Dark Side of Economic Growth:
A Case Study of the Relationship between Economic Growth and Suicide Mortality

Wilson Rajagukguk

Faculty of Economics and Business, Universitas Kristen Indonesia
Jl. Mayjen Sutojo No.2, Cawang, Jakarta 13630, Indonesia
Email: wrajagukguk@yahoo.com; wilson.rajagukguk@uki.ac.id

Perak Samosir

Study Program on Mechanical Engineering
Institut Teknologi Indonesia. Jl.Raya Puspiptek Serpong
Kota Tangerang Selatan 15314
samosirperak@gmail.com and perak.samosir@iti.ac.id

John Tampil Purba and Sidik Budiono

Department of Management Faculty of Economics and Business
Universitas Pelita Harapan
Tangerang-15811, Indonesia
john.purba@uph.edu; sidik.budiono@uph.edu

Gidion P. Adirinekso

Department of Management Faculty of Economics and Business
Universitas Kristen Krida Wacana, Jakarta, Indonesia
gidion.adirinekso@ukrida.ac.id

Abstract

Economic growth is often associated with the welfare improvement. However, data show they can relate conversely. Behind economic growth there is dark side, among others is suicide mortality. This study aims to investigate the relationship between economic growth and suicide mortality. This research was done for 180 countries in the world in 2005, 2010, 2015, and 2016. The dependent variables are suicide mortality rate (per 100,000 population), female suicide mortality rate (per 100,000 female population), and male suicide mortality rate (per 100,000 male population). Meanwhile, the independent variables are GDP per capita growth (annual %), tuberculosis case detection rate (%, all forms), and total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age). The method used was multiple multivariate linear regression analyses. The results of data analysis found that the GDP per capita growth, tuberculosis case detection rate, and total alcohol consumption per capita had positive and significant association with the three suicide mortality rates in the world.

Keywords

Dark side, suicide, economic growth, alcohol consumption, and tuberculosis.

1. Introduction

Since the 4.0th generation of the industrial revolution, world economic development has changed to an unprecedented level. Where is economic growth, always unequal because it benefits most of humanity in certain regions of the world? (Rajaguguk & Purba, 2016, Purba & Budiono, 2019). This also resulted in tremendous investment and demographic expansion. This also results in tremendous investment and demographic expansion from one country to another developing country. This shift in investment has direct and indirect consequences for the destination (Purba & Rajaguguk, 2012, Budiono & Purba, 2019).

However, there are some dark sides to this development, which we need to pay attention to. This positive economic growth may be heard, but from the latest data reveals that human consumption is quickly exceeding the capacity of land to regenerate. Human growth is faster than previously thought on this planet (Purba & Rajaguguk, 2017, Budiono & Purba 2019). The things as described above show there is a strong correlation between suicide rates and all economic variables, except GDP per capita and female employment (Fountoulakis KN, Kawohl W, Theodorakis PN, et al. (2014)). The benefit of economic growth, like higher employment and education opportunity in rural China contributed to the suicide rate decline. On the other side, stress levels have an impact on suicide rate increase, in particular among older population (Wang CW, Chan CLW, Yip PSF 2014). Barth A, Sögner L, Gnambs T, Kundi M, Reiner A, Winker R. (2011) carried out a study in 18 countries employing panel-vector error correction model and found the association between economic factors and suicides rates. Among female population, the improvement in economic growth, unemployment, and divorce rate were associate with the increase on suicide mortality rates.

Chen J, Choi YJ, and Sawada Y. (2009) conducted studies in OECD countries and Japan. The impacts of socioeconomic factors on suicide mortality rates were higher in Japan than in OECD countries. They also found that suicide mortality pattern in Japan was different from suicide mortality pattern in OECD countries. Better economic condition, like higher income and economic growth levels, was found to reduce suicide mortality rates. However, income inequality increased suicide mortality rates. Suicide mortality rates were more sensitive to the real GDP per capita alcohol consumption.

Alcohol addiction is an important risk factor in suicide mortality behavior (Sher L.2006). Alcohol consumption has a positive impact in suicide mortality rate increase (Chen J, Choi YJ, Sawada Y. 2009). Peltzer K and Louw J. (2013) carried out a study on suicide mortality and its relationship with tuberculosis patients and alcohol abuse to 4,900 patients in South Africa. They found that alcohol abuse and being a tuberculosis patient increased the risk of committing suicide. The investigations above become the aspirations and regulations concerning for the community as well as government over the world how to protect the society.

