The Effects of Tax Structure on Economic Growth and Income Inequality

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ABSTRACT

This paper investigates how tax systems, in fact, affect a country's economic growth rate and distribution of income through the use of a panel dataset of cross-national data consisting of 65 countries during the period 1970-2006. By using the top statutory corporate and personal income tax rate, this thesis estimates the impact of tax structures on economic growth and income inequality. For the estimation analysis, it applies OLS, random effect and fixed effect estimations. Moreover, this paper also uses instrumental variable estimation following the assumption that of the endogeneity of tax measures.

This paper finds that statutory corporate income tax rates are strongly negatively associated with economic growth and income inequality by controlling for various other determinants of growth and income distribution. However, personal income tax rates have no impact on economic growth and on income inequality. In addition, by classifying the countries into tax groups based on their average top statutory corporate income tax rates, this study also found that high top CIT rates, above 40%, correspond with lower income inequality. On the other hand, lower CIT rates, those below 40%, are not significant in reducing income inequality.

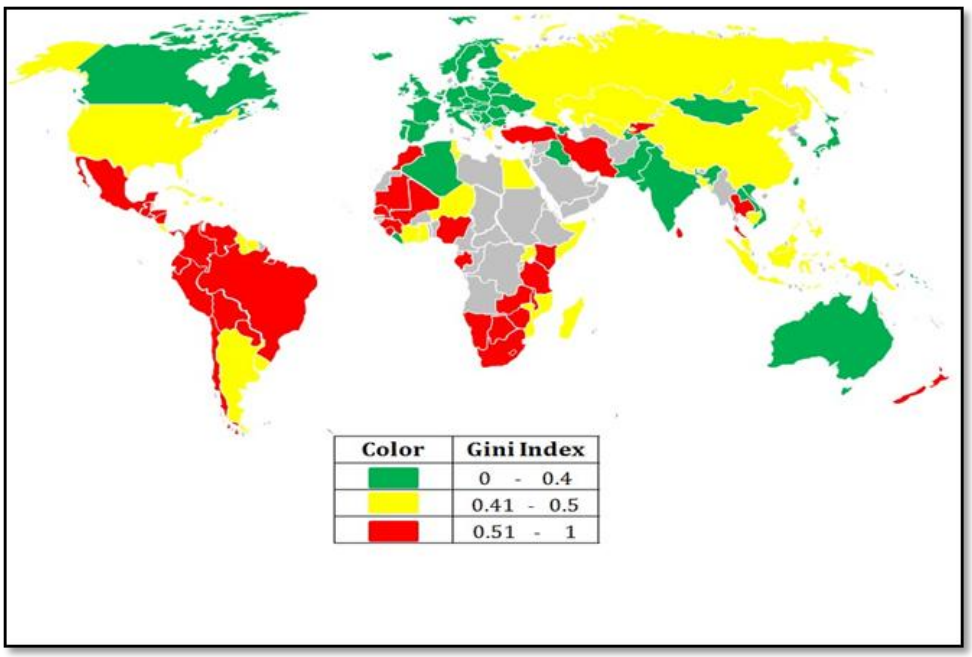
Keywords: Kuznets hypothesis; Tax structure; Economic growth; Income inequality

1. Introduction

Since the beginning of representative government, the presence of the income gap between the poor and the rich has been a serious issue in countries all over the world. Reduction in absolute poverty does not result in an equal income distribution, though it is usually correlated with sustainable economic growth. The OECD inequality report (2011) confirms that inequality around the world is growing fast.

Figure 1-1 shows a world map of income inequality across countries over the period 1970-2006. Generally, income inequality is still a substantial issue for many countries all over the world. Even though countries develop at a faster rate, the poor cannot improve their income because inappropriate redistribution policies cannot reduce the income gap.

Figure 1-1 World Map of Income Inequality, 1970-2006



Source: WIID. Author's calculations.

In some regions such as Africa and the Americas, the income gap between the bottom and the top income are worse than other regions, implying that government still needs to make more efforts to alleviate poverty through distributing income equally. Table 1-1 presents data on the share of household income derived by the highest and bottom quintiles in the 1980s and the 1990s. These figures are presented for (1) countries with tenaciously low (40% or less) top CIT during the 1980s and the 1990s and (2) countries with persistently high (50% or more) during the 1980s and the 1990s. Two things stand out with regard to the pattern of the data in Table 1-1. First, the income inequality of the countries in the proportionately low tax category is greater than those in the relatively high-tax group. In the late 1990s, the income share of the top quintile of earners rose from 48.4% to 52% or more in all the countries with a lower top CIT rate. In contrast, the income share of the top quintile decreased from approximately 50% for all countries in the high-tax group. Second, the general trend appears to be toward more income inequality in the low-tax countries but less-inequality in countries with higher CIT rates.

