.00
Kenya	3,099	30.00	United States	54,370	39.08
Korea, South	34,355	29.08	Vietnam	5,656	22.00
Kyrgyzstan	3,262	10.00			

Data sources: G (PPP, constant international $ for 2014, reported by the IMF) http://www.imf.org/external/data.htm

T (Corporate tax rate) https://taxfoundation.org/corporate-tax-rates-by-country-2021/

$= 1985.61/378 = 5.25 > t_{\alpha=0.01,v=79-2} = 2.64$, where v is the number of degrees of freedom, we conclude with a level of significance $\alpha = 1\%$ that there is a statistically significant relationship between GDPppp and Tax rate. The coefficient for Tax rate^2 is evaluated similarly and found to be statistically significant. There is only a 1% chance that this conclusion is reached erroneously. This should was re-estimated for years 1995 to 2016 with similar results.

A graph of the fitted function is shown in Figure 1. As we can see GDPppp rises and falls as the corporate tax rates increases. When the rate is zero GDPppp is zero. As the tax rate increases, taxes yield revenues for investment in economic development. The GDPppp peaks at a corporate tax rate of about 26%. As tax rate continues to increase the disincentive of taxation reduces investment activity and GDPppp. The optimal tax rate can be calculated directly from calculus. Differentiating the fitted revenue function 1985.60 T -38.24 T2 with respect to the tax rate and setting the result to zero, we have 1985.60 -2x38.24 T =0. Fom which we obtain T=26%. The theoretical corporate rate of 21% for all taxes (corporate, private, other) is calculated below from the CDR model. These numbers are consistent if the private rate is less than the corporate rate such that the weighted average is less than the corporate rate.

4. Optimal Reinvestment Rate

4.1. The CDR Growth Model

The CDR global time invariant economic growth model (see Appendix) is

$$g_i = 1.53C_i + 0.14D_i + 0.23R_i - 1.21C_i \cdot D_i \cdot R_i + 0.38N_i$$

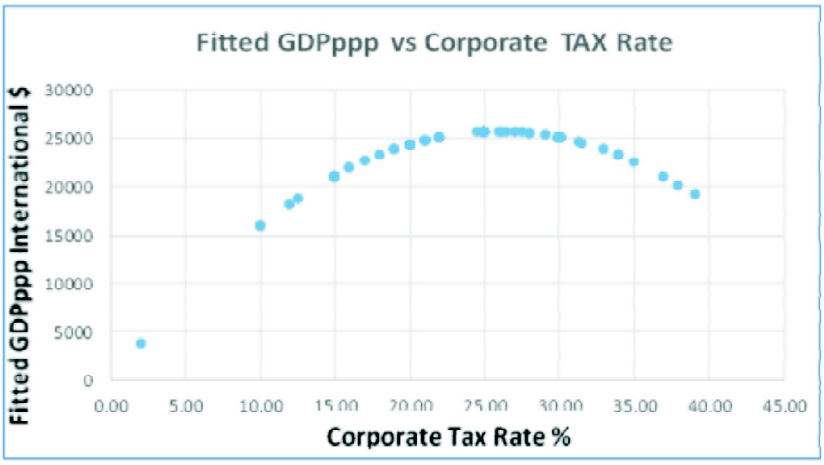

Figure 1: Fitted GDPppp vs. Corporate tax rate for year 2014.

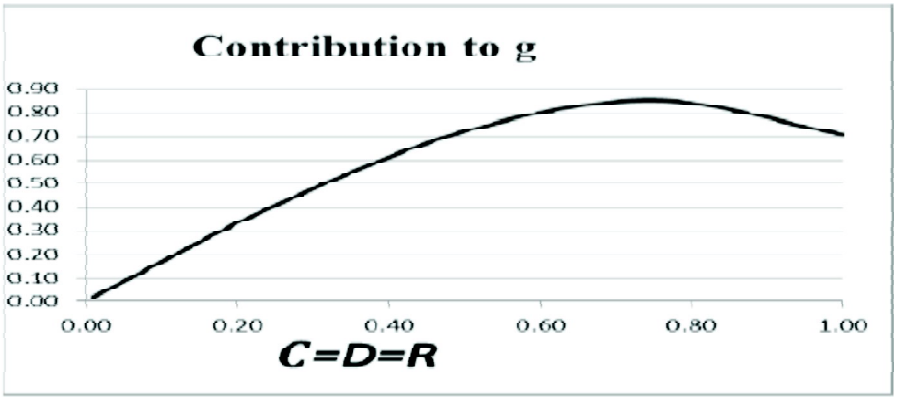

Figure 2: Contribution to g from *C*, *D*, *R*.

where i represents the i^{th} country and g is GDPppp rescaled (as are C, D, R, N) to fall on and between 0 and 1.