2. Data and Methods

2.1. Data

Data in this study came from the World Bank[1] for 180 countries in the world in 2005, 2010, 2015, and 2016. Therefore, the study consisted of 720 country-years (Table 1). The predictor variables include suicide mortality rate (per 100,000 population), female suicide mortality rate (per 100,000 female population), and male suicide mortality rate (per 100,000 male population). Meanwhile, the explanatory variables involve GDP per capita growth (annual %), tuberculosis case detection rate (%, all forms), and total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age).

The descriptive statistics (number of observations, mean, standard deviation, minimum, and maximum) for the variables used in the study were presented in Table 1. It can be seen that the suicide mortality rate ranged from 0.3 to 51.6 suicide deaths per 100,000 population, female suicide mortality rate varied between 0 and 24.4 female suicide deaths per 100,000 female population, male suicide mortality rate ranged from 0 to 92.5 male suicide deaths per 100,000 male population, annual GDP per capita growth varied between -22.3% and 32.7, all form tuberculosis case detection rate ranged from 0 to 100%, and projected estimate of total pure alcohol consumption per capita among population aged 15 years and above varied between 0 and 17.9 liters.

Table 1
Variables, Observations, Mean, Standard Deviation, Minimum, and Maximum

Variable	Obs	Mean	Std. Dev.	Min.	Max
Suicide mortality rate (per 100,000 population)	720	9.776525	6.933501	0.3	51.6
Male suicide mortality rate (per 100,000 male population)	720	14.56409	11.67723	0	92.5
Female suicide mortality rate (per 100,000 female population)	720	5.137562	3.636071	0	24.4
GDP per capita growth (annual %)	720	2.382046	4.334565	-22.312	32.707
Tuberculosis case detection rate (%, all forms)	720	71.97639	20.40183	0	100
Total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age)	720	3.103076	4.308433	0	17.9

Source: World Bank (2020) (Authors' calculation).

2.2. Methods

Data analysis in this study employed two methods: bivariate and multivariate analyses. The bivariate analyses included the analysis of the relationship between total suicide mortality rate

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[1] https://databank.worldbank.org/source/world-development-indicators. Accessed, February, 2020.

and each independent variable. The multivariate analysis included a multiple multivariate regression analyses (MMR). MMR was utilized to model linear relationship between a set of dependent variables and a set of independent variables simultaneously (Dattalo, 2013, STATA Manual, 2015). The regression for the *i*-th observation from a data set can be modeled. The response for the *i*-th trial, y_i, can be written as a linear combination of predictor variables z_{i1}, z_{i2}, ..., z_{ir} with a constant β_0, and a random error term ε_i. The model is as follows.

$$y_i = [\beta_0 + \beta_1 z_{i1} + \beta_2 z_{i2} + ... + z_{ir}] + \varepsilon_i$$
or
$$y_i = \beta_0 + \sum_{j=1}^{r} \beta_j z_{ij} + \varepsilon_i$$

