EFFECTS OF TAX POLICY ON ECONOMIC GROWTH IN OECD COUNTRIES

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By

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ABSTRACT

This thesis analyzes the effects that different taxation policies have on per-capita GDP by running a series of panel data regressions on 40 years of economic data from 30 OECD countries. Factors such as trade openness, labor productivity, inflation volatility, gross fixed capital formation and the nominal tax burden are included in the models along with data about tax revenue collected by each country from income, property, and consumption taxes. A preliminary model comparing income taxes to property and consumption taxes shows that property and consumption taxes are associated with a significantly larger positive coefficient for GDP per capita than income taxes. A series of models which desegregates the tax categories further finds that net wealth taxes such as recurrent taxes on net wealth; estate, inheritance and gift taxes; taxes on financial and capital transactions; and other non-recurrent property taxes are associated with the highest increase in GDP per-capita when all other tax variables are held constant.
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I. **Introduction:**

In my thesis, I study the effects that different methods of taxation have on economic growth. For example, would the per-capita GDP of a nation change if the total tax revenue collected by the government remained the same but the composition of the tax revenue was altered? How big of an impact would be felt on GDP per capita if the amount of taxes collected from income taxes changed relative to the amount of taxes collected from consumption taxes? Is taxing individuals and corporations at different tax rates across various tax categories better or worse for GDP per capita? What distinguishes my thesis from the earlier literature is that I consider a finer breakdown of the tax structure than earlier studies. The greater examination detail provided by my thesis will facilitate more efficient allocation of tax targets in order to optimize the growth in GDP per capita while retaining an acceptable tax revenue stream.

II. **Review of Related Literature:**

My thesis builds on ideas presented in several recent publications from the Organization for Economic Co-operation and Development (OECD) regarding the impact of government tax policy on economic growth. One of the more important articles on this issue is Jens Arnold’s *Do Tax Structures Affect Aggregate Economic Growth? Empirical evidence from a panel of OECD countries* (2008). My thesis employs a similar approach to their model, using the amounts of tax revenue collected by each country in the 6 OECD tax categories over a period of time to draw conclusions on
whether changes in the amount of revenue collected from one tax category relative to another would result in a positive or negative impact on per-capita GDP. The conclusions of their paper are that it is the relative changes in the type of taxes imposed on a country by its government, not the amount of taxes, which have a greater impact on per-capita GDP. In particular, the models in the paper predict that, holding total tax revenue constant, a rise in income taxes compensated by a decrease in other taxes will discourage growth while a rise in consumption and property tax offset by a decrease in other taxes causes a rise in economic growth.

Gareth Myles’s ‘Economic Growth and the Role of Taxation’ (2008) also argues that economic growth is affected more from the type of taxation, not from the absolute value of taxation. His paper has two main conclusions: that it is more important to draw tax revenues from certain types of taxes than it is to adjust the total amount of taxes collected, and that higher growth occurs when income taxes are lower relative to consumption taxes. A paper by Arnold, Bassanini, and Scarpetta entitled ‘Solow or Lucas? Testing Growth Models Using Panel Data from OECD Countries’ (2007) also confirms that growth depends more on endogenous factors such as human and capital growth as well as how progressive\(^1\) a tax system is in relation to income taxes. Because this paper mentions factors such as human and capital growth, I decided to account for those variables in my model by controlling for several population and capital variables in

\(^1\) A progressive tax “takes a larger percentage of income from high-income groups than from low-income groups”: “Progressive Tax”, Internal Revenue Service, 3 April 2009 http://www.irs.gov/app/understandingTaxes/student/glossary.jsp#P
order to better identify the effects of the individual tax structures on economic growth and this is another difference between my thesis and *Arnold (2008)*.