4.2. Total CDR Contribution to g

The contribution to g depends on a wide variety of combinations of C, D and R. For purposes of simplicity, assuming that they rise together, then estimated contributions for different levels of C, D and R are plotted in Figure 2. The average rank of all countries must be 0.5.

This model comprises total capital C_i and exogenous D_i, R_i and $N_i \cdot C_i$ comprises exogenous entrepreneurship capital and endogenous capital stock. This model is biased because of the endogenous component of capital. The Ridley (2018a) estimated 2nd stage least squares (2SLS) unbiased model for estimating g from exogenous entrepreneurship capital $(\hat{C}_i)$ is

$$\hat{g}_i = 1.30\hat{C}_i + 0.12D_i + 0.12D_i + 0.28R_i - 0.98(\hat{C}_i + f_i\hat{g}_i)\cdot D_i \cdot R_i + 0.39N_i.$$

4.3. Marginal Capital Contribution to g

The marginal contributions to the mean in $\hat{g}_i$ (denoted by $E[\hat{g}_i]$) from C_i, is the partial derivative $\partial E[\hat{g}_i]/\partial C_i = 1.3 - 0.98D_i \cdot R_i$, for different fixed values of $D_i \cdot R_i$. The product $D_i \cdot R_i$ is a product of fractions and is therefore small but positive. Therefore, the negative values for $-0.98D_i \cdot R_i$ implies that $\partial E[\hat{g}_i]/\partial C_i < 1.3$.

Consider the scenario where a fraction f_i of $\hat{g}_i$ is reinvested in capital stock, such that

$$\hat{g}_i = 1.3(\hat{C}_i + f_i\hat{g}_i) + 1.2D_i + 0.28R_i - 0.98(\hat{C}_i + f_i\hat{g}_i)\cdot D_i \cdot R_i + 0.39N_i.$$

Then,

$$(1-1.3f_i+0.98f_i\cdot D_i\cdot R_i)\hat{g}_i=1.3\hat{C}_i+0.12D_i+0.28R_i-0.98\hat{C}_i\cdot D_i\cdot R_i + 0.39N_i,$$

from which

$$\hat{g}_i=((1.3\hat{C}_i+0.12D_i+0.28R_i-0.98\hat{C}_i\cdot D_i\cdot R_i)+0.39N_i)\,/ (1-1.3f_i+0.98f_i\cdot D_i\cdot R_i),$$

and the marginal return on entrepreneurial capital $(\hat{C}_i)$ is

$$\partial E[\hat{g}_i]/\partial\hat{C}_i=(1.3-0.98D_i\cdot R_i)/(1-1.3f_i+0.98f_i\cdot D_i\cdot R_i).$$

4.4. Unitary Entrepreneurship Capital Elasticity of G

The entrepreneurial capital $(\hat{C})$ elasticity of g is defined from the percentage change in g in response to a 1% change in $\hat{C}$, ceteris paribus. This point elasticity can be investigated directly from the marginal return on $\hat{C}$. That is, from $(\hat{C}_i/\hat{g}_i)\partial E[\hat{g}_i]/\partial\hat{C}_i$.

$$(\hat{C}_i/\hat{g}_i)\partial E[\hat{g}_i]/\partial\hat{C}_i=(\hat{C}_i/\hat{g}_i)(1.3-0.98D_i\cdot R_i)/(1-1.3f_i+0.98f\cdot D_i\cdot R_i)$$

To maximize g and therefore GDPppp, we set this elasticity = 1 and solving for f_i.

$$(\hat{C}_i/\hat{g}_i)\,(1.3-0.98f_i\cdot D_i\cdot R_i)/(1-1.3f_i+0.98f\cdot D_i\cdot R_i)=1.$$