This study will first attempt to investigate which income tax structure has the most influential impact on economic growth using both cross-sectional and time-series information on growth rates between 1970 and 2006. Specifically, to what extent do changes in income tax structures affect the economic growth rate? Next, this study will investigate whether income inequality is affected by the structure of national income tax systems from a cross-national perspective. Does

redistribution policy induced by income tax instruments affect income inequality across countries?

Table 1-1 Distribution of Income between Low-Tax and High-Tax Countries

	Top CIT Rate		Income Share of the Top Quintile, 1980-1989	Income Share of the Bottom Quintile, 1980-1989	Year	Income Share of the Top Quintile, 1990-1999	Income Share of the Bottom Quintile, 1990-1999	Year	Income Inequality
	1990-1999	1980-1989							
Low tax countries, 1990 - 1999									
Argentina	0.2	0.33	48.4	5.4	1986	52.3	4.3	1996	Increasing
Bolivia	0.03	0.3	56.6	3.8	1986	62.3	1.1	1999	Increasing
Brazil	0.15	0.35	57.4	3.8	1982	64.8	2.6	1997	Increasing
High tax countries, 1990 – 1999									
Germany	0.5	0.56	38.75	8.46	1985	38.01	8.19	1998	Decreasing
Pakistan	0.55	0.55	50.2	6.5	1984	41.68	8.08	1991	Decreasing
Trinidad & Tobago	0.45	0.45	47.97	4.9	1988	45.89	5.51	1992	Decreasing

Note. 1980s and 1990s income distribution data are taken from World Income Inequality Database (WIID); CIT= Corporate Income Tax; Top CIT rate data are taken from World Tax Database (WTD).

The remainder of this thesis is structured as described below. A comprehensive literature review is provided in Chapter 2. Chapter 3 discusses the data and methodology for the benchmark models used in detail. Chapter 4 presents and discusses the empirical results. In this chapter, the analysis of tax and economic growth is divided into two parts. First, it will review the impact of the CIT rate on growth, and then it discusses the impact of the PIT rate on economic growth. Finally, Chapter 5 discusses the conclusions and policy implications resulting from this study.

2. LITERATURE REVIEW

Widmalm (2001) found that personal income tax is negatively correlated with growth, and corporate income tax does not correlate with growth at all. She assumed that the tax structures were unchanged during the entire sample period and the design of tax revenue in all countries in the study is the same. These assumptions are important since she measured personal income tax by using the average income tax. In contrast, Padovano and Galli (2002) argued that average tax rates lead to several biases which in turn lead to the conclusion that taxation has no impact on growth because of the possibility of high correlation with average fiscal spending.

Lee and Gordon (2005) disputed these arguments because estimated tax rates tend to be biased due to the existence of the problem of tax evasion which many countries face. Therefore, they employed the top statutory income tax rate in their estimations. They proposed that the concrete tax rates that most greatly affect economic growth are the top statutory CIT rates.

Utilizing a sample of 70 developed and developing countries from 1970-1997 Lee and Gordon (2005) also used neighboring countries' tax rate weighted by the inverse of the distance between the countries as an instrumental variable for the home country's tax rate, in order to account for the endogeneity problem associated with the tax rates. Following their argumentation, the neighboring countries' tax rate was not affected by the growth rate of the home country but it was highly correlated with the home country's tax rate; controlling for the

neighboring countries' tax rate was a good instrument. From their estimation, they found that only the CIT rate had a significant negative impact on economic growth in all their regressions by controlling the endogeneity of tax measures. Conversely, the PIT rate and its progressivity did not significantly affect economic growth.

Similarly, Arnold (2008) supports the results of Lee and Gordon (2005). He found that the CIT and PIT rate could reduce the economic performance of a country. He compared progressive taxes and other tax indicators such as consumption tax and property tax.

The approach of tax incidence analysis was first introduced by Harberger (1962). The author analyzed the incidence of taxes within the context of a general equilibrium model of the economy, without making further explanations about the final shifting of taxes. In his models, tax incidence is determined by considering the initial structure of the economy followed by measurement of the outcome through observation of the differences in the vector of equilibrium prices before and after the tax change. He found that capital bears almost the entire tax burden, implying that corporate income tax lowers the after-tax marginal productivity of capital equally. Hence, the corporate income tax lowers the steady-state capital-labor ratio and finally real GDP per capita and the standard of living. Later, he extended his analysis by using four sectors to analyze the impact of CIT on capital (Harberger, 2006). He investigated how capital bears the burden of the CIT in a closed-economy and open-economy scenario by employing dynamic incidence

analysis. The author found that US labor bears almost the entire CIT burden following his assumptions of no other distortions and demand neutrality.