While not directly related to my thesis topic, a paper by Duval, Elmeskov, and Vogel entitled *‘Structural Policies and Economic Resilience to Shocks’* (2007) explores how different economic structures respond to common market shocks. This paper is interesting because it touches upon the debate on whether growth is more exogenous or endogenous. Assuming economic shocks are exogenous, it shows how endogenous factors such as exchange rate flexibility or labor and product market regulation of an economy can help it recover from such a shock. By studying this paper, I was able to better understand the diversity of economic structures among countries, even in groups such as the OECD, which have a tendency to have convergent governmental policies. Finally, a paper by Johansson, et al entitled *‘Tax and Economic Growth’* (2008) served as a guide for the development of my thesis idea as it used empirical findings to rank the various sources of tax revenue by the degree to which they promote economic growth and the rankings were similar to those found in the previous literature, e.g., *Arnold (2008)*.

**III. Procedure:**

The OECD classification of taxation methods divides all taxes that a government can collect into 6 primary categories, with three increasingly specific levels of sub-categories for each primary category. I estimate how changing the proportion of total tax revenue collected from the six primary categories as well as the first level of sub-categories affect per-capita GDP. The six primary categories as described by the OECD are:
1. Taxes on income, profits, and capital gains
2. Social security contributions
3. Taxes on payroll and workforce
4. Taxes on property
5. Taxes on goods and services
6. Other taxes

The full breakdown of tax categories as determined by the OECD is attached as Appendix A.

Using data collected by the OECD since 1965 for thirty countries that are currently members of the OECD, I perform panel data regressions to test for the significance, magnitude, and direction that each of the different tax structures identified by the OECD has in improving or stifling economic growth. In addition to the tax variables, I control for other variables that are generally accepted to have an influence on economic growth, such as population and capital factors.

IV. Model Discussion:

As discussed in the literature review, recent papers suggest that the absolute value of taxation, or the tax burden, is not as important to per capita GDP as the proportion of certain kinds of taxes to others, given that the tax burden falls within a reasonable range which allows for the government to collect some revenue and for the population to retain some wealth. In order to gain a preliminary understanding of the trends in proportions of tax revenue collected by the thirty nations over the past forty years, the nominal values of tax revenue collected in each category to be studied is converted to the percentage of total tax revenue collected by that country in that year. This allows for a standardized
comparison across many countries that would otherwise have varying exchange and inflation rates. The final models use tax revenue values which have been converted to dollar values.

In total, the model has 36 variables. A general version is shown below, where the variables are grouped by type, but a specific description of the variables found in each group follows the model:

\[
\text{GDP Per Capita} = \text{Economic Variables} + \text{Human Capital Variables} + \text{Income Tax Variables} + \text{Social Security Variables} + \text{Payroll Tax Variables} + \text{Property Tax Variables} + \text{Goods and Services Tax Variables} + \text{Other Tax Variables}
\]

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation Volatility</td>
<td>Measured as the percent change in inflation from the previous year</td>
</tr>
<tr>
<td>GDP Deflator</td>
<td>Measured as the percent annual growth in GDP</td>
</tr>
<tr>
<td>Gross Fixed Capital Formation</td>
<td>Measured as total value of gross fixed capital formation as a total of GDP</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>Measured as the sum of imports and exports as a percentage of GDP</td>
</tr>
<tr>
<td>Research and Development Funding</td>
<td>Measured as total funding for R&amp;D as a percentage of GDP</td>
</tr>
<tr>
<td>Lagged GDP Per Capita</td>
<td>Automatically generated in STATA</td>
</tr>
<tr>
<td>Labor Productivity Growth</td>
<td>Measured as percent growth in labor productivity over previous period</td>
</tr>
<tr>
<td>Education</td>
<td>Measured as the percentage of the population with a tertiary education</td>
</tr>
<tr>
<td>Income, Profits, and Capital Gains Taxes for Individuals</td>
<td>Corresponding to OECD Tax Category 1100</td>
</tr>
<tr>
<td>Income, Profits, and Capital Gains Taxes for Corporations</td>
<td>Corresponding to OECD Tax Category 1200</td>
</tr>
<tr>
<td>Other Income Taxes</td>
<td>Corresponding to OECD Tax Category 1300</td>
</tr>
</tbody>
</table>
Several models were run in order to demonstrate the effects that various tax categories have on per-capita GDP. By aggregating several variables, it is possible to examine the effects of entire tax categories while others are held constant. All of the models used identical variables for the external variables, with only the tax variables changing from model to model. Initially, all variables included in the model, but some were found to introduce autocorrelation and multicollinearity issues and were removed from the model.