Therefore,

$$(1-1.3f_i+0.98f_i\times D_i\times R_i)=(\hat{C}_i/\hat{g}_i)\,(1.3-0.98D_i\cdot R_i)$$

$$1+(-1.3+0.98f_i\cdot D_i\cdot R_i)=(\hat{C}_i/\hat{g}_i)\,(1.3-0.98D_i\cdot R_i)$$

$$f_i=[-1+(\hat{C}_i/\hat{g}_i)\,(1.3-0.98D_i\cdot R_i)]/(-1.30+0.98\cdot D_i\cdot R_i)$$

Consider for example three scenarios as follows.

From figure 3 for the average country, if $\hat{C}_i=D_i=R_i\approx 0.332$ and $\hat{g}_i\approx 0.5$, and

$$f_i=\left[-1+\left(\frac{0.332}{0.50}\right)(1.3-0.98\cdot 0.332\cdot 0.332)\right]/(-1.3+0.98\cdot 0.332\cdot 0.332)$$

$$=0.175=17.5\%.$$

From figure 3 the hypothetical optimal values of $\hat{C}_i = D_i = R_i \approx 0.7$ and $\hat{g}_i \approx 0.85$, and

$$f_i = \left[-1+\left(\frac{0.7}{0.85}\right)(1.3-0.98\cdot 0.7\cdot 0.7)\right]/(-1.3+0.98\cdot 0.7\cdot 0.7)$$

$$= 0.396 = 39.6\%,$$

From figure 3 the world average values of $\hat{C}_i = D_i = R_i \approx 0.5$ and $\hat{g}_i \approx 0.72$, and

$$f_i = \left[-1+\left(\frac{0.5}{0.72}\right)(1.3-0.98\cdot 0.5\cdot 0.5)\right]/(-1.3+0.98\cdot 0.5\cdot 0.5)$$

$$= 0.253 = 25.3\%,$$

Dropping the country *i* notation and applying the same fraction to all countries, the entrepreneurship capital elasticity of *g* for three different fractions of reinvestment in capital stock = 0, 0.1, 0.2 are plotted in Figure 3. In general, as *D* and *R* increase, the elasticity of *g* falls. When there is no reinvestment (*f* = 0), *g* is always inelastic. As the reinvestment fraction increases to *f* = 0.1 and 0.2, the elasticity increases. If a unitary elasticity of 1.0 can be obtained for some combination of these variables, such that *g* is maximum, then the policy suggested is to reinvest about 10% when *D* and

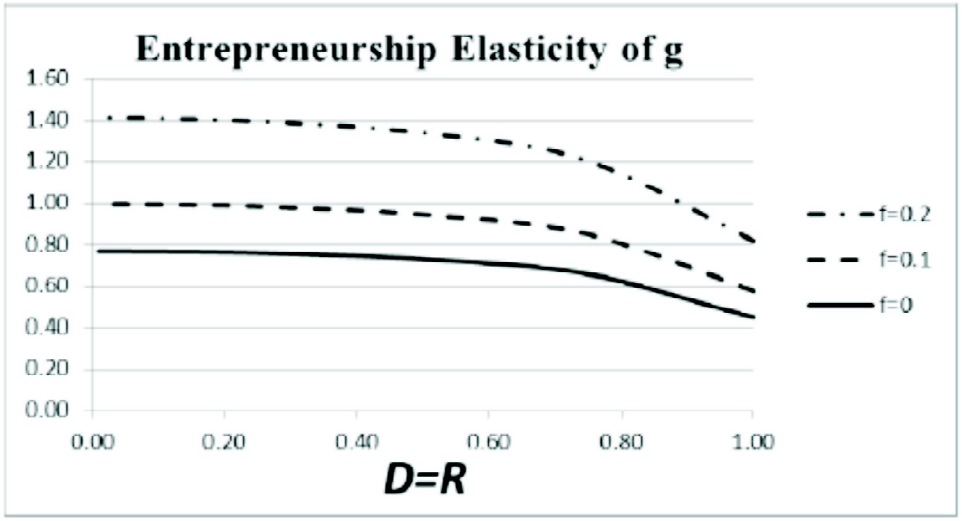

Figure 3: Entrepreneurship elasticity of *g*.