2.3. Results

The results of bivariate analysis were presented in Figure 1 – Figure 3. It can be seen from these figures that there is a positive relationship between GDP per capita growth (GDP), total alcohol consumption per capita (Alcohol), and tuberculosis case detection rate (TB) with suicide mortality rate (SMR). An increase of 1% in GDP per capita growth, a liter in pure total alcohol consumption per capita, and 1% in all form tuberculosis case detection rate would, respectively, increase the suicide mortality rate by 0.1483, 0.422, and 0.00912 suicide deaths per 100,000 people in the world.
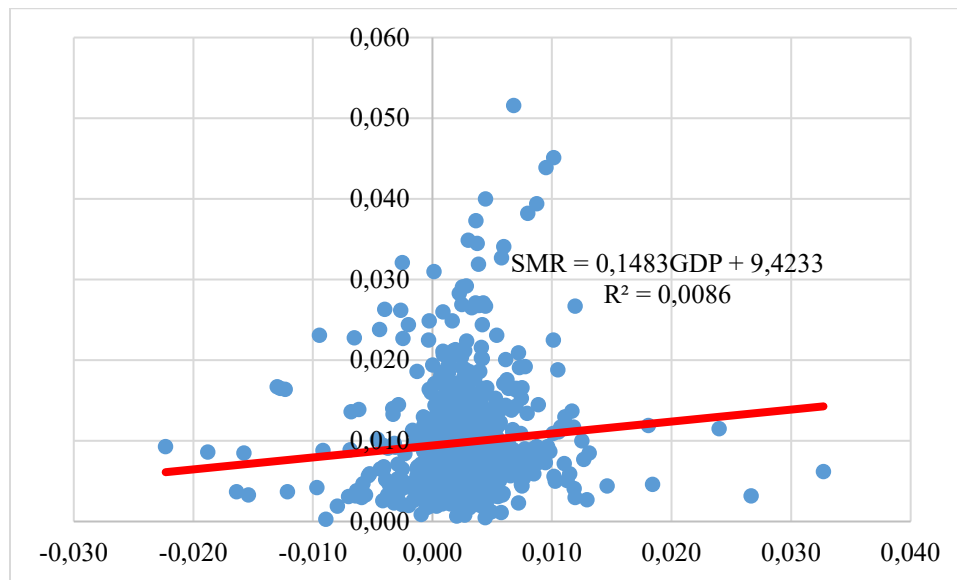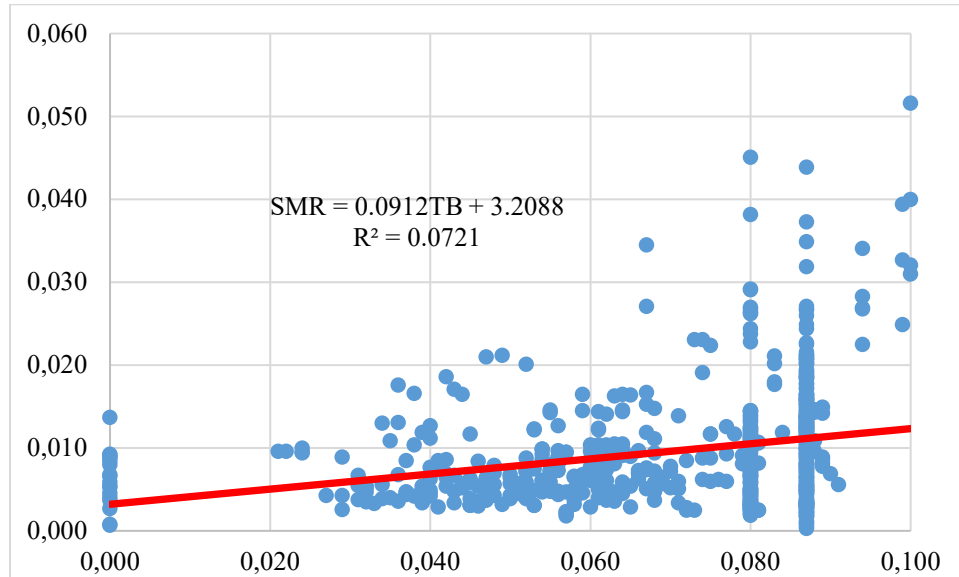

Source: World Bank (2020) (Authors' calculation).

Figure 1:
GDP per Capita Growth (%) and Suicide Mortality Rate (Total) and: 2005, 2010, 2015, and 2016
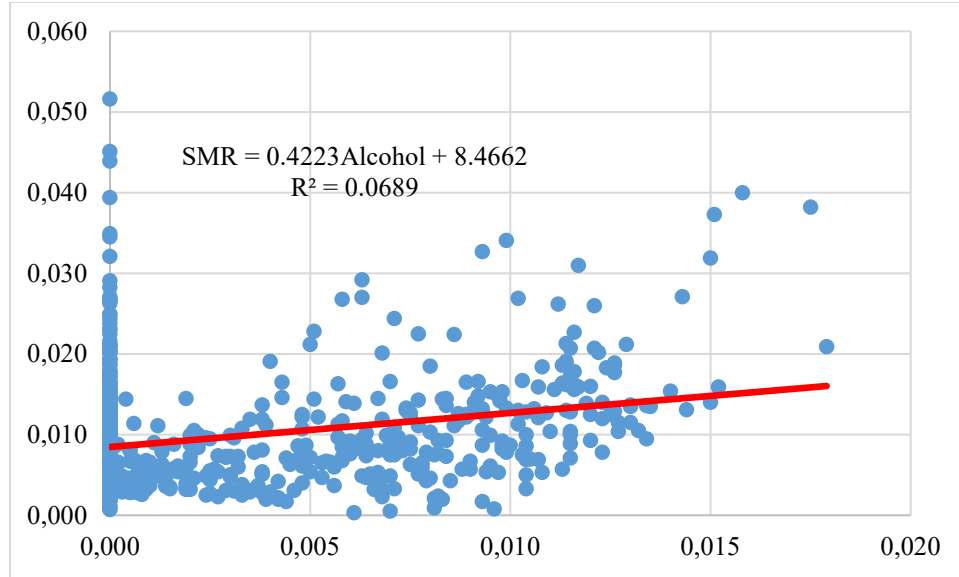
Source: World Bank (2020) (Authors' calculation).

Figure 2
Total Alcohol Consumption per Capita (liters of pure alcohol, projected estimates, 15+ years of age) and Suicide Mortality Rate (Total): 2005, 2010, 2015, and 2016

Source: World Bank (2020) (Authors' calculation).

Figure 3
Tuberculosis Case Detection Rate (%, all forms) and Suicide Mortality Rate (Total): 2005, 2010, 2015, and 2016

The results of the analysis of variance (ANOVA) test for the multiple multivariate regression (root means square of errors (RMSE, $R2$, F statistics, and P-values) are presented in Table 2. It can be seen that the models fit well with the data at the less than 0.001 significance level.

Table 2
ANOVA Test for the Multiple Multivariate Regression

Equation	Obs	Parms	RMSE	R-Sq	F	P
Suicide mortality rate per 100,000 population	720	4	6.483003	0.1294	35.46566	0.0000
Female suicide mortality rate per 100,000 female population	720	4	3.558505	0.0462	11.562	0.0000
Male suicide mortality rate per male 100,000 population	720	4	10.81833	0.1453	40.56622	0.0000

Source: World Bank (2020) (Authors' calculation).

The results of the multiple multivariate analyses are presented in Table 3. It can be seen that the three independent variables statistically had significant association with the suicide mortality rate at the less than 0.05 significance level. Other things being the same, an increase of 1% in GDP per capita growth, a liter in pure total alcohol consumption per capita, and 1% in all form tuberculosis case detection rate would, respectively, increase the suicide mortality rate by 0.1680977, 0.36022, and 0.0770793 suicide deaths per 100,000 people in the world. Meanwhile, after controlling for the effects of other factors, an increase of 1% in GDP per capita growth, a liter in pure total alcohol consumption per capita, and 1% in all form tuberculosis case detection rate would, respectively, increase the female suicide mortality rate by 0.089784, 0.136786, and 0.0133171 female suicide deaths per 100,000 females in the world. Further, ceteris paribus, an increase of 1% in GDP per capita growth, a liter in pure total alcohol consumption per capita, and 1% in all form tuberculosis case detection rate would, respectively, increase the female suicide mortality rate by 0.2681606, 0.6138201, and 0.1455109 female suicide deaths per 100,000 females in the world.

The findings from this study confirm that there is dark side of economic growth. Better economic achievements may lead to a higher suicide mortality rate that countries should take a caution and anticipate its increasing trends with a policy that aims to reduce it.

Table 3
Variables, Coefficient, Standard Error, *t*, *P*-value, and 95% Confidence Interval

Variables	Coefficient	Std. Err.	t	P > |t|	95% Conf. Interval	
Suicide mortality rate per 100,000 population						
GDP per capita growth (annual %)	.1680977	.0558356	3.01	0.003	.0584766	.2777187
Tuberculosis case detection rate (%, all forms)	.0770793	.0120729	6.38	0.000	.0533769	.1007818