First, a correlation matrix (corr) was used to determine whether multicollinearity was present. It was found that the Research and Development Funding variable was highly correlated with the Education variable and that the GDP Deflator variable was highly correlated with the Inflation Volatility variable. In addition, these variables were found to contain large amounts of missing data and were therefore eliminated from the model.
For each of the models outlined below, the Wooldridge test of autocorrelation in panel data (xtserial) was performed. With a p-value of 0.000 across all models, it was determined that autocorrelation was present in all models. Therefore, a cross-sectional time-series first-order autoregression fixed-effects (xtregar, fe) model was run along with a random-effects (xtregar, re) model to account for autocorrelation. The results of the two models were compared using a Hausman test but the Hausman test failed for all models and so the random effects model was chosen. In terms of the fixed effects model, the net wealth tax variable from model 5 was statistically significant (p-value = 0.055) with a coefficient of 1.399 and the consumption tax variable was marginally significant (p-value = 0.102) with a coefficient of 0.148. The signs of the variables used in the 6 models were found to be similar between the fixed effects model and the random effects model.

The models were also regressed with Newey-West standard errors and with a lag of 1 (newey2, lag(1)). This regression accounted for the autocorrelation and the possibility of heteroskedasticity influencing the significance of the coefficients, with the lag of 1 being used due to the first-order autocorrelation discussed above. The Newey-West results were not materially different from the random-effects model that is described above.

The results presented in this thesis are outcome of the random effects model regression. The following models were used to determine the effects of Income Taxes, Consumption, and Property Taxes on per-capita GDP:

(1) Effects of Income Tax:

GDP Per Capita = Nominal Tax Burden + Gross Fixed Capital Formation + Labor Productivity Growth + Inflation Volatility + Trade Openness + Income Tax

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2 For all models, GDP Per Capita was a log function.
3 Income Tax is the sum of Tax Revenue collected in the OECD Categories 1000, 2000, and 3000.
(2) Effects of Consumption and Property Tax:

GDP Per Capita = Nominal Tax Burden + Gross Fixed Capital Formation + Labor Productivity Growth + Inflation Volatility + Trade Openness + Consumption and Property Taxes

To further study the effects of individual types of tax categories, each of the above models was broken down even further. For the Income Tax Effects model, the Income Tax variable was split into Personal Income Tax and Corporate Income Tax. The Personal Income Tax is comprised of the sum of “taxes on income, profits and capital gains of individuals”, “social security contributions from employees” and “taxes on payroll and workforce”. The Corporate Income Tax is comprised of the sum of “corporate taxes on income, profits, and capital gains” and “social security contributions from employers”. The Consumption and Property Tax model was split into three models. Model 4 looks only at the effects of Recurrent Taxes on Immovable Property and is comprised of “recurrent taxes on immovable property” and “other recurrent taxes on property”. Model 5 examines Net Wealth Taxes and is comprised of “recurrent taxes on net wealth”, “estate, inheritance and gift taxes”, “taxes on financial and capital transactions” and “other non-recurrent taxes on property”. Model 6 examines Consumption Taxes and is comprised of “taxes on goods and services” and “other taxes”.