R are between 0 and 0.5. As *D* and *R* increase from 0.5 to 0.9, increase the fraction of reinvestment in like manner to about 20%. As *D* and *R* increase from 0.9 to 1.0, the fraction of reinvestment should be increased to about 25%. Assuming uniform distribution across countries, the weighted average is about 10% + (25 – 10)% × 0.5 = 17.5%.

This corresponds to the scenario where $\hat{C}_i = D_i = R_i = 0.33$ and $\hat{g}_i \approx 0.5$, and $f = 17.5\%$ computed above. It represents the low world average level of CDR performance as it is currently. Adding 3.5% for depreciation and obsolescence brings this number up to 21%. This estimate of depreciation is consistent with the minimum estimate obtained by Hernández and Mauleón (2005) for the Spanish economy. This estimate of reinvestment is consistent with the World Bank report of 21% for year 2014 worldwide average gross fixed capital formation (GFCF). GFCF does not include book value recovery of depreciation for tax purposes, but it does include actual replacements. Neither one of these includes capital stock investment in training to develop knowledge and skills. Therefore, we proffer that the theoretical $g = f(C, D, R)$ function is validated by the empirical GFCF.

The US corporate tax rate was its highest in 1968 and 1969 at 52.8%. Immediately prior to year 2018, at 40% the US corporate tax rate was the second highest in the world. Entire industries and related jobs were being lost to competing countries. Beginning in 2018, the Tax Cuts and Jobs Act (P.L. 115-97) replaced the graduated corporate tax structure with a flat 21% corporate tax rate. The US rate was then below the global average of 23.79%. Jobs returned to the US and the economy boomed. This and the GFCF are empirical indications that our theoretical optimum of 21% is correct.

5. Taxation and Optimal Reinvestment

Now that we have established the entrepreneurship capital elasticity of g the next question is what is its relationship to taxation? Ridley (2020a,b) indicates that if government expenditures are added to the CDR economic growth model there is no change in the coefficient of multiple determination. And the coefficient of the government expenditure variable is zero. That is, government spending has no effect whatsoever on GDPppp, with the possible exception of what we stipulate might be a small inflationary effect (see also Hayek, 1944 and Friedman, 2002). The inflation effect is a tax. This zero-effect is due to the fact that all money for government spending must be obtained from taxes. The government spending contribution to GDPppp is offset exactly by the reduction that the private sector no longer has to spend. So, what exactly is the agency of government? In the principal agency relationship, the principal comprises citizens and corporations, and the

agent is the government. The purpose of government is to minimally invest in all the facilities that enable economic growth but that the private sector is unable or unwilling to do. These include public infrastructures such as roads, bridges, airports, seaports, etc., and schools, hospitals, sanitation, clean water, clean air, national defense, public safety, domestic law enforcement, etc. Said infrastructures comprise endogenous capital stock that requires maintenance and that are subject to depreciation and obsolescence. Government acquires its money from taxation. Although welfare may appear to be a drain on the economy, these transfers are ultimately spent in the economy as consumption and contribute to GDP. The net effect is zero. Taxation comprises direct and indirect taxes. Direct taxes comprise personal income, corporate income, and social security taxes. Indirect taxes comprise excise duty, sales, customs duty and property tax.

Consider the following reinvestment equivalency,

Total reinvestment = Private tax deductible reinvestment
+ Effective taxation for public reinvestment
– interest payments on government bonds
+ (sales of bonds - redemption of bonds).

Effective taxation for public reinvestment
= Total reinvestment – Private tax deductible reinvestment + interest payments on overnment bonds – (sales of bonds - redemption of bonds).

From which money must be allocated at the following rates,

Effective tax rate = Total reinvestment rate
– Private tax deductible reinvestment rate
+ 100 (interest payments on government bonds
– (sales of bonds - redemption of bonds))/
GDPppp.

Substituting f = 21% from above,

Effective tax rate = 21% – Private tax deductible reinvestment rate
+ 100(interest payments on government bonds
– (sales of bonds - redemption of bonds))/
GDPppp.