Likewise, Auerbach (2006) reviewed the concept of tax incidence and evidence about who actually bears the burden of CIT. He summarized that the shareholders may bear the CIT burden in the short-run and in the long-run because they are unable to shift taxes on corporate capital. He also asserted that analyzing the incidence of corporate tax changes is more substantial than the whole tax structure because different components of the tax have different incidence which lead to different paths of the economy over time, not just in a single year.Moreover, Duncan and Sabirianova Peter (2008) developed a modest measurement of income tax progressivity especially in the PIT rate.[1] They found that the PIT rate could promote more equal distribution of income via its progressive characteristics. The authors studied this impact employing data for 35 countries over the period 1981-2005.

Some studies have assessed the impact of both the CIT and the PIT rate on income inequality. For example, Claus, Martinez-Vazquez, and Vulovic (2012) discussed the role of fiscal policies, especially taxation and government expenditures for redistributing the income.[2] By exploiting a panel data consisting of 150 countries for the period between 1970 and 2009; they found that both CIT and PIT tend to be progressive over time and effectively redistributing the income. These findings also confirmed by Cornia, Gómez, and Martorano (2012).

[1] They only focused on the personal income tax only. As such, any equity offsets that may come from other taxes such as corporate income tax were not taken into account.
[2] They only focus on the impact of government fiscal policies on income inequality in Asian countries.

3. Data and Methodology

The panel dataset used for this thesis consists of 65 countries over the period 1970-2006. The maximum number of observations for this study should be 2,405 observations. However, the number of the observations in this study is only 544 observations as there are some missing observations for some countries in some periods (unbalanced panel data).

The proxy variables for tax structures in this paper are the top statutory CIT and PIT rate following a previous study (Lee & Gordon, 2005). The highest CIT and PIT rates mainly were obtained from the World Tax Database (WTD) provided by Office for Tax Policy Research (OTPR) at the University of Michigan. The author also used other sources of data such as KPMG and Pricewaterhouse Coopers (PwC). Control variables such as education, GDP per capita, inflation rate, population growth and investment rate (% of GDP) were collected from World Development Indicators (WDI) provided by World Bank organizations. Moreover, data for Gini's index as a measurement of income inequality was collected from the World Income Inequality Database (WIID) provided by the United Nations organization. The data for investment as a percentage of GDP is collected from Penn World Tables, version 7.0 (PWT 7.0). Summary statistics for all the other variables, including the dependent variable (growth in per-capita GDP) are presented in Table 3-1.

Table 3-1 Summary Statistics for Dependent and Independent Variables

No.	Country	Unit	n	Mean	Max	Min.	Source
1	Growth of GDP per Capita	%	2,401	2.2	22.27, Botswana (1972)	-31.34, Latvia (1992)	WDI
2	CIT	%	1,967	35.16	75, Iran (1990)	0, Mexico (1970-1979), Canada (1979)	WTD
3	PIT	%	1,372	40.43	91, Portugal (1991)	0, Paraguay (1974-1999), Uruguay (1976-1998)	WTD
4	Gini	Index (0-1)	1,085	0.39	0.78, Zambia (1991)	0.12, China (1982)	WIID
5	GDP per Capita	USD	2,405	8235.89	53701.7, Luxembourg (2006)	121.24 Malawi (1970)	WDI
6	Primary Education Completed	%	1,371	81.62	125.51, Malta (1981)	20.19, Malawi (1974)	WDI
7	Population	%	2,405	1.56	5.92, Malawi (1987)	-8.5, Latvia (1970)	WDI
8	Inflation	%	2,256	33.76	11749.6, Bolivia (1985)	-9.63, Netherland (1985)	WDI
9	Openness	%	2,382	70.22	399.68, Hongkong (2006)	4.83, Zimbabwe (2003)	PWT 7.0
10	Investment	%	2,382	31.22	367.1, Malawi (1978)	0.1, Cote d`Ivoire (2000)	PWT 7.0

Note. n= number of observations, CIT=Corporate Income Tax, PIT=Personal Income Tax, GDP=Gross Domestic Product, WDI=World Development Indicators, WTD=World Tax Database, WIID=World Income Inequality Database, PWT=Penn World Table. Source: Author's Calculations.

To investigate the impact of tax structure on economic growth, this thesis estimates the following the model developed by Lee and Gordon (2005):

$$\boldsymbol{Growth_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 X_{it} + \partial_1 DG_{it} + \partial_2 DR_{it} + + a_i + e_{it}} \quad (\mathbf{1})$$

where *i* represents the country, *t* denotes the time period (1970 to 2006), Growth is an annual growth rate of GDP per capita; *T* is the tax structures which represent top CIT and PIT rates. *X* is a set of control variables consisting of Gini's index, education, openness, inflation and investment. a_i is unobserved variables in this model. DG is dummy variables for Gini index and DR is dummy variables for countries classified by regions.

To quantify the impact of income tax structures on income inequality, this thesis estimates the following equation:

$$\boldsymbol{Gini_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 G_{it} + \beta_3 G_{it}^2 + \beta_4 X_{it} + \gamma CIT * OPEN_{it} + \partial_1 DG_{it} + \partial_2 DR_{it} + a_i + e_{it}} \quad (\mathbf{2})$$

Equation (2) shows that income inequality, measured by the Gini coefficient, $Gini_{it}$, for country *i* in year *t*, is a function of GDP per capita, G_{it}, income tax structures, T_{it}, and a set of control variables, X_{it}, which is commonly used in the literature to explain income inequality. Control variables consist of education, trade-openness, inflation rate and population growth rate. a_i is unobserved variables in this model. To identify region-specific income tax policy effects, a dummy variable, DR_{it}, is interacted with the explanatory variables. To account for the impact of taxing the capital on income inequality, CIT is interacted with openness. Moreover, e_{it} is observation-specific errors. Income inequality is measured by Gini's coefficients from World Income Inequality Database (WIID) provided by the United Nations Organization.

To investigate whether high-tax countries could promote equal distribution among income groups, this paper estimates the following equation:

$$\boldsymbol{Gini_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 G_{it} + \beta_3 G_{it}^2 + \beta_4 X_{it} + a_i + e_{it}} \quad (\mathbf{3})$$

The model in equation (3) is a non-linear model which is similar with model in equation (2). As shown in Table 3-2, this paper distributes the average of top CIT in 1970-2006 into four intervals.

Table 3-2 Distribution of Average Top CIT in 1970 - 2006

Corporate Tax rate	Countries	Number of Countries
Above 40%	Iran, India, Germany, Pakistan, Malawi, Zambia, France, Trinidad & Tobago, Austria, Belgium, Morocco, Venezuela, Zimbabwe, United States, South Africa, Greece, Panama, Netherlands	18
30% - 39%	Kenya, Canada, New Zealand, Egypt, Japan, Cote d'Ivore, Denmark, China, Costa Rica, Peru, Ireland, Sweden, Malaysia, Turkey, Luxembourg, Guatemala, Nicaragua, Swaziland, Jamaica, Indonesia, Colombia, Senegal, Philippines, Spain, Malta, Dominican Republic, Finland, Honduras, Argentina, Italy, Botswana, Thailand	32
20% - 29%	Uruguay, Korea, Republic of, Paraguay, El Salvador, Brazil, Portugal, Norway, Iceland, Mexico, Hungary, Ecuador, Latvia, Bolivia,	15
10% - 19%	Hongkong, Switzerland	2
	Total	65

Note. CIT=Corporate Income Tax. Source: Author's Calculations.

4. Empirical Analysis

To capture which tax structure has the most influential impact on economic growth, this paper divides the analysis into two parts. First, this paper analyzes the correlation between CIT rate and economic growth. Then, it will

analyze the relationship between PIT and economic growth. Table 4-1 will focus on the role of the corporate tax rate on growth, and Table 4-2 will describe the impact of the personal tax rates on growth.

Table 4-1 The Impact of CIT on Economic Growth

Estimation method	**1**	**2**	**3**	**4**	**5**
	OLS	**OLS**	**RE**	**RE**	**RE + IV**
Corporate income tax rate (CIT)	**-0.047**	**-0.038**	**-0.046**	**-0.035**	
	(0.019)**	(0.018)**	(0.021)**	(0.02)*	
IV (CIT)					**-0.104**
					(0.058)*
Gini Index	-0.02	-0.001	-0.0186	-0.001	-0.001
	(0.021)	(0.021)	(0.026)	(0.024)	(0.023)
Education	**0.029**	**0.028**	**0.033**	**0.032**	**0.032**
	(0.012)**	(0.012)**	(0.013)**	(0.014)**	(0.014)**
Inflation rate	-0.000	0.000	-0.000	0.000	0.0001
	(0.01)	(0.001)	(0.001)	(0.001)	(0.001)
Trade Openness	0.005	**0.006**	0.004	0.007	0.007
	(0.003)	(0.003)*	(0.004)	(0.004)	(0.004)
Investment (% of GDP)	**0.067**	**0.067**	**0.069**	**0.073**	**0.073**
	(0.01)***	(0.011)***	(0.012)***	(0.011)***	(0.012)***
Constant	-0.003	-0.011	-0.007	-0.018	-0.018
	(0.018)	(0.02)	(0.019)	(0.022)	(0.021)
Gini Dummy:					
- Gross income		-0.012		-0.012	-0.011
		(0.01)		(0.014)	(0.014)
- Net income		-0.010		-0.009	-0.009
		(0.01)		(0.014)	(0.014)
Continent Dummy :					
- Asia		**0.017**		**0.017**	**0.017**
		(0.008)**		(0.010)*	(0.010)*
- America		0.007		0.007	0.007491
		(0.007)		(0.009)	(0.009)
- Europe		0.010		0.010	0.010309
		(0.009)		(0.011)	(0.011)
Observations	544	544	544	544	544
Observed Years	1970-2006	1970-2006	1970-2006	1970-2006	1970-2006
Adj. R squared	0.149	0.153	0.112	0.109	0.113
F-statistic	16.797	9.172	12.465	6.822	6.831
Hausman p-value			0.465	0.257	0.259

Note. Dependent variable is the growth of GDP per capita; Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

From the regression results presented in table 4-1, this paper found that the coefficient of statutory corporate tax is negative implying that imposing a high CIT rate will reduce the economic performance of a country. In OLS estimation, the coefficient of CIT is between -0.038 to -0.047, which implies that a 10% decrease in corporate tax rate is correlated with a 0.38% to 0.47% increase in the annual growth rate of GDP per capita. Furthermore, Both education and investment have significant positive impacts on economic growth, which indicates that countries will be growth faster when they have more educated citizens and higher capital formation.

Column 3 to 5 of Table 4-1 records the regression results based on random effect estimations. Based on these estimations, the coefficient of the CIT rate is also negative. Column 5 shows instrumental variable (IV) estimation results. The instrumental variable for the CIT rate is created from the weighted average of corporate tax rate, weighted by the reciprocal distance between the two countries. The estimated coefficient of the corporate tax rate in the IV estimation is larger compared to other estimations, indicating that endogeneity is a serious problem. The coefficient of the CIT rate on IV estimation is -0.104 which is three times bigger than random effect estimation. It implies that lowering CIT rate 10% could promote annual economic growth by 1.04%.

After describing the impact of CIT on growth, table 4-2 will show the relationship between PIT rate and economic growth. Column 1 and column 2 present the result for OLS estimation. Column 3 to column 5 exhibits the result for random-effect estimation. As expected before, PIT rate is not significant

affecting economic growth. This result confirms the findings from the previous study. It implies that imposing a high tax rate on the top statutory personal tax does not affect economic growth significantly.

Table 4-2 The Impact of PIT on Economic Growth

Estimation method	**1**	**2**	**3**	**4**	**5**
	OLS	**OLS**	**RE**	**RE**	**RE + IV**
Personal income tax rate (PIT)	-0.0012	-0.011	-0.08	-0.009	
	(0.018)	(0.011)	(0.012)	(0.015)	
IV (PIT)					-0.027
					(0.046)
Gini Index	**-0.035**	-0.030	-0.034	-0.028	-0.029
	(0.002)*	(0.027)	(0.031)	(0.038)	(0.038)
Education	**0.047**	**0.043**	**-0.048**	**0.044**	**0.042**
	(0.013)***	(0.015)***	(0.011)***	(0.014)***	(0.015)***
Inflation rate	0.001	0.001	0.000	0.001	0.001
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Trade Openness	0.006	0.011	0.007	0.013	0.013
	(0.006)	(0.006)	(0.008)	(0.007)	(0.008)
Investment (% of GDP)	**0.068**	**0.067**	**0.066**	**0.069**	**0.068**
	(0.009)***	(0.012)***	(0.011)***	(0.018)***	(0.017)***
Constant	0.027	-0.026	0.029	-0.031	-0.030
	(0.018)	(0.021)	(0.019)	(0.020)	(0.020)
Gini Dummy:					
- Gross income		**-0.029**		**-0.029**	**-0.030**
		(0.011)***		(0.010)***	(0.010)***
- Net income		-0.016		-0.018	-0.016
		(0.012)		(0.014)	(0.015)
Continent Dummy :					
- Asia		**0.030**		**0.029**	**0.031**
		(0.01)***		(0.13)**	(0.13)**
- America		**0.028**		**0.027**	**0.028**
		(0.008)***		(0.009)***	(0.009)***
- Europe		0.017		0.019	0.020
		(0.011)		(0.015)	(0.015)
Observations	325	286	325	286	286
Observed Years	1972-2002	1972-2002	1972-2002	1972-2002	1972-2002
Adj. R squared	0.193	0.222	0.139	0.169	0.171
F-statistic	13.927	8.387	9.688	6.268	6.298
Hausman p-value			0.839	0.1621	0.22

Note. Dependent variable is the growth of GDP per capita; Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table 4-3 shows the results regarding the impact of corporate income tax on income inequality. From the OLS estimation, this paper found that the coefficient on statutory corporate tax is negative indicating that the progressivity of the CIT rate could reduce the income gap between the rich and the poor. It implies that reducing the CIT rate by 10% could lower income inequality by 3.84%. Furthermore, trade-openness has a negative relationship with inequality. This finding indicates that countries that have a higher degree of investment or foreign direct investment, which allows for capital formations, could reduce the income disparity between income groups. In addition, population is positively correlated with income inequality, implying that a higher population growth rate could enhance income gap between the rich and the poor because a large population will increase the labor supply which is harmful for the distribution of income. Next, interacting CIT with openness shows an increase in inequality which is consistent with the prior literature discussed in Chapter 3. Imposing higher taxes could increase the capital cost which reduces capital formation. Lower capital formation will reduce productivity, since countries lose their capital, which reduces the real wage to the workers. Region dummies capture the pattern that income inequality in Asian and European countries is lower compared to other countries.

Table 4-4 shows the results for PIT and income inequality analysis. From the estimations, the effect of statutory personal income tax rates on income inequality is not significant. It implies that the progressive tax rate reflected in the top statutory personal tax does not affect income distribution significantly

Table 4-3 The Impact of CIT on Income Inequality

Estimation method	1	2	3
	OLS	**RE**	**RE + IV**
Corporate income tax rate (CIT)	**-0.384**	**-0.440**	
	(0.134)***	(0.133)***	
IV (CIT)			**-1.278**
			(0.382)***
Ln GDP per capita (-1)	0.067	0.012	0.011
	(0.053)	(0.087)	(0.087)
Ln GDP per capita (-1) squared	-0.005	-0.002	-0.002
	(0.003)	(0.005)	(0.005)
Inflation	0.005	0.000	0.000
	(0.003)	(0.001)	(0.001)
Openness	**-0.135**	**-0.104**	**-0.103**
	(0.067)**	(0.050)**	(0.049)**
Education	-0.029	0.081	0.081
	(0.047)	(0.054)	(0.054)
Population	**2.425**	1.323	1.334
	(0.778)***	(0.944)	(0.946)
CIT * Openness	**0.470**	**0.448**	
	(0.193)**	(0.141)***	
IV (CIT) * Openness			**1.29**
			(0.404)***
Dummy Gini :			
- Gross Income	0.027	0.073	0.074
	(0.031)	(0.079)	(0.079)
- Net Income	-0.016	-0.015	-0.014
	(0.028)	(0.069)	(0.069)
Dummy Region/Continent :			
- Asia	**-0.071**	**-0.088**	**-0.088**
	(0.026)***	(0.037)**	(0.037)**
- America	0.040	0.023	0.023
	(0.026)	(0.030)	(0.030)
- Europe	**-0.101**	**-0.119**	**-0.119**
	(0.029)***	(0.038)***	(0.038)***
Constant	0.300	0.494	0.495
	(0.212)	(0.381)	(0.380)
Observations	229	229	229
Observed Years	1973 - 2002	1973 - 2002	1973 - 2002
Adj. R squared	0.718	0.362	0.362
F-statistic	45.578	10.936	10.947

Note. Dependent variable is Gini coefficient; Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table 4-4 The Impact of PIT on Income Inequality

Estimation method	1	2	3
	OLS	**RE**	**RE + IV**
Personal income tax rate (PIT)	0.042	0.019	
	(0.027)	(0.030)	
IV (PIT)			0.053
			(0.089)
Ln GDP per capita (-1)	0.051	0.036	0.037
	(0.055)	(0.106)	(0.106)
Ln GDP per capita (-1) squared	-0.004	-0.003	-0.003
	(0.003)	(0.006)	(0.006)
Inflation	**0.007**	**0.002**	**0.002**
	(0.003)**	(0.001)**	(0.001)**
Openness	**0.034**	**0.060**	**0.060**
	(0.015)**	(0.018)***	(0.018)***
Education	-0.029	0.063	0.063
	(0.047)	(0.058)	(0.058)
Population	**2.332**	1.194	1.195
	(0.784)***	(0.972)	(0.973)
Dummy Gini :			
- Gross Income	0.027	0.0699	0.0699
	(0.031)	(0.081)	(0.081)
- Net Income	0.000	-0.0029	-0.0029
	(0.028)	(0.069)	(0.069)
Dummy Region/Continent :			
- Asia	**-0.081**	**-0.087**	**-0.087**
	(0.027)***	(0.041)**	(0.041)**
- America	**0.054**	0.031	0.031
	(0.026)**	(0.031)	(0.031)
- Europe	**-0.106**	**-0.128**	**-0.128**
	(0.030)***	(0.045)***	(0.045)***
Constant	0.214	0.237	0.236
	(0.212)	(0.444)	(0.444)
Observations	229	229	229
Observed Years	1973 - 2002	1973 – 2002	1973 - 2002
Adj. R squared	0.711	0.325	0.325
F-statistics	47.848	10.133	10.131

Note. Dependent variable is Gini coefficient; Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Finally, this estimation includes both CIT and PIT rate to evaluate their joint effect on income inequality. Overall, as shown in Table 4-5, the results support the prior findings that the CIT rate is more effective than the PIT rate in reducing the income disparity.

Table 4-5 Joint Impact of CIT and PIT on Income Inequality

Estimation method	1	2
	RE	RE + IV
Corporate income tax rate (CIT)	**-0.479**	
	(0.146)***	
IV (CIT)		**-1.412**
		(0.425)***
Personal income tax rate	0.051	
	(0.032)	
IV (PIT)		0.1501
		(0.094)
Ln GDP per capita (-1)	-0.030	-0.030
	(0.093)	(0.092)
Ln GDP per capita (-1) squared	0.001	0.001
	(0.005)	(0.005)
Inflation	0.0003	0.0002
	(0.001)	(0.001)
Openness	**-0.098**	**-0.099**
	(0.052)*	(0.052)*
Education	0.089	0.090
	(0.055)	(0.055)
Population	1.247	1.247
	(0.920)	(0.918)
CIT * Openness	**0.454**	
	(0.156)***	
IV (CIT) * Openness		**0.460**
		(0.156)***
Gini Dummy :		
- Gross Income	0.073	0.074
	(0.082)	(0.081)
- Net Income	-0.019	-0.019
	(0.071)	(0.070)
Region/Continent Dummy :		
- Asia	**-0.100**	**-0.100**
	(0.038)***	(0.038)***
- America	0.024	0.025
	(0.030)	(0.030)
- Europe	**-0.133**	**-0.133**
	(0.042)***	(0.042)***
Constant	0.646	0.648
	(0.403)	(0.402)
Observations	229	229
Observed Years	1973 – 2002	1973 - 2002
Adj. R squared	0.362	0.363
F-statistics	10.226	16.797

Note. Dependent variable is Gini coefficient; Standard errors in parentheses.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

After analyzing the impact of income tax structures, this paper tries to investigate further the effect of high statutory top corporate income tax rate on the distribution of income. Table 4-6 reports the estimation result for high-tax group (top CIT above 40%). High CIT rates are significant in reducing the income gap between the rich and the poor. Moreover, openness has a negative association with income inequality in this estimation implying that greater trade openness could reduce income inequality among income groups.

Table 4-6 The Estimation Results for High-Tax Group (Top CIT is above 40%)

Estimation method	**1**	**2**	**3**
	OLS	**FE**	**FE + IV**
Corporate income tax rate (CIT)	**-0.447**	**-0.256**	
	(0.142)***	(0.114)**	
IV (CIT)			**-0.746**
			(0.333)**
Ln GDP per capita (-1)	0.109	0.160	0.160
	(0.874)	(0.182)	(0.182)
Ln GDP per capita (-1) squared	-0.006	-0.012	-0.012
	(0.005)	(0.010)	(0.010)
Education	-0.066	0.086	0.085
	(0.089)	(0.144)	(0.144)
Inflation	**0.397**	0.175	0.174
	(0.207)*	(0.136)	(0.136)
Openness	0.010	**-0.120**	**-0.120**
	(0.028)	(0.055)**	(0.055)**
Population	**9.889**	1.639	1.629
	(1.708)***	(1.432)	(1.431)
Constant	-0.009	-0.020	-0.018
	(0.326)	(0.814)	(0.814)
Observations	81	81	81
Observed Years	1971-2006	1971-2006	1971-2006
Adj. R squared	0.489	0.874	0.873
F-statistics	11.943	27.316	27.302
Hausman p-Value		0.002	0.002

Note. Dependent variable is Gini coefficient; Standard errors in parentheses.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table 4-7 presents the estimation result for the middle-tax group countries which have average statutory top CIT rates between 30% and 39%. According to

this estimation, CIT rates have no significant impact on income inequality. Hence, it implies that tax group in which top CIT rate is between 30% and 39% is not significant to reduce income disparity. In addition, Ln GDP per Capita and Ln GDP per Capita squared variables are significant in this model, proving the *inverted-U* Kuznets hypothesis. Furthermore, trade openness has a significant negative correlation with income inequality. Population growth is also found significantly positively associated with inequality.

Table 4-7 The Estimation Result for Middle-Tax Group (Top CIT is between 30% - 39%)

Estimation method	**1**	**2**	**3**
	OLS	**FE**	**RE + IV**
Corporate income tax rate (CIT)	0.040	-0.070	
	(0.066)	(0.063)	
IV (CIT)			0.387
			(0.245)
Ln GDP per capita (-1)	**0.432**	0.230	-0.029
	(0.062)***	(0.144)	(0.131)
Ln GDP per capita (-1) squared	**-0.028**	**-0.014**	-0.002
	(0.004)***	(0.008)*	(0.007)
Education	-0.058	0.100	0.047
	(0.054)	(0.071)	(0.110)
Inflation	-0.039	-0.023	-0.016
	(0.042)	(0.040)	(0.050)
Openness	**-0.007**	**-0.008**	**-0.033**
	(0.011)***	(0.031)***	(0.024)**
Population	**4.254**	3.319	3.374
	(0.832)***	(1.141)	(1.391)
Constant	**-1.210**	-0.609	0.793
	(0.251)***	(0.637)	(0.538)
Observations	273	273	147
Observed Years	1971-2006	1971-2006	1971-2006
Adj. R squared	0.631	0.800	0.299
F-statistics	67.390	32.030	9.886
Hausman p-Value		0.099	0.833