(3) Effects of Personal and Corporate Income Taxes:

GDP Per Capita = Nominal Tax Burden + Gross Fixed Capital Formation + Labor Productivity Growth + Inflation Volatility + Trade Openness + Personal Income Tax + Corporate Income Tax

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4 Consumption and Property Taxes are the sum of Tax Revenue collected in the OECD Categories 4000, 5000, and 6000.
5 Personal Income Tax is the sum of Tax Revenue collected from the OECD Categories 1100, 2100, and 3000.
6 Corporate Income Tax is the sum of Tax Revenue collected from the OECD Categories 1200 and 2200.
(4) Effects of Recurrent Property Taxes:

\[
\text{GDP Per Capita} = \text{Nominal Tax Burden} + \text{Gross Fixed Capital Formation} + \text{Labor Productivity Growth} + \text{Inflation Volatility} + \text{Trade Openness} + \text{Recurrent Property Tax}^7
\]

(5) Effects of Non-Recurrent Property Taxes:

\[
\text{GDP Per Capita} = \text{Nominal Tax Burden} + \text{Gross Fixed Capital Formation} + \text{Labor Productivity Growth} + \text{Inflation Volatility} + \text{Trade Openness} + \text{Net Wealth Tax}^8
\]

(6) Effects of Consumption Taxes:

\[
\text{GDP Per Capita} = \text{Nominal Tax Burden} + \text{Gross Fixed Capital Formation} + \text{Labor Productivity Growth} + \text{Inflation Volatility} + \text{Trade Openness} + \text{Consumption Tax}^9
\]

V. Results:

Some countries did not join the OECD until several years or decades after the data collection began\(^{10}\). In those cases, large swathes of data are missing for those particular countries. Nevertheless, it appears that enough variation remains within the available years of data to determine the effects of the changes in tax structure on GDP per capita.

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\(^7\) Recurrent Property Tax is the sum of Tax Revenue collected from the OECD Categories 4100 and 4600.

\(^8\) Net Wealth Tax is the sum of Tax Revenue collected from the OECD Categories 4200, 4300, 4400, and 4500.

\(^9\) Consumption Tax is the sum of Tax Revenue collected from the OECD Categories 5000 and 6000.

\(^{10}\) The Czech Republic, Hungary, Korea, Mexico, Poland, and Slovakia are missing varying amounts of years of data.
After cleaning the data, the maximum and minimum amount that each tax category represented as a proportion of a country’s total tax revenue were as follows:

<table>
<thead>
<tr>
<th>Tax Category</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income, Profits, and Capital Gains</td>
<td>69.8%</td>
<td>9.1%</td>
</tr>
<tr>
<td></td>
<td>(New Zealand, 1980)</td>
<td>(Greece, 1965)</td>
</tr>
<tr>
<td>Social Security Contributions</td>
<td>48.6%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>(Spain, 1980)</td>
<td>(Several countries)</td>
</tr>
<tr>
<td>Payroll and Workforce</td>
<td>8%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>(Austria, 1975)</td>
<td>(Several countries)</td>
</tr>
<tr>
<td>Property</td>
<td>15.9%</td>
<td>0.5%</td>
</tr>
<tr>
<td></td>
<td>(United States, 1965)</td>
<td>(Mexico, 1985)</td>
</tr>
<tr>
<td>Goods and Services</td>
<td>64.8%</td>
<td>13.7%</td>
</tr>
<tr>
<td></td>
<td>(Mexico, 1985)</td>
<td>(Japan, 1990)</td>
</tr>
<tr>
<td>Other</td>
<td>19%</td>
<td>0%</td>
</tr>
<tr>
<td></td>
<td>(Turkey, 1995)</td>
<td>(Several Countries)</td>
</tr>
</tbody>
</table>

While maximums and minimums provide an interesting look at the extremes that the taxation categories go to and show that not all categories have a minimum of zero, analyzing the trends in how each tax category has changed also provides some interesting insights. In order to better analyze these trends, however, it is important to also make distinctions between corporations and individuals, as some of the articles suggested that it’s not only the type of tax that’s important but also whether it’s imposed on corporations or individuals. With that in mind, the following graph shows the various tax structures in greater detail, highlighting how they have changed across time on average across all OECD countries:

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11 Some of the maximum values in the data come from Turkey’s 1965 data set. Because summing the total tax revenue adds to over 300% of the reported total, it is unclear whether any of the data in the 1965 Turkey dataset is reliable. The maximum values that were eliminated and replaced with second-place values in the table are 83.8% for income, profits, and capital gains taxes, 30.9% for property taxes, and 180.8% for goods and services taxes.
Chart 1 shows that while some tax levels, such as property and payroll taxes, have remained nearly constant on average, other taxes have been shifting in composition or magnitude. For example, while income taxes have stayed relatively steady as a proportion of total tax revenue, personal income taxes have decreased from a high of 30% of total revenue in the 1970s and 1980s to 25% of total tax revenue by 2006. On the other hand, corporate income taxes rose slightly to compensate for the difference.

Conversely, consumption taxes have decreased in proportion from 38% in 1965 to 30% in 2006, but specific consumption taxes have actually decreased by even more (from 24% to 11%) while general consumption taxes actually increased from 14% to 19%.

Similarly, as the populations of OECD countries get older and start straining the social security budgets of their countries, there has been a rise in the proportion of taxes made up by social security taxes from 18% in 1965 to 25% of all tax revenue by 2006.

Looking more specifically at general consumption taxes, a subcategory of the “Goods and Services Tax” variables in the model made up of the revenue derived from value-
added taxes, sales taxes, and other general taxes on goods and services, we see a consistent rise across the OECD:

In this case, the OECD Total refers to the sum of general consumption taxes from all nations, while OECD America focuses only on OECD Nations in the Americas (Canada, Mexico, United States), OECD Pacific only on nations in the Pacific Region (Australia, Japan, Korea, New Zealand), and OECD Europe only on European nations, which make up the remaining OECD nations in the sample.

The rise in the proportion of general consumption tax to total tax revenue is constant across all regions represented by the OECD. This finding is consistent with chart 1, which shows a growth in general consumption taxes (shown in orange), but also demonstrates that all regions are moving in a similar direction, as opposed to a situation where one region is growing faster than another region is declining. Finally, the most detail can be achieved by looking at individual countries and how the tax structures there have changed. Using general consumption taxes as an example again, Chart 3 illustrates
that at the national level, the proportion of general consumption taxes to total tax revenue varies quite a bit not only from country to country, but also from year to year. These variations across all of the tax variables are what the model correlates to changes in per-capita GDP.

As the data gets more complicated at this level, the graphs become harder to read, but matching the colors and the fact that the nations are grouped by region (Americas, Pacific, Europe), we can see how, overall, they match the trends shown in charts 1 and 2. The nations that appear to have no taxes for several years actually are the ones that were
mentioned earlier as having no data for some of the initial years of OECD’s tracking. When the data will be analyzed as part of the model, those missing years will be eliminated, not reduced to zero as had to be done for the purposes of making this graph.

By analyzing all of the tax variables at this detailed level and contrasting how changes in their levels correlate to changes in per capita GDP, the models illustrate a clear picture of which taxes are more beneficial to economic growth and which taxes are less so. After running the aforementioned tests on the data (see page 7), the results shown below are the outcome of the following auto-correlation corrected regressions run in Stata:

**Model 1:** xtregar ln(gdp_per_capita) tax_burden gross_fixed_capital_formation labor_productivity_growth inflation_volatility trade_openness income_tax, re

**Model 2:** xtregar ln(gdp_per_capita) tax_burden gross_fixed_capital_formation labor_productivity_growth inflation_volatility trade_openness consumption_and_property_tax, re