There should be no double counting since private tax-deductible reinvestment is a reduction in tax. If private tax-deductible reinvestment = 0 then contemporaneous profits will be at a contemporaneous maximum and the tax must rise to 21% for reinvestment. As the private tax-deductible

reinvestment rises, the amount of tax will fall. So, the posted nominal tax rate should be 21% and the effective tax rate less than 21%. In the case of a graduated progressive tax schedule, the nominal average weighted by income should be 21%. In the case of a flat tax, the rate should be 21% provided there are no tax exemptions and no tax loopholes. The optimal effective tax rate is equal to the optimal total reinvestment rate minus the private tax-deductible reinvestment rate. For example, if the private tax-deductible reinvestment rate is 10% then the effective tax is 21%-10% = 11%.

If taxation exceeds the optimal reinvestment rate, the unnecessary government spending could be inflationary. Inflation occurs when there is too much money in comparison to the value of goods produced. The measure of GDPppp used in this research corrects for the effect of inflation on purchasing power parity. But there are other effects. If inflation does not automatically occur, then government spending may crowd out the private sector. Government participation in the money market to raise capital will raise interest rates and the cost of borrowing to the private sector. Crowding out the private sector must necessarily stultify the source of new economic growth and wealth. It vanquishes the collaboration required for the healthy development of systems for converting exogenous human ideas such as inventions, into endogenous capital stock. The agent will be acting counter to the interest of the principal.

If a government insists that there is such a thing as a living wage, it might consider a minimum wage law that it considers will result in a living wage. Taxes are often used to redistribute money from the rich to the poor. If there are prevailing wages that are below the minimum wage, the tax rate will necessarily be supraoptimal for maximizing GDPppp. Transfer payments may on the surface seem to be fair in a societal sense. This is especially the case when the below living wage earners were previously employed and helped to develop automation technologies that displaced them. Unfortunately, introducing a minimum wage can only exacerbate that problem since employers will simply look for more technology to replace still more workers rather than pay the minimum wage. Sometimes technology makes workers more valuable thereby raising the amount that the employer will pay. But it often requires that the worker receive new training. New people wishing to enter the workforce may not have that training. If experience is the only way to obtain the training, then they will not be worth the minimum wage. If this scenario results in unemployment, the government can only demonstrate its original intention of fairness by making welfare transfer payments (not unlike Paine, 1797). We have established from the CDR economic growth model that the source of wealth

is exogenous human capital ideas of imagination and creativity. Therefore, any able-bodied person who is unemployed and is living on welfare is dead capital. The net effect of dead capital on GDPppp is therefore negative. Everybody loses.

A better approach is the Ridley (2017) micro intrapreneurship proposal. In that scenario, the government subsidizes the wages of the inexperienced job seeker, in the amount of the difference between what an employer values him and is willing pay and the minimum living wage. That is, the recipient of assistance must work. While working he obtains the requisite experience needed to close the gap. In a matter of a few months the worker becomes worth every penny he receives, and some. His natural pay exceeds the living wage, and the government assistance ends. In the meantime, the employee will discover numerous potential micro intrapreneurial improvements that only they can because they are involved in seeing the work needs up close. The economy will expand to offset the paid assistance, and some.

6. Conclusions

The wide range of corporate tax rates around the world from 2% to 39% is evidence that there is no consensus that there is an optimal rate or what it is. This paper investigates this phenomenon. The optimal corporate tax rate was found to be 26%. The optimal theoretical rate, inclusive of corporate, private and other taxes was found from the CDR model to be 21%. This implies that the optimal noncorporate rate is less than the corporate rate such that the weighted average rate is 21%. This tax rate is also consistent with the World Bank report of 21% for worldwide average gross fixed capital formation. The conclusion is that all countries can maximized their GDPppp by setting their nominal total tax rate at 21% and the nominal corporate tax rate at 26%. These rates are either flat or in the case of bracketed tax rates the average rates across all tax brackets. Effective tax rates will depend on the amount of tax incentives that are given for private investment. Future research could include experimentation with other objectives such as maximize tax revenue.

Appendix

From Ridley (2020a) and Ridley (2018a) the ordinary least squares (OLS) model is $g_i = \beta_0 + \beta_c C_i + \beta_d D_i + \beta_r R_i + \beta_{cdr} C_i \cdot D_i \cdot R_i \cdot + \beta_n N_i + \varepsilon_i$, where i represents the i^{th} country, the coefficients and variables are dimensionless, and the errors ε_i are random and normally distributed with zero mean and constant standard deviation. We regress g on C, D, R, and N to obtain the ith country estimated g as follows.

Year 2014: $g = 1.53C_i. + 0.14D_i + 0.23R_i - 1.21C_i \cdot D_i \cdot R_i + 0.38N_i.$

Where to determine the relative contributions of C, D, R and natural resources (N), we standardize the variables to guarantee upper and lower bounds of $0 \leq g, C, D, R, C \cdot D \cdot R, N \leq 1$ as follows:

g = (G – lowest G)/(highest G – lowest G)

C (Capitalism) = (per capita capitalization-lowest per capita capitalization)/(highest per capita capitalization – lowest per capita capitalization)

D (Democracy) = (lowest democracy rank – democracy rank)/(lowest democracy rank – highest democracy rank)

R (Rule of law) = (lowest corruption rank – corruption rank)/(lowest corruption rank – highest corruption rank)

N (Natural resources) = (per capita total natural resource rents – lowest per capita total natural resource rents)/(highest per capita total natural resource rents – lowest per capita total natural resource rents).

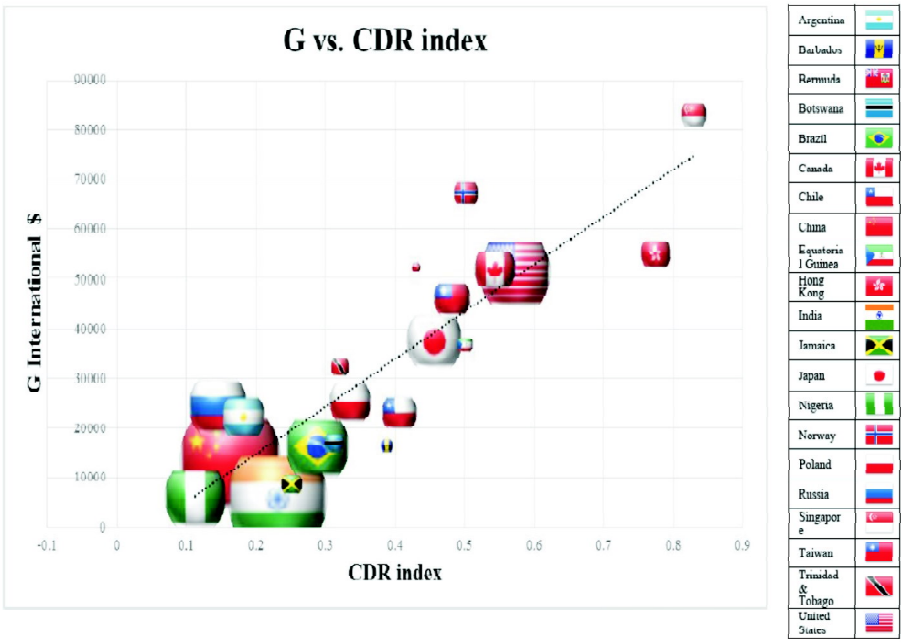

Figure 4: Year 2014 G vs CDR Index for 79 countries (line). Bubble size (21 countries) is the square root of population.

Democracy and corruption are rank ordered, where the highest
= 1 and the lowest = the number of countries.

These transformations are all one hundred percent reversible.

The CDR model is depicted graphically in Figure 4.

To correct for biased due to the endogenous capital stock component of capital, a two stage least squares (2SLS) estimate is conducted as follows.

The estimated 1st stage least squares model is

$$\hat{C}_i = 0.04 - 0.070L_i - 16D_i + 0.22R_i + 1.11C_i \cdot D_i \cdot R_i - 0.02N_i$$

where $\hat{C}$ is the exogenous entrepreneurship component of capital and the instrumental variable (IV) is exogenous geographic latitude (L_i).

The estimated 2nd stage least squares unbiased model for estimating g from entrepreneurship capital ($\hat{C}_i$) is

$$\hat{g}_i = 1.30\hat{C}_i + 0.12D_i + 0.28R_i - 0.98\hat{C}_i \cdot D_i \cdot R_i - 0.39N_i.$$

References

Blum, W. J. and Kalven, H. (1953). *The Uneasy Case for Progressive Taxation*, University of Chicago Press.