Total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age)	.36022	.0120729	6.29	0.000	.2478721	.4725679
Constant	2.710426	.8979067	3.02	0.003	.9475809	4.47327
Female suicide mortality rate per 100,000 female population						
GDP per capita growth (annual %)	.089784	.030648	2.93	0.004	.0296133	.1499547
Tuberculosis case detection rate (%, all forms)	.0133171	.006627	2.01	0.045	.000307	.0263273
Total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age)	.136786	.031410	4.35	0.000	.0751181	.1984531
Constant	3.540719	.4928589	7.18	0.000	2.573098	4.50834
Suicide mortality rate male per 100.000 population						
GDP per capita growth (annual %)	.2681606	.0931741	2.88	0.004	.0852336	.4510876
Tuberculosis case detection rate (%, all forms)	.1455109	.0201462	7.22	0.000	.1059581	.1850636
Total alcohol consumption per capita (liters of pure alcohol, projected estimates, 15+ years of age)	.6138201	.0954918	6.43	0.000	.4263427	.8012976
Constant	1.547238	1.498357	1.03	0.302	-1.39446	4.488935

Source: World Bank (2020) (Authors' calculation).

Conclusion

The dark side of the impact of a country's economic growth is alcohol abuse which damages the health of the population who do it. This will affect the well-being of families, communities and people of all ages around them. According to worldwide studies and researches inform that drinking alcohol for minors interferes with their own development. And it affects the ability of a nation's competitiveness to respond to changes very quickly as well as to face the challenges of a very dynamic economy both now and in the future. The presence of regulations, law enforcement as well as education and universities is expected to be able to prevent and reduce alcohol abuse in the region (Rajagukguk & Purba, 2012, Butarbutar & Purba, 2016). Research has shown that millions of alcoholics' workers around the world result in loss of productivity, profits and business competitiveness. It is clear that the consequences of economic growth with alcohol abuse in the community are more closely related to each other thus; public concern for its prevention and treatment must be of concern to all of us.

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Biographies

Wilson Rajagukguk currently works as the Vice Rector for Academic Affairs at the Universitas Kristen Indonesia, Jakarta, Indonesia. Dr. Wilson Rajagukguk held two Masters Degree,- in Demographic and Labor Economics, and Theology. He obtained his Ph.D. in Demographic Economics from the Universitas Indonesia. His research interests are in the field of demographic economic growth, religion economic, statistics, econometrics, and mathematics. Email: wrajagukguk@yahoo.com.

Perak Samosir is a lecturer at the Study Program on Mechanical Engineering of the Institut Teknologi Indonesia. Perak Samosir is also a lecturer at the Department of Mathematics of the Faculty of Science and Technology (FAST) of the Universitas Pelita Harapan Indonesia. Her first degree is in Mathematics from the Institut Teknologi

Bandung and her master degree is in Statistics from the Institut Pertanian Bogor Indonesia. Her research interest is modeling with statistics. Email: samosirperak@gmail.com.

John Tampil Purba, obtained a degree Doctor (S3) majoring Management from De La Salle University Systems Manila, Philippines in 2002. Dr. Purba also has several certifications international competition in management information systems and technology, among others; MCP, MCSA, MCSE, MCSES, MCSAS, MCDL and MCT from Microsoft Technologies, USA and CSE from Cisco System USA. He is also Professional Membership of IEOM Society since last year 2019. He has a number of managerial experiences in the Service Industries more than 25 years. He is currently a senior lecturer at the Faculty of Economics and Business Pelita Harapan University, Karawaci Banten, Indonesia.

Sidik Budiono is currently serves as an Associate Professor in Economics at Department of Management Faculty of Economics and Business Pelita Harapan University, Lippo Karawaci Tangerang Banten. Dr. Budiono was graduated Bachelor of Economics from Department of Economics, Universitas Kristen Satya Wacana, Salatiga Central Java, Master and Doctor of Economics from Faculty of Business and Economics Universitas Indonesia, Jakarta. His research interests are in national, regional development, and international economics.

Gidion P. Adirinekso joint with the Department of Management Faculty of Economics and Business Krida Wacana Christian University in Jakarta. Dr. Adirinekso graduated with his master's and a doctoral degree from the Departement of Economics Faculty of Economics and Business Universitas Indonesia Jakarta after completing his bachelor's degree from the Departement of Economics, Satya Wacana Christian University. His interests in research on economics behavior, urban dan regional economics, also urban community development and economic development.