<table>
<thead>
<tr>
<th>Dependent variable: ln(GDP Per Capita)</th>
<th>Model 1</th>
<th>Model 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Tax Burden</td>
<td>.0128*** (.0026)</td>
<td>.0132*** (.0025)</td>
</tr>
<tr>
<td>Gross Fixed Capital Formation</td>
<td>.0021 (.0026)</td>
<td>.0023 (.0026)</td>
</tr>
<tr>
<td>Labor Productivity Growth</td>
<td>-.0051 (.0037)</td>
<td>-.0047 (.0036)</td>
</tr>
<tr>
<td>Inflation Volatility</td>
<td>-.0094*** (.0015)</td>
<td>-.0089*** (.0015)</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>.0044*** (.0008)</td>
<td>.0046*** (.0008)</td>
</tr>
<tr>
<td>Income Tax</td>
<td>.3226*** (.0561)</td>
<td>---</td>
</tr>
<tr>
<td>Property and Consumption Taxes</td>
<td>---</td>
<td>0.8585*** (.1324)</td>
</tr>
</tbody>
</table>
Even with a preliminary model which groups all income taxes into one variable and all property and consumption taxes into a second variable, it is clear from the respective coefficients of the two variables that income taxes are not as beneficial for GDP per capita as property and consumption taxes. Both variables are statistically significant at the 99% level, yet the property and consumption tax variable’s coefficient (0.8585) is 266% larger than the income tax coefficient (0.3226), signaling that an increase in property and consumption taxes when income taxes are held constant is associated with a larger increase in GDP Per Capita than an increase in income taxes when consumption and property taxes are held constant. This distinction between income taxes and other taxes is even more evident when considering the next four models, which analyze the different tax categories more closely.

**Model 3:** xtregar ln(gdp_per_capita) tax_burden gross_fixed_capital_formation labor_productivity_growth inflation_volatility trade_openness personal_tax corporate_tax, re

**Model 4:** xtregar ln(gdp_per_capita) tax_burden gross_fixed_capital_formation labor_productivity_growth inflation_volatility trade_openness recurrent_property, re

**Model 5:** xtregar ln(gdp_per_capita) tax_burden gross_fixed_capital_formation labor_productivity_growth inflation_volatility trade_openness net_wealth, re

**Model 6:** xtregar ln(gdp_per_capita) tax_burden gross_fixed_capital_formation labor_productivity_growth inflation_volatility trade_openness consumption_tax, re

<table>
<thead>
<tr>
<th>Dependent variable: ln(GDP Per Capita)</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Tax Burden</td>
<td>.0128*** (.0026)</td>
<td>0.0138*** (.0026)</td>
<td>.0107*** (.0026)</td>
<td>.0128*** (.0025)</td>
</tr>
<tr>
<td>Gross Fixed Capital Formation</td>
<td>.0020 (.0026)</td>
<td>.0027 (.0027)</td>
<td>.0001 (.0027)</td>
<td>.0021 (.0025)</td>
</tr>
<tr>
<td>Labor Productivity Growth</td>
<td>-.0044 (.0037)</td>
<td>-.0058 (.0039)</td>
<td>-.0046 (.0038)</td>
<td>-.0041 (.0036)</td>
</tr>
<tr>
<td>Inflation Volatility</td>
<td>-.0094*** (.0015)</td>
<td>-.0098*** (.0015)</td>
<td>-.0095*** (.0015)</td>
<td>-.0088*** (.0015)</td>
</tr>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
<td>Model 3</td>
<td>Model 4</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Trade Openness</td>
<td>.0045*** (.0009)</td>
<td>.0041*** (.0009)</td>
<td>.0045*** (.0008)</td>
<td>.0048*** (.0008)</td>
</tr>
<tr>
<td>Personal Income Tax</td>
<td>.0442 (.1829)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Corporate Income Tax</td>
<td>.8972*** (.3486)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Recurrent Property Taxes</td>
<td>---</td>
<td>1.9757*** (.4353)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Net Wealth Taxes</td>
<td>---</td>
<td>---</td>
<td>12.7113*** (.20985)</td>
<td>---</td>
</tr>
<tr>
<td>Consumption Taxes</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1.298*** (.1912)</td>
</tr>
</tbody>
</table>

Based on the results from the models shown above, it can be deduced that an increase in Net Wealth Taxes, holding all else constant, is associated with the largest benefit for GDP Per-Capita. As most of the taxes included in the Net Wealth Tax category are a one-time payment to the government, as opposed to the Recurrent Property Tax which is paid on a periodic basis, it could be argued that the non-recurrent taxes are more visible and therefore more easily factorable into cost-benefit calculations, thereby facilitating trade or creation of property.