Cowperwaite, J. J. (1915-2006). John James Cowperthwaite - Wikiquote.

Diamond, P.A. (1968) Negative Income Taxes and the Poverty Problem-a Review Article, *National Tax Journal.*

Feldstein, M. (2006). The effect of taxes on Efficiency and growth, National Bureau of Economic Research, Working Paper 12201. https://www.nber.org/system/files/working_papers/w12201/w12201.pdf.

Friedman, M. (2002). *Capitalism and Freedom*. University of Chicago Press, Chicago.

Hayek, F. (1944). *The Road to Serfdom,* University of Chicago Press, Chicago.

Hernández, J. and Mauleon, I. (2005). Econometric estimation of a variable rate of depreciation of the capital stock, *Empirical Economics*, 30(3):575-595.

Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money*, Polygraphic Company of America, NY.

Laffer, A. B., Moore, S., Tanous, P. J. (2008). *The end of Prosperity: how higher taxes will doom the economy - if we let it.* Threshold Editions, N.Y.

Laffer, A. B., Moore, S. (2010). *Return to Prosperity: how America can regain its superpower status*. Threshold Editions, N.Y.

Laffer, A. B., Moore, S., Sinquefield, R. A. and Brown, T.H. (2014). *An Inquiry into the Nature and Causes of the Wealth of States.* John Wiley and Sons, Inc., Hoboken, N.J.

Lee, Y. and Gordon, R. (2005). Tax structure and economic growth. *Journal of Public Economics*, 89(5–6), 1027-1043. https://doi.org/10.1016/j.jpubeco.2004.07.002

Mills, J. (1806-1873). https://en.wikipedia.org/wiki/John_Stuart_Mill

Mirrlees, J. A. (1071). An Exploration in the Theory of Optimal Income Taxation, *The Review of Economic Studies*, 38(2), 175-208.

Paine, T. (1797). Agrarian Justice pamphlet, Social Security History (ssa.gov)

Petty, W. (1662). https://www.hargaden.com/enda/wp-content/petty_taxescontributions.pdf

Ricardo, D. (1772-1823). https://www.newworldencyclopedia.org/entry/David_Ricardo

Ridley, A. D. (2017). Micro Intrapreneurship. *International Journal of Social Science and Economic Research*, 2(9), 4729-4743. http://ijsser.org/uploads/ijsser_02__299.pdf.

Ridley, A. D. (2018a). General theory of economics: CDR supply side scientific growth law unveiled, *Theoretical Economics Letters*, 8(15), pp. 3637-3663. https://doi.org/10.4236/tel.2018.815223

Ridley, A. D. (2018b). Entrepreneurial Economics: revising the econ 101 course. *International Journal of Economics, Business and Management Research*, 2(5), 183-203.

http://ijebmr.com/uploads2018/IJEBMR_02_280.pdf

Ridley, A. D. (2020a). *The Mystery of Wealth: Capitalism.Democracy. Rule of law*. Sciendo (De Gruyter).

https://content.sciendo.com/search?pageSize=10&q1=The+Mystery+of+Wealth&sort=relevance&subSite=sciendo

https://www.amazon.com/s?k=the+mystery+of+wealth+by+ridley&ref=nb_sb_noss

Ridley, A. D. (2021). Economic Development via Collaborating Populations, Theoretical Economics Letters, 11(6), 1101-1121.

https://www.scirp.org/journal/paperinformation.aspx?paperid=113266

Ridley, A. D. and Nelson, A. (2022). Collaboration and Rule of Law, *South East Asia Journal of Contemporary Business, Economics and Law*, 26(1), 194-205.

Smith, A. (1776, 2007, 2010). *An Inquiry into the Nature and Causes of The Wealth of Nations*, Tantor.

Tomasello, M. (2001). *The cultural origins of human cognition*. Cambridge, MA: Harvard University Press.

Vickrey, W. (1947). *Agenda for Progressive Taxation*, Ronald Press, N.Y.

Theories of Taxation - MBA Knowledge Base (mbaknol.com)