Note. Dependent variable is Gini coefficient; Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Finally, Table 4-8 reports the estimation results for the low-tax group whose top CIT is between 10% and 29%. From these estimations, lower CIT rates

between 10% and 29% could not reduce income inequality significantly. Looking into control variables, trade openness has a significant negative impact on income inequality based on OLS estimations. On the other hand, population growth is positively associated with income inequality. Furthermore, the Kuznets inverted-U hypothesis is also proved in fixed estimations in column 2 and column 3 of Table 4-8.

Table 4-8 The Estimation Result for Low-Tax Group (Top CIT is between 10% - 29%)

Estimation method	**1**	**2**	**3**
	OLS	**FE**	**FE + IV**
Corporate income tax rate (CIT)	-0.119	-0.071	
	(0.073)	(0.055)	
IV (CIT)			-0.206
			(0.160)
Ln GDP per capita (-1)	0.107	**0.383**	**0.383**
	(0.101)	(0.205)*	(0.205)*
Ln GDP per capita (-1) squared	**-0.010**	**-0.020**	**-0.020**
	(0.006)*	(0.011)*	(0.011)*
Education	0.1140	0.010	0.010
	(0.049)	(0.046)	(0.046)
Inflation	0.002	0.001	0.001
	(0.003)	(0.002)	(0.002)
Openness	**-0.125**	0.0004	0.001
	(0.024)***	(0.027)	(0.027)
Population	**5.336**	-1.053	-1.054
	(0.807)***	(1.287)	(1.287)
Constant	0.196	-1.368	-1.370
	(0.454)	(0.934)	(0.934)
Observations	131	131	131
Observed Years	1971-2006	1971-2006	1971-2006
Adj. R squared	0.776	0.915	0.915
F-statistics	65.291	74.616	74.616
Hausman p-Value		0.000	0.000

Note. Dependent variable is Gini coefficient; Standard errors in parentheses. * Significant at 10%; ** Significant at 5%; *** Significant at 1%.

5. CONCLUSIONS AND POLICY IMPLICATIONS

This thesis finds support for the hypothesis that CIT rates have a negative impact both on economic growth and income inequality. However, personal income tax rate does not significantly affect economic growth, which is consistent with the previous literature (Lee and Gordon, 2005). There are two explanations due to these findings. First, the majority of the lowest group income does not pay personal income tax because the existence of tax-free threshold/individual allowance or deductions (Claus, I., Martinez-Vazquez, J., & Vulovic, V., 2012). Second, the rich tend to be more sensitive to changes in the tax rates, and they are able to hide their income. Therefore, there are many tax evasion/avoidance activities at the highest income group (Diamond & Saez, 2011). It also finds that income inequality is decreasing in countries which have a relatively high-top corporate tax rate. Following the modest and oldest theory of corporate tax incidence is that the tax falls on corporate shareholders in proportion to their ownership. Thus, this theory indicates that individual share of ownership is highly concentrated among higher income group by assuming the corporate tax as a progressive tax (Auerbach, 2006).

This paper offers three policy recommendations from the analysis of the impact of income tax structures on economic growth and income inequality. First, it is important to develop a modest design into the tax system because countries that are able to mobilize tax resources through broad-based tax structures with efficient administration and enforcement will be likely to enjoy faster growth rates

than countries with lower efficiency. Generally, an efficient tax system is one that reduces the disincentive effects of taxation to work, save and invest by using broad-based income tax structures. Therefore, a broad base of corporate income tax in conjunction with lower administrative costs is often seen as fairer than a narrow-based system because of horizontal and vertical equity considerations. Hence, tax reform in Asia and Europe should thereby focus on enhancing tax enforcement and broadening their tax base by minimizing tax incentives, exemptions and allowances, which would reduce the administrative costs of taxation and lead to an increase in tax revenue. Increases in tax revenue would allow greater government benefits to achieve more equal distributions of wealth and income.

Second, since the personal tax rate does not have a significant impact on growth and on income inequality, the government should focus to reduce tax evasion, which is believed happen in the highest income group that could distort the horizontal and vertical equity in redistributing the income.

Finally, very high earners or the highest income group should be subject to high and rising marginal tax rates, especially in the statutory top corporate tax rate. This paper suggests that increasing the highest statutory CIT rates above 40% could reduce the income gap between the poor and the rich, which is consistent with the study by Diamond and Saez (2011). Therefore, the government should focus on minimizing the tax avoidance activities such as re-timing or income shifting by broadening the corporate tax base and promoting tax enforcement.

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