As described in the previous comparison between Models 1 and 2, Income Taxes are less beneficial than Consumption and Property Taxes. Although the Personal Income Tax coefficient falls outside the statistical significance threshold, given that the coefficient for all income taxes was 0.3226 in Model 1, it can be assumed that with more data, a significant coefficient for Personal Income Tax would likely have a similarly small coefficient.

The above table indicates that of all the statistically significant tax variables, the Corporate Income Tax is the least beneficial to GDP Per-Capita when holding all other variables constant, with a coefficient of just 0.8972. It is approximately one-fourteenth the size of the Net Wealth Tax coefficient and thus appears to support the hypothesis that Income Taxes are less beneficial for GDP Per-Capita than Property Taxes. On the other
hand, the Corporate Income Tax coefficient is larger than the coefficient for Consumption and Property Taxes from Model 2. However, as Model 2 grouped all Income Taxes into one variable and all Consumption and Property Taxes into a second variable, a comparison between the two coefficients is not equitable. The Corporate Income Tax Coefficient is significant at the 99% level while the Personal Income Tax variable is not statistically significant. The decrease in significance indicates that desegregating the Income Tax variable into personal and corporate variables might not yield as much insight as desegregating the Consumption and Property Tax variable into three 99% statistically significant variables did. Nevertheless, the 99% significance level indicates that the coefficient for Corporate Income Tax is worthy of note and demonstrates the diminished benefit of income taxes when compared to other taxes.

Recurrent Property Taxes and Consumption Taxes both revealed positive coefficients approximately one-tenth of the scale of the Net Wealth Taxes variable. With regards to the Recurrent Property Taxes, it can be argued that owning a property that requires regular tax payments in the form of Recurrent Property Taxes adds an additional cost of ownership for that property, leading either to an incentive to sell the property or to refrain from purchasing the property in the first place. Consumption Taxes essentially raise the price of consuming a good, thereby reducing demand and restricting consumption. Therefore, it is plausible that aside from Income Taxes, the Consumption Tax would be the next tax that leads to the lowest benefit for Per-Capita GDP. As both taxes affect the perceived wealth that an individual or corporation has on a regular basis through the mechanisms described above, it is understandable why an increase in either of these taxes when holding all others constant would result in a much smaller growth of GDP Per Capita than an increase in Net Wealth Taxes.

VI. Conclusions:

One of the goals of government is to increase the well being of its citizens through intelligent fiscal and monetary policy. Part of that policy is adjusting the taxation rate of citizens so that the government has enough revenue to provide necessary services while
allowing the citizens to expend their earnings as they see fit. While some politicians argue for reduced taxation and others argue for increased taxation, economics literature has found that the level of taxation in a nation, within reasonable ranges, is not nearly as important as the type of taxation. By expanding on current research into this question, my thesis analyzes the effects of several aggregated tax variables to determine a general trend that certain taxes have in relation to per-capita GDP and then disaggregates the various tax variables to understand how each type of tax individually affects per-capita GDP.

As taxes are not the only variables to have an impact on GDP per-capita, several other variables are included in the model in order to balance the model and allow for a more valid assessment of the effect that the various tax variables have on GDP per-capita. The external factors being considered in the model account for human capital, physical capital, and productivity variables. In total, there are five external factors variables: Gross Fixed Capital Formation, Labor Productivity Growth, Inflation Volatility, Trade Openness, and the Nominal Tax Burden.

Two models are initially examined, and they include the aforementioned external factors variables and either an aggregated income tax variable or an aggregated consumption and property tax variable. By including one, the other variable is held constant and thus the individual effect of changing the included tax variable is revealed. When the income tax variable is included in the model, we see a small, positive coefficient of 0.3226. However, when the consumption and property tax variable is included in the model instead, a coefficient of 0.8585 is obtained. The consumption and property tax coefficient is over 260% larger than the income tax coefficient, signaling that an increase in consumption and property taxes over income taxes would have a larger positive effect on per-capita GDP than if the reverse were to take place.

When the tax variables are disaggregated, four new models are produced. By comparing the personal income tax, corporate income tax, recurrent property tax, net wealth tax, and consumption tax variables using these models, it is determined that net wealth taxes result in a large, positive coefficient of 12.7113. This coefficient is over six
times as large as the one for recurrent property taxes and almost ten times as large as the coefficient for consumption taxes. Finally, the net wealth coefficient is over fourteen times as large as the coefficient for corporate income taxes.

The six models employed demonstrate that when comparing consumption and property taxes to income taxes, an increase in income taxes would not be as beneficial as an increase in property and consumption taxes. Furthermore, the driving force for the difference in the two types of categories seems to be the large positive effect that an increase in net wealth taxes would have on per-capita GDP. It is believed that because of the singular nature of most of those taxes, owners of the property and capital are incentivized to own the property and capital for longer periods of time and are able to more accurately determine the purchasing cost if the tax and the sale price are both paid up front.

It is hoped that through further research into this field, policy makers will be able to determine an optimal balance between the various tax categories such that the maximum GDP per-capita at a certain nominal tax burden can be achieved. Based on this thesis and previous economic papers, it should be theoretically possible to maintain the same tax revenue stream for a government while adjusting some taxes upwards and others downwards in such a way that the nation as a whole is more efficient and, because individual citizens and corporations would perceive having more money available, the nation as a whole would be more well off.
Appendix A

The OECD Classification of Taxes

1000 Taxes on income, profits and capital gains
   1100 Taxes on income, profits and capital gains of individuals
      1110 On income and profits
      1120 On capital gains
   1200 Corporate taxes on income, profits and capital gains
      1210 On income and profits
      1220 On capital gains
   1300 Unallocable as between 1100 and 1200

2000 Social security contributions
   2100 Employees
      2110 On an income tax basis
      2120 On a payroll basis
   2200 Employers
      2210 On a payroll basis
      2220 On an income tax basis
   2300 Self-employed or non-employed
      2310 On a payroll basis
      2320 On an income tax basis
   2400 Unallocable as between 2100, 2200 and 2300
      2410 On a payroll basis
      2420 On an income tax basis

3000 Taxes on payroll and workforce

4000 Taxes on property
   4100 Recurrent taxes on immovable property
      4110 Households
      4120 Other
   4200 Recurrent taxes on net wealth
      4210 Individual
      4220 Corporate
   4300 Estate, inheritance and gift taxes
      4310 Estate and inheritance taxes
      4320 Gift taxes
   4400 Taxes on financial and capital transactions
   4500 Other non-recurrent taxes on property
      4510 On net wealth
      4520 Other non-recurrent taxes
   4600 Other recurrent taxes on property

5000 Taxes on goods and services
   5100 Taxes on production, sale, transfer, leasing and delivery of goods and rendering of services
      5110 General taxes
         5111 Value added taxes
         5112 Sales taxes
         5113 Other general taxes on goods and services
      5120 Taxes on specific goods and services
5121 Excises
5122 Profits of fiscal monopolies
5123 Customs and import duties
5124 Taxes on exports
5125 Taxes on investment goods
5126 Taxes on specific services
5127 Other taxes on international trade and transactions
5128 Other taxes on specific goods and services
5130 Unallocable as between 5110 and 5120
5200 Taxes on use of goods, or on permission to use goods or perform activities
5210 Recurrent taxes
5211 Paid by households in respect of motor vehicles
5212 Paid by others in respect of motor vehicles
5213 Other recurrent taxes
5220 Non-recurrent taxes
5300 Unallocable as between 5100 and 5200
6000 Other taxes
6100 Paid solely by business
6200 Paid by other than business or unidentifiable
Selected Bibliography:


