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MASTER´S FINAL WORK

DISSERTATION

TAX EFFORT DETERMINANTS IN LATIN AMERICA

KELLY VAN VUGT

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SUPERVISION:
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You have power over your mind, not outside events. Realize this, and you will find strength. – Marcus Aurelius

CPI – Consumer Price Index

ENP – Effective Number of Parties

GDP – Gross Domestic Product

GNP – Gross National Product

GMM – Generalized Method of Moments

IMF – International Monetary Fund

JEL – Journal of Economic Literature

LCN – Latin America and the Caribbean

MFW – Master's Final Work

NRGI - Natural Resource Governance Institute

OECD – Organisation for Economic Co-operation and Development

OLS – Ordinary Least Squares

SFA – Stochastic Frontier Analysis

WDI – Worldwide Development Indicators

WGI - Worldwide Governance Indicators

ABSTRACT AND KEYWORDS

Tax revenues form an essential contribution to public expenditures and are ordinarily a distress for developing countries to which Latin America is no exception. Over the years, this topic has become of increasing interest, as countries are urged to enhance their tax system for inclusive economic growth. Addressing their generally low tax effort is of great importance in reaching the latter. This dissertation complements the existing literature on tax effort determinants. The aim of this research is to identify the main determinants of tax effort in Latin America and the Caribbean (LCN region) over the period 2007-2018. The explanatory variables have been classified in 5 separate clusters: fiscal-, economic-, structural-, institutional-, and other determinants. Through OLS regression it was found that the openness of the economy, the share of agriculture in the economy, inflation and the level of income inequality are determinants that increase tax effort. On the contrary, control of corruption, economic development, and government expenditures were found to reduce countries their tax effort.

KEYWORDS: Tax Burden; Tax Effort; Tax Capacity; Latin America; Bird Index; Frank Index

RESUMO E PALAVRAS-CHAVE

As receitas fiscais constituem uma contribuição essencial para os gastos públicos e costumam ser um obstáculo para os países em desenvolvimento, para os quais a América Latina não é a exceção. Com o passar dos anos, este tópico tornou-se cada vez mais interessante, à medida que os países tem a necessidade de melhorar o seu sistema tributário para um crescimento econômico inclusivo. Abordar seu esforço tributário geralmente baixo é de grande importância para alcançar este último. Esta dissertação complementa a literatura existente sobre os determinantes do esforço tributário. O objetivo desta pesquisa é identificar os principais determinantes do esforço tributário na América Latina e no Caribe (região LCN) no período 2007-2018. As variáveis explicativas foram classificadas em 5 grupos distintos: fiscais, econômicos, estruturais, institucionais e outros determinantes. Por meio da regressão OLS, constatou-se que a abertura da economia, a participação da agricultura na economia, a inflação e o nível de desigualdade de renda são determinantes que aumentam o esforço tributário. Ao contrário, o controle da corrupção, o desenvolvimento econômico e os gastos do governo reduzem o esforço tributário de um país.

PALAVRAS-CHAVE: Carga Fiscal; Esforço Fiscal; Capacidade Fiscal; América Latina; Índice de Bird Index; Índice de Frank.

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1. INTRODUCTION

Tax revenues form an essential contribution to public expenditures and are ordinarily a distress for developing countries to which Latin America is no exception. Over the years, this topic has become of increasing interest, as countries are urged to enhance their tax system for the purpose of inclusive economic growth. Key global organizations, for example the IMF, the OECD, the UN, and the World Bank, have urged local governments to make their tax systems stricter/more effective, as domestic resources need to be exploited to reach Sustainable Development Goals (SDGs). Or, like UN Secretary-General António Guterres said: *"I call upon the international community to establish effective mechanisms to combat tax evasion, money laundering and illicit financial flows, so that developing countries could better mobilize their own resources,"* (United Nations, 2018).

Moreover, many developing countries are reliable on foreign aid/loans regarding public expenditures, particularly for addressing deficits/debts. Now that international aid policies became stricter, respective countries are required to enhance their tax system for enabling larger public expenditures through increased tax effort (Bashayreh & Oran, 2016).

Since Latin America is a broad region contemplating large economical-, social-, institutional- and demographic differences; each country's political systems/-effectiveness vary widely. The latter is also visible in the respective tax systems enforced by the national government, which play a leading role. Striking is the diversity in tax burdens across the countries, especially compared to the smaller differences in Europe (Bernardi, Barreix, Marenzi, & profeta, 2007). The majority of developing countries need to enlarge their governmental expenditures on public infrastructure, education, health services, etc., to support growth/development. However, for this purpose an enhanced level of their generally low tax effort[1] is required.

This dissertation complements the existing literature on tax effort determinant, however, concretely focuses on the LCN-region. In addition, a large set of determinants is considered, including political variables, of which for this region in specific no

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[1] The percentage of tax revenues over a country's Gross Domestic Product (GDP)

extensive research was available. The aim of this research is to identify the main determinants of tax effort in Latin America and the Caribbean (LCN region[2]) over the period 2007-2018. The specified region concerns mainly developing countries and are commonly analysed conjointly regarding fiscal concerns. Following the aim of this research, the following research questions has been formulated: "What are the main determinants of tax effort in Latin America?"

Panel data for 42 countries from the LCN-region was gathered over the period 2007 to 2018. The data was retrieved from the Worldwide Development indicators (WDI) database of the World Bank and the Worldwide Governance Indicators (WGI). To answer the research question, an OLS regression was performed on the two dependent variables measuring tax effort: The Frank index and the Bird index. The explanatory variables consist of the main tax effort determinants identified in the existing literature and were grouped into five separate clusters: fiscal-, economic-, structural-, institutional- and other determinants.

The regression results depicted that the openness of the economy, the share of agriculture in the economy, inflation, and the level of income inequality are determinants that increase tax effort. On the contrary, control of corruption, economic development, and government expenditures were found to reduce tax effort.

This paper is structured as followed; First, a literature review is provided in Section 2, covering the main tax effort determinants and their expected effect on tax effort. Subsequently, the research methodology is elaborated in Section 3, listing the variables included in the regression model, the diagnostic tests applied, the regression model and the descriptive statistics. Hereafter, the regression results are presented and interpreted in Section 4, attempting to answer the research question. And lastly, the conclusion is drawn in Section 5 in conjunction with the limitations and the possible future research.

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[2]*In this report, the LCN region refers to the following (42) countries: Antigua and Barbuda, Argentina, Aruba, Bahamas, Barbados, Belize, Bolivia, Brazil, British Virgin Islands, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Curacao, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Sint Maarten (Dutch part), St. Kitts and Nevis, St. Lucia, St. Martin (French part), St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Turks and Caicos Islands, Uruguay, Venezuela and Virgin Islands (U.S.).*

2. LITERATURE REVIEW

This literature review has been structured as followed; first, tax effort and the related concepts will be described in general terms in section 2.1, followed by an explanation on how tax effort can be measured in section 2.2. Finally, an outline of previous studies on tax effort is provided in section 2.3, highlighting the main tax effort determinants identified based on the existing literature.

2.1. Tax Effort in General Terms

As the starting point for elaborating on tax effort, it is important to define the two related terms: tax burden and tax capacity.

Tax burden outlines the balance of the public sector in opposition to the private sector. In relative terms the tax burden can be referred to as "the share of national income taken by taxes" (Bird, 1964). It indicates the amount of income residents need to pay to sustain the governmental instances. Nonetheless, part of the taxes flows back to their original source. Partially directly in the form of national income, for example wages paid to personnel. A limitation of measuring the tax burden is that it is unknown to which extend the taxes flow back directly to their original source. (Frank & Frank, 1959)

In short, tax capacity is the ability of a government instance to finance its public services. In more detail, it can be described as "the maximum amount which a nation can contribute towards the support of the government without inflicting damage on the power and will to produce". Key factors influencing a country's tax capacity include the population size, income distribution, taxation character and -purpose, government reliability, standard of living, and inflation.

Subsequently, tax effort can be defined as the extent to which the tax capacity is exploited. It measures the effort a country devotes to raising tax revenues (Economics Concepts, n.d.). The phenomenon is frequently used as an indicator of economic development and as a reference point for tax reforms/adequacy of government revenues (Bolnick, 2013). Tax effort analysis encourages policy discussions to identify required measures to reach development goals (Cyan, Martinez-Vazquez, & Vulovic, 2013).

The three terms described above relate in such a way that keeping the tax burden constant; a higher tax capacity will result in a lower tax effort. Hence, the different tax capacities of countries are to be considered in making tax burden/effort comparisons.

2.2. Measuring Tax Effort

To measure the tax effort of one country or region in specific, one could use the total tax collections as a measure of tax burden/tax effort. However, when comparisons between countries or regions are to be made, this presumably will not provide meaningful insights, unless the required similarity in income and population is present. One of the commonly used measures of tax effort is total taxes as a percentage of total income. Although this measure takes varying incomes into account, it fails to capture the differences in populations size. Another frequently used measure to make comparisons between countries is total taxes per capita, in which tax revenues are adjusted for the size of the population. Nevertheless, in this measure the varying incomes are neglected. To eliminate both shortcomings in the measurement of tax effort two indices emerged: The Frank Index and the Bird Index, which will be described in further detail in below.

2.2.1. Frank Index

In 1959, Henry J. Frank carried out a research aiming to compare the tax burden of 48 US State between 1953 and 1957 in his work 'Measuring Tax State burdens'. He defined an index of tax sacrifice, called the 'Frank Index' in which he combined the two previously defined measures: total taxes per capita and total taxes as a percentage of total income. Three data-inputs are required to calculate the index: population size, personal income and tax revenues. To obtain the output of the index, taxes as a percentage of personal income is calculated and divided by the calculated per capita personal income. The outcome represents the tax collection per capita in percentage of personal income, or in other words; the individual taxes paid in percentages per unit of income. In addition to measuring changes over time, the Frank index enables the comparison of tax sacrifice between different states, regions, countries, etc. over the same period. It should be noted, however, that the index is based on averages and estimates, and therefore does not provide a realistic view on the actual division of taxes between the members of a population. Only in the perfect world, the taxes would be equally divided among each member. (Frank & Frank, 1959)

2.2.2. Bird Index

Five years after the Frank Index was created Richard Bird developed the Bird Index in 1964 in his work 'A note on "tax sacrifice" comparisons'. Similar to the Frank Index, it functions as a measure of tax sacrifice, however, the Bird index was designed to make comparisons between a collection of countries, primarily from Latin American and Europe, rather than different states. Bird describes tax sacrifice as *"the relative importance to the citizens of the resources given up to government in countries at different levels of income"*. He points out that the Frank Index, despite that it was already an improvement to the traditional measure of tax burden: taxes divided by income, is mainly applicable as a ranking index and not as a realistic measure of tax sacrifice. Bird criticizes that the share of national income taken by taxes, that Frank used as a measure of relative tax burden in his formula, fails to capture the effort needed to generate the income that is used in the denominator. Unregular revenues, for example exchange profits and social security funds, are not considered and might cause preposterous outcomes impeding the comparability. To avoid this shortcoming Bird introduced the use of disposable income (total income minus government revenues) in the denominator instead. This is the main differentiation from the Frank Index, allowing an enhanced comparability between varying income levels. Nevertheless, Bird points out that, due to a lack of administrative capacity and the frequent occurrence of non-market transactions, the tax sacrifice of poor countries easily gets overestimated. (Bird, 1964)

Although Frank and Bird already mention several tax effort determinants in their research, such as income distribution, openness of the economy and tax administration, they have not incorporated these factors in their calculations of the tax sacrifice indices. The following chapter will cover the determinants of tax effort identified in the existing literature.

2.3. Tax Effort Determinants

There exists a broad level of tax effort determinants. The variables identified are considered relevant for the purpose of this research and will be described in the subsequent subtopics: Fiscal-, Economic-, Institutional- and Other determinants.

2.3.1. Fiscal Determinants

2.3.1.1. Tax revenues

As mentioned already in the previous section, tax revenues, either measured as total tax revenues or tax revenue per capita, are required variables in tax effort studies. In line with Frank (1959) and Bird (1964), also the subsequent studies have used these fiscal determinants in their research. Nevertheless, tax revenue variables are incorporated in the measurement of tax effort itself, rather than their impact on tax effort or tax capacity can be studied. By default, higher total tax revenues as well as higher tax revenues per capita are expected to increase the tax effort.

2.3.2. Economic Determinants

2.3.2.1. Economic development

To start with, the level of economic development of a country plays an essential role in its level of taxable capacity, and therewith in its tax effort. Economic development is ordinarily approximated based on a country's GDP per capita *(see Appendix 1 and 2)*. Nonetheless, Frank (1959), Lotz & Morss (1967) and Chelliah, Baas, & Kelly (1975) used Gross National Product (GNP) instead. GDP includes all income produced within the country, which includes the income of non-residents but does not consider income that was generated abroad by residents. GNP on the other hand is all the income that remains within the country, so income of non-residents excluded, but income generated abroad by residents included. Commonly, the GDP is higher than the GNP for developing countries, with the benefit that income from non-residents, but produced in the country, can be taxed. Other alternatives measure of national income are Net National Product (NNP) and National Income at market price (NI) (Lotz & Morss, 1967). Regardless of which measure used, the following expectation applies: the higher the level of economic development, the higher the income and respectively the higher the expected tax revenue (Cyan, Martinez-Vazquez, & Vulovic, 2013). Therefore, a higher GDP per capita is expected to increase tax effort, despite the larger tax capacity it is also associated with.

2.3.2.2. Openness of the economy

In addition, the degree of openness of an economy to international trade can have an ambiguous effect on tax revenues. Tax capacity could decrease because the import- and

export taxes are being reduced to open the economy, and in many Latin American countries, exports are being exempted from income tax. Moreover, an open economy allows for a higher revenue-/tax base mobilization, which potentially reduces tax capacity (Pessino & Fenochietto, 2010). On the contrary, increased economic activity through foreign trade provides a country with higher revenues from VAT on imports; the so-called 'tax handle' (Bernardi, Barreix, Marenzi, & profeta, 2007) also enlarging the tax capacity. Moreover, the enhanced customs procedures, occurring in more specific import-/export locations, make imports more easily taxable (Cyan, Martinez-Vazquez, & Vulovic, 2013). Most researchers have used Trade (exports plus imports as a percentage of GDP) as a measure of openness of the economy. However, Chelliah, Baas, & Kelly & (1975) showed that non-mineral exports as a percentage of GDP offers an alternative measure. A notable outcome of their research was that tax on international trade was the key contributor of total taxes (Chelliah, Baas, & Kelly, 1975). Overall, the positive effects of an open economy are expected to overrule, and consequently to increase the tax capacity and therewith decrease tax effort.

2.3.2.3. Inflation

Finally, inflation can be considered concerning tax collection. Generating resources by printing money naturally causes inflation, creating a negative impact on the taxable capacity. Therefore, a country its tax effort is expected to increase if governments conduct printing for resource obtainment. Inflation can be measure by the Consumer Price Index (CPI). (Pessino & Fenochietto, 2010).

2.3.3. Structural Determinants

Tax capacity is not exclusively relying on the level of income itself, but also on the sectoral composition, as different sectors have highly differing taxable surpluses.

2.3.3.1. Sectoral structure

The sectoral structure of an economy is correlated with the ease of tax collection. Specific economic sectors are traditionally exempted from taxes by some national governments. For example, agriculture and services, whereas revenues from construction are frequently generated informally and therefore difficult to tax (Pessino & Fenochietto, 2010) (Cyan, Martinez-Vazquez, & Vulovic, 2013). Consequently, a larger percentage share of a country's GDP in respective sectors lowers tax capacity, hence increases tax

effort (Mertens, 2003). At the same time, a substantial agriculture sector possibly reduces the commonly urban-based required expenditures on public goods and services, putting less pressure on collecting tax revenues lowering the tax effort (Rahim & Asma, 2019). In addition, Bahl (1971) has shown in his research on tax capacity in 49 developing countries that a higher share of mining leads to an enhanced tax capacity thus lower tax effort. The latter also holds for the research of Chelliah, Baas & Kelly (1975). They pointed out that mining emerged as an important tax determinant for developing countries, which can be explained by their substantial seller´s market in minerals (Chelliah, Baas, & Kelly, 1975). On the contrary, Bashayreh & Oran (2016), found a positive relation between mining and tax effort, with the explanation that mining-dependent countries are considered low development countries generating lower incomes and thus lower tax capacities (Bashayreh & Oran, 2016). Two other sectors to consider, industry and manufacturing, were shown to have a positive effect on potential tax revenues. As industrial businesses are naturally easier to tax (Castro & Camarillo, 2014), and manufacturing enables higher volumes of exports, attributing to a higher tax capacity possibly lowering tax effort. (Bashayreh & Oran, 2016).

Moreover, Bahl (1971) indicated that the three factors described previously; economic development, openness of the economy and sectoral structure are interdependent in such a way that poorly developed countries do not only have a larger share of agriculture in income, but also show significantly lower levels of import and export. Whereas the economy of more developed countries is generally more open. In specific countries that developed through the means of oil/mineral exportation show significantly higher import and export shares in the composition of the GDP, also in relation to countries that developed mainly through the means of import substitution and the exportation of non-mining products (Bahl, 1971).

2.3.4. Institutional Determinants

As previously mentioned, tax effort is the extent to which the tax capacity is exploited. The difference between both terms is commonly labelled as collection inefficiencies and/or tax policy issues. Respective inefficiencies include, but are not limited to, poor tax administration, government ineffectiveness, low enforcement, and foremost, corruption (Pessino & Fenochietto, 2010).

2.3.4.1. Corruption

Corruption is frequently used as a variable in tax effort estimation models. The latter is expected to negatively impact tax collection, and moreover, adds margins to legitimately paid taxes. Off the record corruption charges do not only make the actual effective tax rates higher than on record, but also reduces the contribution to public investments such as health services and education (Pessino & Fenochietto, 2010). It is therefore not surprising that increased tax rates are answered with resistance and evasion in countries where corruption is a given. The latter further increases the tax burden on the actual taxpayers, for which corruption is likely to increase tax effort. Voluntary tax compliance is dependent on the quality of government institutions. Improved voice or accountability and reduced corruption can be crucial factors for the authorities to gain legitimacy (Bird, Martinez-Vazquez, & Torgler, 2008). As a final note, corruption works adversely to foreign investors, having a negative impact on economic activity, and consequently, the tax base (Cyan, Martinez-Vazquez, & Vulovic, 2013).

2.3.4.2. Voice & accountability

Previous studies have shown that tax systems of democracies are generally more efficient. Moreover, a higher level of fractionalization indicates a better citizen representation, and therewith not only a higher proficiency of public services, but also an enhanced political stability less prone to radical reforms (Cyan, Martinez-Vazquez, & Vulovic, 2013). The measure used by Cyan Martinez-Vasquez & Vulvoic (2013) to consider this factor in their research is Voice and Accountability. Alternative measures used to capture the extend of democracy are Political Rights (Castro & Camarillo, 2014) (Dioda, 2012) and Effective Number of Parties (ENP´s) (Garg, Goyal, & Pal, 2017). Since a higher level of democracy can enhance the image of a government through the eyes of taxpayers it is expected to lower tax evasion and enhance tax compliance (Dioda, 2012). Consequently, a lower tax burden on each individual is anticipated.

2.3.4.3. Rule of law

Rule of law observes the willingness of all parties within a society to obey the laws, and the trust they have in the latter. Covering laws regarding human-, contract-, and property rights, and how they are enforced. Transparency and fairness provided by the government are a key factor. Moreover, rule of law relates to the probability of criminal

activity and violence to occur (Kaufmann & Kraay, 2021) (World Justice Project, 2020). Alternative measures to Rule of law are the Law-and-order Index (Garg, Goyal, & Pal, 2017) and the Civil liberties Index (Castro & Camarillo, 2014) (Dioda, 2012). In line with a higher level of democracy, more liberties are expected to increase tax capacity, as it is likely to enhance the trust in the government and therewith creates more willingness to comply to tax regulations. In addition, more social freedom can also encourage economic activity and the establishment of new businesses (Castro & Camarillo, 2014).

2.3.4.4. Government effectiveness

The role of institutions can be added to the variables determining tax effort. (Bird, Martinez-Vazquez, & Torgler, 2008). Institutions can be inadequate to collect revenues because of outdated systems, lack of documentation, inaccurate records, etc. Administrative shortfalls can include tax avoidance/evasion, administrative- and compliance costs, and the taxation process (tax assessment-, collection- and enforcement methods). These elements are frequently neglected in tax studies, while they can have a profound impact on the results of a tax system. Modernized business accounting can be considered one of the most essential factors to efficiently enforce taxes as the use of banking channels enlarges the observability of transactions. Overall, a higher quality of institutions is expected to positively affect tax capacity. To obtain an enhanced tax administration, however, a higher level of expenditures is required to cover the costs of administration, which for many Latin American countries is unattainable. Le, Moreno-Dodson, & Bayraktar (2012) included the Bureaucracy quality index in their research to account for government effectiveness and mentioned that enhances institutional quality could possibly increase tax collections without allocating any additional burden to the economy. (Bird, 2015) (Le, Moreno-Dodson, & Bayraktar, 2012)

2.3.5. Other Determinants

The tax base and consequently the tax effort of a country can also be affected by social-, demographic-, and budgetary aspects. For demographics this commonly concerns an ambiguous effect (Cyan, Martinez-Vazquez, & Vulovic, 2013).

2.3.5.1. Income distribution

Starting with the social determinant income distribution; The more equal the income distribution, the higher the expected tax compliance/collection and vice versa (Pessino &

Fenochietto, 2010). Previous studies, of which a well-known example is Bird et al. (2004) have indicated a negative effect from income inequality on the tax base. The GINI coefficient was adopted to measure this variable, which assesses the extent to which the income distribution of individuals deviates from an equal distribution (Cyan, Martinez-Vazquez, & Vulovic, 2013). Regarding Latin America in specific, there can be referred to a structural 'excess of inequality' (Bernardi, Barreix, Marenzi, & profeta, 2007). Hence, a higher inequality is expected to increase a country its tax effort. Nevertheless, Garg, Goyal & Pal (2017) mention that income inequality can have an ambiguous effect on tax capacity. Since inequality for countries generating a large portion of tax revenues from sales tax could also lead to an increase in tax capacity.

2.3.5.2. Level of education

Secondly, tax compliance improves with a higher education level, as such individuals are generally more familiarized with the necessity of tax payments. In previous studies countries their total public spending on education as a percentage of GDP have commonly been used to approximate the education level of tax contributors, as more specific data is not always obtainable nor comparable for each country (Pessino & Fenochietto, 2010). Alternative measures used are tertiary school enrolment (Castro & Camarillo, 2014), Education Index (Cyan, Martinez-Vazquez, & Vulovic, 2013) and literacy rate (Garg, Goyal, & Pal, 2017). Although better education is expected to increase tax revenues and tax effort, it could also decrease tax effort due to the enhanced tax capacity from superior tax compliance.

2.3.5.3. Infant mortality

Thirdly, a country its infant mortality rate can function as an indicator for both the stage of development and the level of social security. People that feel safe and secure with the provision of decent medical care are expected to work closer to their competency, enabling increased productivity and economic participation. Following this reasoning, a higher infant mortality rate is expected to reduce a country its protentional to collect taxes, and thus to increase tax effort. (Castro & Camarillo, 2014)

2.3.5.4. Population growth

Fourthly, population growth was proven to have a significantly negative impact on countries their tax collection abilities and therefore is likely to reduce tax effort. The

underlying explanation is that it gets more troublesome to efficiently enforce taxes on a fast-growing population. The measure for this determinant was the population growth rate (between the ages of 15-64 years). (Bird, Martinez-Vazquez, & Torgler, 2008) (Le, Moreno-Dodson, & Bayraktar, 2012). Nevertheless, Cyan, Martinez-Vazquez, & Vulovic (2013) found a positive effect of population growth on tax effort. Although this was conflicting with their expectation, they speculated that a growing population could increase the pressure on governments to generate more revenues for financing the increased level of required government expenditures.

2.3.5.5. Age dependency

The demographic variable age dependency has been included in previous research with the expectation that it negatively effects tax capacity. Although Le, Moreno-Dodson, & Bayraktar (2012) did not find any significant relation, Cyan, Martinez-Vazquez, & Vulovic (2013) were able to prove that a higher age dependency, and thus a relatively smaller workforce, can have a significant impact. (Le, Moreno-Dodson, & Bayraktar, 2012) (Cyan, Martinez-Vazquez, & Vulovic, 2013)

2.3.5.6. Labour force participation

A higher labour force participation is expected to have negative effect on tax effort. Since more employment creates a higher tax base, the enlarged tax capacity is likely to lower the overall tax effort (Garg, Goyal, & Pal, 2017).

2.3.5.7. Government expenditure

In addition, it has been found that government expenditure can have a positive effect on tax effort. It represents the amount of public goods and services that was offered by the government to the population; the more the government attributes to the public, the more willing citizens are to comply to tax regulations (Garg, Goyal, & Pal, 2017).

2.3.5.8. Government debt

At the same time, government debt can be positively associated with tax effort. Keeping in mind that debt needs repayment in the future, it can function as a motivation to increase the tax collection efficiency. (Cyan, Martinez-Vazquez, & Vulovic, 2013)

3. METHODOLOGY AND DATA

In this section, the data selection and the methodology of the research will be outlined, which have been based on the relevant variables identified in the literature review. Including a description of the sample selection, the dependent- and explanatory variables, the descriptive statistics, and finally, the regression model.

3.1. Research question

The aim of this research is to study tax effort in Latin America and the Caribbean to identify the main tax effort determinants in this region. The research has been narrowed down for the period of 2007-2018 and has as main objective to answer the following research question: "*What are the main determinants of tax effort in Latin America*"

3.2. Sample description

The sample covers panel data for 42 countries from the LCN-region including 12 time-observations over the period 2007 – 2018. The included countries are comparable in geographical terms, which according to previous studies, enhances the significance level of the results (Castro & Camarillo, 2014). In total, the sample consisted of 504 observations. However, it should be noted that due to insufficient data availability, the actual number of observations for the majority of the variables was lower.

3.3. The dataset

The data for both the dependent and the control variables are extracted from the 'Worldwide Development indicators (WDI)' database (The World Bank Group, 2021), except for the political variables. These have been retrieved from the 'Worldwide Governance Indicators (WGI)' (Kaufmann & Kraay, 2021) dataset which was produced through a collaboration between the World Bank, the Natural Resource Governance Institute (NRGI) and Brookings.

3.3.1. Dependent Variable

The dependent variable, Tax effort, has been calculated in two distinctive ways; based on the Frank Index and the Bird Index. Both indices can be used to measure the effect of the independent variables identified in the literature on tax effort. The data required per country for the calculations are: Total tax revenues in current USD (T), GDP in current USD (Y) and Population (P).

Frank Index: The original formula for the Frank Index looks as followed:

(1) $TE = \left(\frac{T}{Y}\right) \div \left(\frac{Y}{P}\right)$

However, for comparison purposes, the original computation for the Frank Index can be slightly altered. This can be done by multiplying twice by 100 in line with the calculation of the Bird index (Cavadas, 2018), which gives the following formula:

(2) $TE = \left[\left(\frac{T}{Y} \times 100\right) \div \frac{Y}{P}\right] \times 100$

Bird Index: The formula applied to compute the Bird Index is the following:

(3) $TE = \left[\left(\frac{T}{Y-T} \times 100\right) \div \frac{Y}{P}\right] \times 100$

The main distinction from the Frank Index is the introduction of the disposable income (Y-T) in the denominator rather than the total income (Y), which enlarges the comparability between varying income levels.

3.3.2. Explanatory Variables

The explanatory variables that will be included in the analysis have been based on the previous literature on tax effort. Nevertheless, the selection has been limited regarding data availability and applicability.

Total tax revenues in current USD (tax_rev) represents the total taxes collected by the government, excluding other obligatory payments received by the government, for example fines and social security contributions (The World Bank Group, 2021). Higher tax revenues are expected to increase tax effort.

GDP per capita in current USD (gdp_pc) is calculated by dividing gross domestic product by the population size. It indicates how much gross value added was generated on average by each resident in the economy in a given year (The World Bank Group, 2021). It has been used as a measure for economic development and is expected to positively affect tax effort.

Inflation, consumer prices in annual percentages (infl) refers to the yearly price change of goods and services for consumers (The World Bank Group, 2021). Inflation is expected to positively impact tax effort.

Trade as a percentage of GDP (trade) represents the openness of the economy. It is calculated by dividing the total of exports and imports of goods and services combined by GDP (The World Bank Group, 2021). An increase in trade is expected to reduce tax effort.

Imports of goods and services as a percentage of GDP (imports) refers to the total value of goods and services a country received from abroad as a share of GDP (The World Bank Group, 2021). Like trade, imports are expected to positively affect tax effort.

Agriculture, value added as a percentage of GDP (agric) signifies the total net value of outputs generated in the agriculture sector as a share of GDP. Apart from farming this sector also incorporates fishing, forestry, and hunting (The World Bank Group, 2021). Based on the existing theory, a positive impact on tax effort is anticipated.

Industry, value added as a percentage of GDP (ind) covers the total net value of outputs generated in the industry sector as a share of GDP. Apart from mining, manufacturing, and construction, the sector also includes electricity, water, and gas (The World Bank Group, 2021). A negative association with tax effort is expected.

Services, value added as a percentage of GDP (serv) represents the total net value of intangible outputs generated as a share of GDP. In addition to wholesale trade, retail trade and transport, this sector also comprises government-, financial-, professional-, and personal services. For which examples are schooling, medical care, and real property services (The World Bank Group, 2021). A positive effect on tax effort is anticipated.

Control of Corruption in Percentile Rank (corrp) specifies to what degree public authority is abused for personal benefits either by elites or private interests, and moreover which power elites and private interests have over the state (Kaufmann & Kraay, 2021). The score can variate from 0 (lowest) to 100 (highest), where 100 indicates the lowest level of corruption attainable. A higher control of corruption is expected to decrease tax effort (DanielKaufmann, AartKraayand, & MassimoMastruzzi, 2010).

Voice and Accountability in Percentile Rank (account) represents the perceived level of input the inhabitants have in compiling their government, and their level of freedom in speech, coalition, and media (Kaufmann & Kraay, 2021). A better voice and accountability is expected to lower tax effort.

Rule of Law in Percentile Rank (r_law) observes the willingness of all parties within a society to obey the laws and the trust they have in the laws plus how they are enforced. Moreover, it is an indicator for the probability on criminal activity/violence (Kaufmann & Kraay, 2021). Like democracy, more civil liberties are expected to lower tax effort.

Government Effectiveness in Percentile Rank (gov_ef) refers to the quality of public/civil services and implemented policies, as well as the government compliance to such policies (Kaufmann & Kraay, 2021). A negative effect on tax effort is anticipated.

Gini index World Bank estimate (gini) identifies to which degree the income distribution of individuals or households differs from an equal distribution, where 0 stands for perfect equality and 100 for perfect inequality (The World Bank Group, 2021). From the theory can be derived that inequality is expected to positively affect tax effort.

Population growth in annual percentage (pop_g) signifies the yearly percentual increase in the population size of any midyear compared to the previous midyear, all residents included irrespective of their citizenship or legal status (The World Bank Group, 2021). From the literature a negative relation to tax effort is expected.

Infant mortality rate per 1,000 live births (inf_mor) defines the number new-borns, per 1,000 births within a specified year, that pass away before their first birthday (The World Bank Group, 2021). A positive impact on tax effort is expected.

Age dependency ratio as a percentage of the working-age population (age_depen) depicts the number of dependent people, everyone below the age of 15 or above 64, per 100 working-age population, everyone aged between the age of 15 to 64 years (The World Bank Group, 2021). From previous research, a positive effect on tax effort is anticipated.

Labor force participation rate as a percentage of total population ages 15+ (labor_part) represents which share of the population provides an active contribution to the economy in terms of labour, exclusively considering ages of 15 years and above (The World Bank Group, 2021). A higher ratio is expected to reduce tax effort.

Total government expenditure on education as a percentage of GDP (educ_gdp) represents all expenses made by the general government on education as a share of GDP, including expenses that were covered by international funds (The World Bank Group, 2021). Higher expenditures are expected to increase tax effort.

General government final consumption expenditure as a percentage of GDP (gov_exp) captures all expenses made by the government for buying both tangible and intangible goods, employee salaries not exempted (The World Bank Group, 2021). From the literature is expected that this variable positively relates to tax effort.

Central government debt, total as a percentage of GDP (gov_debt) refers to all due government liabilities, domestic and foreign, minus any financial/equity derivatives owned by the government on a certain moment in time. (The World Bank Group, 2021). A positive association with tax effort is expected.

3.4. Diagnostic tests

To verify if the compiled dataset is suitable to be used in an Ordinary Least Squares (OLS) regression, several diagnostics tests have been performed and explained in below. Moreover, the list of the descriptive statistics will be presented.

3.4.1. Testing the dependent variables

After calculating both the Frank and the Bird index, their histograms, Figure 1 and 7 of the appendices, showed a rather skewed distribution. To bring the distribution of the indices closer to a normal distribution, a logarithmic transformation had to be made, of which the histograms can be found in Figure 4 and 10 of the appendices (Andy, 2019). In addition, the kernel density estimations of the logged indices, depicted in Figure 5 and Figure 11, affirm the variables follow a normal distribution. A kernel density estimation adopts a kernel function on every data point to estimate an unknown probability density function, different to a where the amount of data points in more random areas is counted (statsmodels, 2021). Finally, the residual plots, Figure 6 and 12 respectively, appear to be near to linear. This evidences that the error terms follow a normal distribution.

3.4.2. Testing the independent variables

Like for the dependent variables, logarithmic transformations were made for two of the independent variables, GDP per capita and total tax revenues, due to their high variety in incomes/revenues. This resulted in a lowered standard deviation and a more normalized distribution for both variables.

Hereafter, the correlation matrix, presented in Table 4 of the appendices, was created to detect if any multicollinearity exists between the independent variables.

Multicollinearity creates large standard errors and doubtful p-values in assessing the significance of variables, which should be avoided. From the table can be derived that there is a strong presence of multicollinearity, all variables below -0.6 and above 0.6, meaning precautions need to be made in running the regressions. Considering a strong correlation exists among the political variables only corruption will be included in the regression model as all four would bring similar results. Hence, voice & accountability, rule of law, and government efficiency will be excluded. Regarding the structural variables only agriculture will be included, meaning industry and service will be dropped. Following the same reasoning, infant mortality, age dependency, log tax revenues, imports, industry, services, education, and government debt were also excluded from the regression model. Nevertheless, four separate regressions will need to be ran as multicollinearity remains between the included variables.

Another common complication for multiple regression analysis is heteroscedasticity. Heteroscedasticity can be described as *"a systematic change in the variance of residuals over a range of measured values"* and makes the standard errors that are displayed in the regression results unsound. To test whether heteroscedasticity is present in the model, the Breusch-Pagan test has been performed. When the p-value of the test is above the specified limit of 0.1, the null hypothesis that states no heteroscedasticity is present can be accepted. With a p-value of 0.18 it can be concluded that no heteroscedasticity is present assuming that the variance of the error terms is constant (Zach, 2020). Nevertheless, robust standard errors were used in the regressions.

Consequently, the Wald test was used to verify if the independent variables included in the model have any explanatory power in terms of the dependent variable, or in other words, if they are significant. The null hypothesis states that the coefficients of the explanatory variables combined are equal to zero, implying that the variables can be excluded from the model without affecting the model substantially. When the p-value of the test is below the specified limit (0.1), the null hypothesis will be rejected, which was the case for this research. As the obtained p-value is 0.00, no variables were removed. (Stephanie, 2016) (UCLA: Statistical Consulting Group, n.d.)

3.5. Regression model

Having tested and amended both the dependent- and the independent variables for any discrepancies, the regression model has been formulated as followed:

$$TE_i = \propto + \beta_1 labor\_part + \beta_2 gini + \beta_3 corrp + \beta_4 pop\_g + \beta_5 \log\_gdp\_pc$$
$$+ \beta_6 gov\_exp + \beta_7 trade + \beta_8 agric + \beta_9 infl + \varepsilon_i$$

Legend:

TE_i = dependent variables

$\propto$ = constant

β_x = slope coefficient of the independent variables

ε = error term

3.6. Descriptive statistics

In below the descriptive statistics of the dataset have been presented.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
log_frank	256	-1.563094	0.755371	-3.321694	0.211832
log_bird	256	-1.379478	0.7739665	-3.20112	0.3977383
log_gdp_pc	468	9.100728	0.889551	6.888685	11.3628
log_tax_rev	256	7.09324	0.8226178	5.215386	8.740772
infl	397	5.519909	15.08158	-3.09299	254.9485
trade	386	90.175	75.4474	22.10598	860.8
imports	386	47.97631	37.80899	11.2546	427.5765
agric	438	6.632565	5.71246	0.0751547	31.72752
ind	438	24.50464	10.24922	6.813325	63.97826
serv	438	60.36421	10.91795	35.1757	87.60998
corrp	444	53.56636	24.77674	4.326923	92.891
account	439	59.57225	20.23897	3.365385	92.61084
r_law	444	48.33664	24.73825	0.4694836	90.04739
gov_ef	444	53.15336	21.89322	0.9615384	91.26214
gini	168	47.50357	4.152251	38	55.8
pop_g	504	0.9736369	0.8868179	-4.048391	5.52304
inf_mor	396	17.44848	9.670753	3.9	85.4
age_depen	420	53.92925	7.846426	39.53863	83.33713
labor_part	372	63.5961	6.63538	40.18	79.08
educ_gdp	223	4.878001	1.676148	2.04679	14.05908
gov_exp	345	15.06834	5.672028	6.552417	42.74598
gov_debt	120	62.55093	32.21234	15.928	141.7288
income_group	504	2.119048	0.9817997	1	4

4. RESULTS

In this section the regression results will be analysed and interpreted with as main objective to answer to the research question on what the main tax efforts determinants are within Latin America and the Caribbean.

4.1. Ordinary-Least-Squares (OLS) Method

In Table 5 and 6 from the appendices the output of the OLS regressions for the log of the Frank- and respectively the Bird index are presented. The results of both indices are highly resembling. As previously mentioned, several regressions had to be ran due to the presence of multicollinearity. Country and year effects were applied to each regression.

From the results can be derived that no clear relation was found between the GINI-coefficient and tax effort, however, the results tend to lean towards a positive association. Although a significant positive relation exists between the Gini-coefficient and tax effort in the first and the third regression at 1% level, which was expected from the literature, a significant[3] negative relation appears in the second regression at a 5%[4] level of significance. As Cyan, Martinez Vasquez & Vulovic indicated, income inequality lowers the tax base for which an increase in tax effort is expected. Not only because the tax collection is mostly dependent on the higher income groups, but also because income inequality commonly coincides with activity in the informal sector obstructing tax collection (Cyan, Martinez-Vazquez, & Vulovic, 2013).

In addition, the regression result shows a significant negative relation between control of corruption and tax effort at a 5% level of significance. Implying that the higher the control of corruption, the lower the tax effort. Hence, the more corruption the higher the tax effort. This is in accordance with the existing literature. Pessino & Fenochietto (2010) explained that corruption adds margins to legitimately paid taxes and therefore makes the actual effective tax rates higher than on record increasing the tax burden. Moreover, corruption is associated with tax evasion. which intensifies with any increase in the tax rates. Resulting in a lower tax capacity and an increased tax burden on the actual taxpayers (Cyan, Martinez-Vazquez, & Vulovic, 2013).

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[3] A variable from Table 5 and 6 can be considered significant exclusively when it is significant in most of the regressions.

[4] A significance level can be defended as the likelihood a null hypothesis is falsely rejected.

Concerning the development indicator, log GDP per capita, the results depict a significant negative relationship to tax effort at an 1% level of significance. This result is conflicting with the outcome of previous literature which either found an insignificant- or in most cases a positive significant relation. As a higher GDP per capita is associated with a higher level of development, higher incomes and higher tax revenues, a positive effect on tax effort is expected (Garg, Goyal, & Pal, 2017). Nevertheless, the result can be explained by the superior tax capacity that is associated with a higher GDP per capita, which can indeed lower tax effort. Moreover, Le, Moreno-Dodson & Bayraktar (2012) found that in regressions including institutional variables, GDP per capita was not always significant and moreover could depict a negative sign. The explanation provided is that institutional variables by default incorporate the effect of income. Therefore, GDP per capita, being an income variable, included simultaneously with an institutional variable, can become insignificant (Le, Moreno-Dodson, & Bayraktar, 2012).

More government expenditure is found to reduce tax effort, as the result indicate a significant negative relation at a 1% level of significance for this variable. An 1% increase in government expenditure will decrease tax effort by 0.04%. This is contradictory to the effect that was expected; The willingness to comply to tax regulations should increase when the government allocates more to the public (Garg, Goyal, & Pal, 2017). Possibly the choice of fiscal policy could explain the obtained results. Combining increased government expenditures with lowered tax rates to encourage demand and economic growth (Horton & El-Ganainy, 2020).

A positive and significant relation can be observed from Table 5 and 6 between trade and tax effort at a confidence level of 1%. More specifically, an 1% increase in trade will lead to an 0.01% increase in tax effort. Even though the outcome does not correspond to the expectation, the results can be substantiated through the existing literature which indicated an ambiguous effect from trade on tax effort. Pessino & Fenochietto (2010) explained that the implementation of tax exemptions and low tax rates on imports and exports to open the economy could lower countries their tax capacity. The latter is also true for increased tax mobilization. Hence, a more open economy can increase tax effort.

Regarding the variable agriculture, a significant positive relation to tax effort was obtained at a 1% level of significance for both indices, apart from one regressions of the

Bird index that showed a significance level of 5%. Confirming the expectation from previous research, the results imply that a higher share of agriculture in GDP elevates the level of tax effort. Since agriculture is traditionally exempted from taxes by some national governments, countries generally experience difficulties collecting taxes in this sector (Pessino & Fenochietto, 2010).

Finally, the results indicate that inflation has a significant positive effect on tax effort at a confidence level of 1%, affirming the expectation based on previous literature. Pessino & Fenochietto (2010) proved that inflation is accompanied by higher inefficiency in tax collection. Since inflation lowers the purchase power of individuals, the tax burden will increase with the occurrence of inflation.

4.2. Arellano-Bond Estimator

A robustness test was carried out to identify any model uncertainty. A respective test analyses the likeliness that the estimated effects presented in Table 5 and 6 will change in response to any changes in the model specification (Neumayer & Plümper, n.d.). The method adopted for the latter is the Arellano-Bond approach, which addresses potential endogeneity. The approach was defined by Arellano and Bond (1991) and Arellano and Bover (1995) and applies a Generalized Method of Moments (GMM) estimator to estimate dynamic models of panel data. In more detail, the approach formulates a new equation on the first differences of the dependent variable, using the lag of the dependent variable as an explanatory variable and the first differences of the exogenous (explanatory) variables. (Castro & Camarillo, 2014) (StataCorp, s.d.)

In Table 7 and 8 from the appendices the results of the GMM differences estimator for the log of the Frank and the log of the Bird index are presented. The results are partially conflicting with the OLS results presented in Table 5 and 6. The lagged dependent variables appear significant at a 1% level of significance. The lagged explanatory variables log GDP per capita, and agriculture have a significant negative impact on tax effort for both indices, of which the former is in line with the OLS output. The trade variable was only significant for the Bird index with a negative sign contrasting the OLS output. In addition, the Gini variable was only significant in one of the three regressions with a negative sign, and finally, government expenditure was significant in one of the two regression for each index with a negative sign in line with the OLS results.

5. CONCLUSION

Tax revenues form an essential contribution to public expenditures and are ordinarily a distress for developing countries to which Latin America is no exception. Over the years, this topic has become of increasing interest, as countries are urged to enhance their tax system for inclusive economic growth. Identifying the main tax effort determinants can provide guidance for the required tax reforms. This dissertation complements the existing literature on tax effort determinants, however, concretely focuses on the LCN-region. Hence, the aim of this research is to identify the main determinants of tax effort in Latin America and the Caribbean (LCN region) over the period 2007-2018. The considered determinants were categorized in five separate clusters: fiscal-, economic-, structural-, institutional- and other determinants.

After performing an OLS regression it was found that the following variables are significantly positively related to tax effort: the openness of the economy, the share of agriculture in the economy, and inflation. Meaning that an increase in any of the preceding variables will lead to an increase in tax effort. On the contrary, the following variables were found to be significantly negatively related to tax effort: control of corruption, economic development, and government expenditures. In other words, an increase in these variables is expected to reduce tax effort. The results regarding income inequality were ambiguous, however, an increase in income inequality tends to point towards an increase in tax effort. Moreover, no significant relation was found for the variables labour participation and population growth.

Hence, it can be concluded that the main tax effort determinants in the LCN-region over the studied period are openness of the economy, share of agriculture in the economy, inflation, control of corruption, economic development, and government expenditures.

Nonetheless, the results are subject to several limitations, which could be considered in future research. Regarding the income groups of the countries studied, no separate regressions were performed for the distinctive groups. Like with geographic area, a proximity in income of the countries studied is likely to give more accurate results. Studying the determinants of tax efforts for each income group separately, moreover, enables comparisons. In addition, the timeframe studied was rather narrow, especially considering the moderate data availability. Future research could consider a longer time-

period, also incorporating the effect of the financial crisis. Finally, it could be of interest to include a more extensive selection of explanatory variables. Examples of variables that could be considered in future research are fiscal balance, capital investments, foreign grants, and foreign direct investments.

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Table 2: Literature table

Author	Topic paper	Region/ Period	Dep. Variable	Independent variables	Main conclusions
(Frank, 1959)	Measuring State Tax Burdens	48 US states between 1953 and 1957	Tax Sacrifice	-Taxes as a percentage of personal income -Per capita personal income - (Tax revenues, Income (GNP) & Population size)	- Defined an Index of tax sacrifice in which the two frequently used measures of tax burdens are combined: total taxes per capita and total taxes as a percentage of total income. - Mainly a ranking Index
(Bird, 1964)	A note on "tax sacrifice" comparisons	Number of countries mainly in Latin America and Europe between 1956 - 1960	Tax Sacrifice	-Taxes as a percentage of disposable income -Per capita personal income (Current government revenues, Income (GDP) & Population size)	- Using Current government revenues instead of taxes (the difference is extrabudgetary revenues: social security funds and exchange profits) - The use of disposable income in the denominator is the main difference from the Frank Index, avoiding absurd results.
(Lotz & Morss, 1967)	Measuring "tax effort" in developing countries	72 Developing countries between 1962 and 1966	Tax Capacity	- GNP - GNP per capita - Openness of the economy: (Import + Export) / GNP	- No significant relation of GNP per capita to the tax ratio for high income countries, also not when including the openness of the economy, whereas for low-income countries, both variables were significant. - Moreover, it was found that tax capacity often forms a limitation for the level of tax effort in low-income countries.
(Bahl, 1971)	A Regression Approach to Tax Effort and Tax Ratio Analysis	49 Developing countries between 1966 - 1968	Tax Capacity	- Agriculture share of income (stage of development) - Mining share of income (sectoral composition of the produced income) - Export share of income (size of foreign trade sector)	- Formulated a regression analyses on tax capacity from which also the fiscal capacity can be derived. -Found that there exists a significant negative correlation between agriculture share of income and the tax ratio, affirming the presumption that taxable capacity and the stage of development are negatively related. - On the contrary, a significant positive relation was found between the mining share of income (and through intercorrelation also the export ratio) and the tax ratio, affirming the expectation that more developed countries attained a higher taxable capacity by mineral- and oil exportation. - Finally, it was found that countries developing through the exportation of non-mining products and through income substitution have a taxable capacity in-between the two previously mentioned.

(Chelliah, Baas, & Kelly, 1975)	Tax ratios and tax effort in developing countries, 1969-71	47 Developing countries between 1969 - 1971	Tax Effort	- Average level of income (GNP per capita) - Degree of openness of the economy (percentage share of nonmineral exports) - The composition of GDP (% share of mining in GDP)	-Evaluate the relative tax effort of the selected countries by identifying the main determinants of tax capacity through regressions analysis of cross section data. Based on the chosen variables/coefficients a tax ratio was estimated for each country that was said to represent the expected average using the tax capacity factors. The eventual Tax Effort Index was created through dividing the actual tax ratios by the ones estimated. -Indices of tax effort can be valuable for assessing the ability to increase tax. - The mining share of income was found to be an important tax ratio determinant, which was to be expected based on the existence on a well-establishes seller's market for minerals. Mining production has in specific a positive effect on income tax. - It was found that tax on international trade made the largest contribution to total taxes, followed closely by production tax and income tax.
(Berry & Fording, 1997)	Measuring state tax capacity and effort	All 50 US states and the District of Columbia between 1960-1991.	Tax Capacity & Tax Effort	- Personal income per capita - Gross State Product (GSP)	- Estimate the values of the missing years between 1960 and 1991 of the tax capacity and tax effort index of the Advisory Commission on Intergovernmental Relations (ACIR). - The recommended estimation method to use in regard to the tax capacity index was found to be a regression analysis for the years up to 1975, and interpolation for the years hereafter. In addition, to recommended estimation approach for the tax effort index was found to be extrapolation for the first years, and interpolation after 1967.
(Mertens, 2003)	Measuring tax effort in Central and Eastern Europe	10 Central and Eastern European countries between 1992-2000	Tax Capacity	- Share of Agriculture in GDP - Share of industry in value added - The share of imports on GDP *(In line with Bahl only. factors affecting taxable capacity, and thus not tax effort, are included)*	-Make a comparison between CEE countries' level of utilization of their tax capacity through empirical estimation of their tax capacity/-effort. - A significant negative relation was found between the agricultural share and tax revenues, whereas no significant relation was found for imports- and industry share (possibly due to provided tax incentives to (exporting) industry). - In line with previous research it was found that countries with higher shares of tax revenues to GDP have higher tax effort indices. The correlation was low. - In several CEE countries the tax effort can be increased, but mainly in Bulgaria, Romania, Poland and the Slovak Republic.

(Bird, Martinez-Vazquez, & Torgler, 2008)	Tax Effort in Developing Countries and High-Income Countries: The Impact of Corruption, Voice and Accountability	96 Developing and transition countries & 25 High income countries worldwide between 1998 - 2000	Tax Capacity	- Governance: Corruption - Voice/accountability - Development: GDP per capita - Population growth - Openness of the economy -Economic structure: Agriculture	-More legitimate and responsive state is an essential factor for a more adequate level of tax effort in developing countries and high-income countries. - Not only do supply factors matter, but also demand factors such as Corruption, voice and accountability determine tax effort to a significant extent.
(Pessino & Fenochietto, 2010)	Determining countries' tax effort*	96 Countries worldwide between 1991-2006	Tax burden	-Level of development: GDP per capita -Degree of openness of the economy (trade): Imports plus exports as a percentage of GDP -Ease of tax collection: agricultural sector value added (AVA) as GDP percent -Level of education: public expenditure on education as percent of GDP -Income distribution: GINI Coefficient -Inflation: Percentage change of the Consumer price Index (CPI) -Inefficiencies in collection: The corruption perception index (TICPI)	- Assess the tax effort- and capacity and their main dependent variables of 96 countries worldwide based on a stochastic frontier model; Enabling the evaluation of countries' their distance from their tax capacity and therewith the potential for increasing tax revenues. - In line with previous studies a significant positive relation was found between tax revenue as a share of GDP and level of development, trade, education. In addition, a negative relation was found between tax revenue and inflation, income distribution, ease of tax collection and corruption.
(Le, Moreno-Dodson, & Bayraktar, 2012)	Tax capacity and tax effort: Extended cross-country analysis from 1994 to 2009	110 Developing and developed countries between 1994-2009	Tax Capacity & Tax Effort	-GDP per capita -Population growth: growth rate of population between 15-64 years old (or the age dependency rate) -Trade openness: exports plus imports in percentage of GDP -Agriculture value added in percentage of GDP -Bureaucracy quality index	-Estimate countries their tax capacity and -effort, to provide guidance for tax reforms for countries with different levels of tax capacity/revenues: -The variables included in the regression analysis were found to be mostly significant. However, in regressions incl. institutional variables, GDP per capita was not always significant. A reason given is that institutional variables already include the effect of income, for which income itself loses its significance. -As a general rule: a higher income

				-Corruption index For robustness check: -(Size of shadow economy) -(Total consumption)	level, a lower population growth, a more open economy, a smaller agricultural sector, and more institutional quality result in higher tax- and fiscal revenues. - Countries with superior institutional quality were found to have the ability to increase tax revenues with no additional burden on its economy.
(Dioda, 2012)	Structural determinants of revenue in Latin America and the Caribbean, 1990-2009	32 Countries between 1990-2009	Total tax Revenue % of GDP	- GDP per capita - Per capita GDP growth rate - Agriculture in % of GDP -Openness of the economy - Fiscal deficit of the previous year - Civil liberties - Political rights - Regime durability - Level of education - School enrollment - Female labor force participation - Population age - Population density - Population growth - Urbanization - The shadow economy - GINI index	- Identify the tax revenue determinants of countries within Latin America and the Caribbean through regression analysis using panel data. - Civil liberties, durability of the political regime, openness, GDP per capita, population density, education and female labor force participation were found to have a significantly positive impact on tax revenues. - Agriculture and the shadow economy were found to be significantly negatively related to tax revenues.
(Fenochietto & Pessino, 2013)	Understanding Countries' Tax Effort	113 Countries between 1991-2012	Tax Capacity & Tax Effort	- Level of development: GDP per capita - Openness of the economy: Trade = imports + exports as % of GDP - Ease of tax collection: Agriculture Value Added as % of GDP - Level of education: Public expenditure on education as % of GDP -Income distribution: GINI coefficient - % change of the Consumer Price Index (CPI) -Inefficiencies in tax collecting: Corruption perception index	-Set up a stochastic frontier model using panel data to measure countries their tax effort, tax capacity and the main dependent variables. Countries with revenues from natural sources > 25% are incl. (whereas in their 2010 these countries were excl. >30%). - As anticipated a significant positive relationship was found between tax revenue and level of development, education & trade. Also, there was a significant negative relationship found between tax revenue and inflation, income distribution, the ease of tax collection & corruption. - Natural resource-dependent countries show a higher tax inefficiency. - Most well-developed EU countries are close to their tax capacity
(Cyan, Martinez-Vazquez, & Vulovi	Measuring tax effort: Does the estimati	94 countries worldwide between 1970-2009	Tax Capacity	ECONOMIC - GDP per capita - Openness of the economy - Agricultures share as an % of GDP	- The research considers an alternative tax effort measure to the traditional approach and the stochastic frontier approach: using countries their observed level of expenditures as a benchmark for the desired level of

c, 2013)	on approach matter and should effort be linked to expenditure goals?			- Services share as an % of GDP. - Construction share as an % of GDP - Inflation rate -Income inequality - Capital investments - Foreign grants - Crude petrol productions -Government debt DEMOGRAPHIC - Age dependency - Population density - Population growth - Level of education INSTITUTIONAL - Corruption level - Complexity of tax system - Tax Morale - Political Fractionalization	taxation. Moreover, the study compares the performance of the 3 approaches in the tax effort scores. - Corruption is seen as an important factor that decreases tax collection and can add rents to formally paid taxes; Corruption also discourages foreign investment, which negatively affects economic activity and the tax base. - All the estimated variables are having the expected signs and are mostly statistically significant/
(Castro & Camarillo, 2014)	Determinants of tax revenue in OECD countries over the period 2001-2011	34 OECD Countries between 2001-2011	Total tax Revenue % of GDP	ECONOMIC -GDP per capita -Openness of the economy: Trade = imports + exports as % of GDP -Foreign Direct Investment (FDI) % of Gross Fixed Capital Formation (GFCF) PRODUCTIVE SPECIALIZATION -Agriculture value added as a % of GDP -Industry value added as a % of GDP SOCIAL -Gross Tertiary School Enrollment -Life Expectancy -Child Mortality rate SOCIAL - Political rights - Civil liberties (both measured on a 1-7 scale of Freedom House)	-The goal was to analyze the impact of economic, structural, institutional and social factors on tax revenue. -Gross domestic product per capita, the industrial sector, and civil liberties were found to have a positive impact on the dependent variable, whereas agricultural sector and the share of foreign direct investment in gross fixed capital formation have negative impact -Tax effort and tax gap were found to be stable over time but differ across countries despite the level of development of the economies -In terms of significance level, results improve with similarity in income level/geographical location of the sample.
(Bashayreh & Oran, 2016)	Tax Capacity and Effort and Economic	17 developing countries incl. Jordan between 1990-2013		-Agriculture % of GDP -Mining % of GDP -Manufacturing % of GDP -Services (Cons) % of GDP -Openness of the	-The research discusses tax effort determinants and aims to estimate a tax effort index for Jordan through an econometric analysis that regresses the tax burden. - Openness of the economy and the share of services and manufacturing in

				Economy: (Import + Export) % of GDP	GDP were found to be positively related to tax effort, whereas a negative relation was found for agriculture share and mining share. - Rather than raising extra taxes, the studies recommend Jordan to improve tax collection procedures and to decrease tax avoidance/evasion in order to enhance the government revenues.
Implica tions: Eviden ce from Jordan*					
(Garg, Goyal, & Pal, 2017)	Why tax effort falls short of tax capacit y in Indian states: A stochas tic frontier approac h	14 Major Indian States between 1991-2011	Per capita State tax revenue (Tax Capacity & Tax Effort)	<u>Variables determining tax capacity:</u> - Per capita Gross State Domestic Product (GSDP). -Labor force as a percentage of total population -Inequality in urban house- holds' consumption expenditure (Urban GINI) - Literacy rate - Road density: Ratio of total road length (km) to the total area of a state (km2) <u>Variables affecting tax effort</u> -Agriculture share in GSDP. -Ratio of federal transfers net of loan to rev. receipts - Ratio of total expenditure to GSDP (desired level of public goods/services) -Ratio of outstanding liabilities to GSDP -Principal Component analysis (Law and order index) - Effective number of parties (ENP's) at the state level	-Measure states their tax capacity and tax effort and evaluate the determinants using stochastic frontier analysis. - A positive relation was found between tax capacity and per capita gross state domestic product, literacy rate & labor force participation. A negative relation was found between tax capacity and agriculture share. - A significant positive relation was found between tax effort and within-state political competition & governance indicators. A negative relation was found between tax effort and intergovernmental transfers, expenditure on debt repayment, outstanding liabilities, and electoral competition. In addition, Enactment of Fiscal Responsibility and Budget Management Act can help to improve the tax effort within states. - Road density did not have any significant relationship to tax capacity. - The inequality in tax effort between the different states increased over time.

Table 3: List of independent variables on tax effort

Independent Variable	Author	Result on tax effort [5]	Remark
Tax Revenues	(Frank, 1959)	Positive	
	(Bird, 1964)	Positive	
GNP	(Frank, 1959)	Positive	
	(Lotz & Morss, 1967)	Positive	
GDP	(Bird, 1964)	Positive	
GNP per capita	(Lotz & Morss, 1967)	Positive	
	(Chelliah, Baas, & Kelly, 1975)	Positive	
Openness of the Economy	(Lotz & Morss, 1967)	Negative	
	(Chelliah, Baas, & Kelly, 1975)	Negative	
	(Bird, Martinez-Vazquez, & Torgler, 2008)	x	
	(Pessino & Fenochietto, 2010)	Positive	
	(Le, Moreno-Dodson, & Bayraktar, 2012)	Negative	Positive effect on tax capacity
	(Dioda, 2012)	Positive	Positive effect on tax revenues
	(Fenochietto & Pessino, 2013)	Positive	
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Negative	Positive effect on tax capacity
	(Castro & Camarillo, 2014)	Not significant	
	(Bashayreh & Oran, 2016)	Positive	Positive effect on tax revenues (Negative in Latin America)
Agriculture (AVA) % of GDP	(Bahl, 1971)	Positive	
	(Mertens, 2003)	Negative	
	(Bird, Martinez-Vazquez, & Torgler, 2008)	Negative	
	(Pessino & Fenochietto, 2010)	Positive	
	(Le, Moreno-Dodson, & Bayraktar, 2012)	Positive	Negative effect on tax capacity
	(Dioda, 2012)	Positive	Negative effect ton tax capacity
	(Fenochietto & Pessino, 2013)	Positive	
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
	(Garg, Goyal, & Pal, 2017)	Positive	Negative effect on tax capacity
	(Castro & Camarillo, 2014)	Positive	Negative effect on tax capacity
	(Bashayreh & Oran, 2016)	Positive	Negative effect on tax capacity
Gross State Product (GSP)	(Berry & Fording, 1997)	x	
GDP per capita	(Berry & Fording, 1997)	x	
	(Bird, Martinez-Vazquez, & Torgler, 2008)	x	
	(Pessino & Fenochietto, 2010)	Positive	
	(Le, Moreno-Dodson, & Bayraktar, 2012)	Positive	

[5] Since previous literature frequently adopted tax revenue or tax capacity as dependent variable, instead of tax effort, the effect of the independent variables on tax effort is not always clear. In general, higher tax capacity is expected to reduce tax effort. Nevertheless, when an increase in tax capacity is accompanied by a substantial increase in tax revenues, the tax effort could increase.

|			
	(Dioda, 2012)	Positive	
	(Fenochietto & Pessino, 2013)	Positive	
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	
	(Garg, Goyal, & Pal, 2017)	Positive	
	(Castro & Camarillo, 2014)	Positive	
Industry % GDP	(Mertens, 2003)	Not significant	
	(Castro & Camarillo, 2014)	Negative	Positive effect on tax capacity
Imports % of GDP	(Mertens, 2003)	Not significant	
Corruption	(Bird, Martinez-Vazquez, & Torgler, 2008)	Negative	
	(Pessino & Fenochietto, 2010)	Positive	Negative effect on tax capacity
	(Le, Moreno-Dodson, & Bayraktar, 2012)	Positive	Negative effect on tax capacity
	(Fenochietto & Pessino, 2013)	Positive	Negative effect on tax capacity
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
Voice/Accountability	(Bird, Martinez-Vazquez, & Torgler, 2008)	Negative	Positive effect on tax capacity
Population Growth	(Bird, Martinez-Vazquez, & Torgler, 2008)	Negative	
	(Le, Moreno-Dodson, & Bayraktar, 2012)	Negative	
	(Dioda, 2021)	Not significant	
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Pressure to raise revenues to finance increased need for public expenditures.
Public Expenditure on Education % of GDP	(Pessino & Fenochietto, 2010)	Positive	
	(Fenochietto & Pessino, 2013)	Positive	
Income inequality (GINI coefficient)	(Pessino & Fenochietto, 2010)	Positive	Negative effect on tax capacity
	(Dioda, 2012)	Not significant	
	(Fenochietto & Pessino, 2013)	Positive	Negative effect on tax capacity
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
	(Garg, Goyal, & Pal, 2017)	Negative	Positive effect on tax capacity
Inflation: % change of the Consumer Price Index (CPI)	(Pessino & Fenochietto, 2010)	Positive	Negative effect on tax capacity
	(Fenochietto & Pessino, 2013)	Positive	Negative effect on tax capacity
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
Bureaucracy Quality	(Le, Moreno-Dodson, & Bayraktar, 2012)	Negative	Positive effect on tax capacity
Services % of GDP	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
	(Bashayreh & Oran, 2016)	Negative	Positive effect on tax capacity

Construction % of GDP	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
Government Debt % of nominal GDP	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	
Age Dependency ratio	(Le, Moreno-Dodson, & Bayraktar, 2012)	Not significant	
	(Dioda, 2012)	Positive	Negative effect toon tax capacity
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Positive	Negative effect on tax capacity
Political Regime Durability	(Dioda, 2012)	Negative	Positive effect ton tax capacity
Level of Education	(Dioda, 2012)	Negative	Positive effect on tax capacity
	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Negative	Positive effect on tax capacity
Complexity of tax system (see article)	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Negative	Positive effect on tax capacity
Tax Morale	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Negative	Positive effect on tax capacity
Political Fractionalization Index	(Cyan, Martinez-Vazquez, & Vulovic, 2013)	Negative	Positive effect on tax capacity
Labor Force % of Total Population	(Garg, Goyal, & Pal, 2017)	Negative	Positive effect on tax capacity
Literacy rate	(Garg, Goyal, & Pal, 2017)	Negative	Positive effect on tax capacity
Total expenditure % of GDP	(Garg, Goyal, & Pal, 2017)	Positive	
Law and order index	(Garg, Goyal, & Pal, 2017)	Positive	
Effective Number of Parties (ENP's) at state level	(Garg, Goyal, & Pal, 2017)	Positive	
Secondary or Tertiary School Enrolment	(Dioda, 2012)	Negative	Positive effect on tax capacity
	(Castro & Camarillo, 2014)	Not significant	
Life Expectancy	(Castro & Camarillo, 2014)	Negative	
Child Mortality rate	(Castro & Camarillo, 2014)	Not significant	
Political Rights (Freedom house scale)	(Dioda, 2012)	Not significant	
	(Castro & Camarillo, 2014)	Not significant	
Civil Liberties (Freedom house scale)	(Dioda, 2012)	Negative	Positive effect ton tax capacity
	(Castro & Camarillo, 2014)	Negative	Positive effect on tax capacity because of lower tax evasion.
Manufacturing % of GDP	(Bashayreh & Oran, 2016)	Negative	Positive effect on tax capacity

Figure 1: Histogram - Frank index
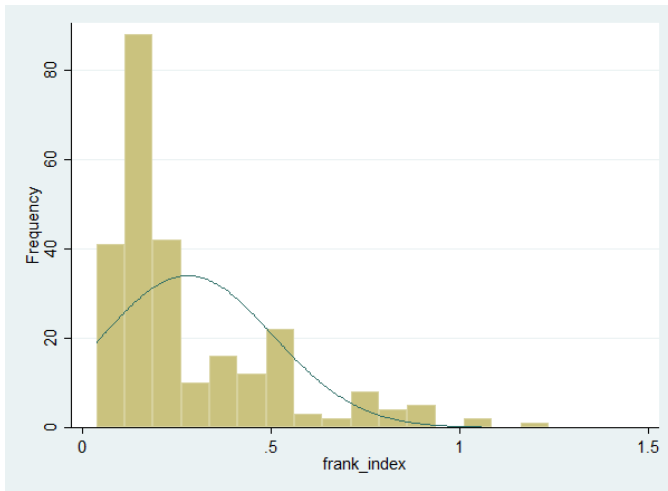
Figure 2: Kernel density estimate – Frank index
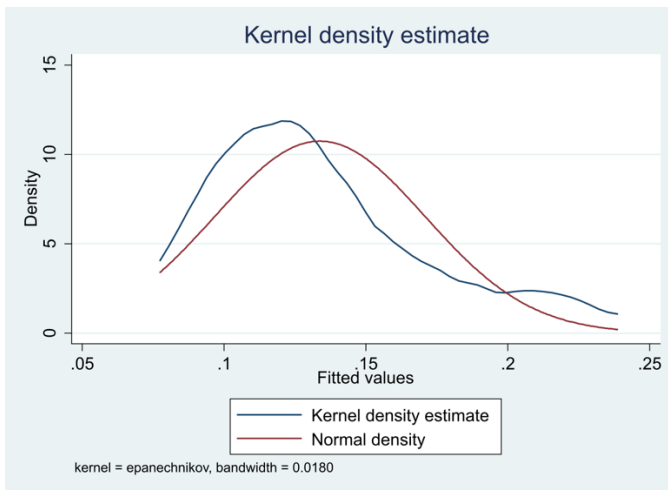
Figure 3: Residual plot – Frank index
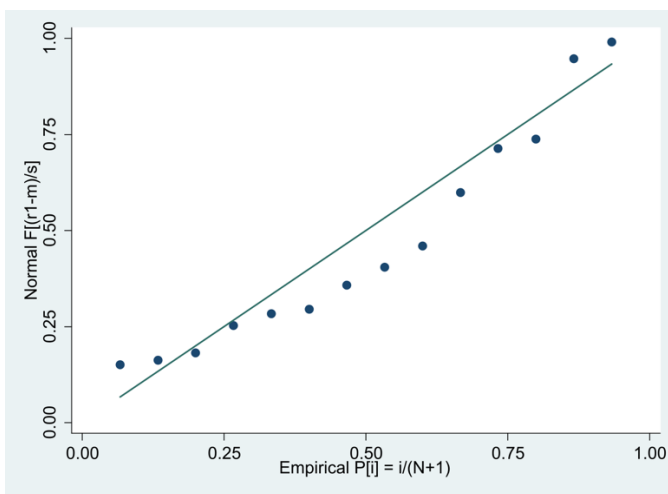
Figure 4: Histogram – Log Frank index

Figure 5: Kernel density estimate – Log Frank index
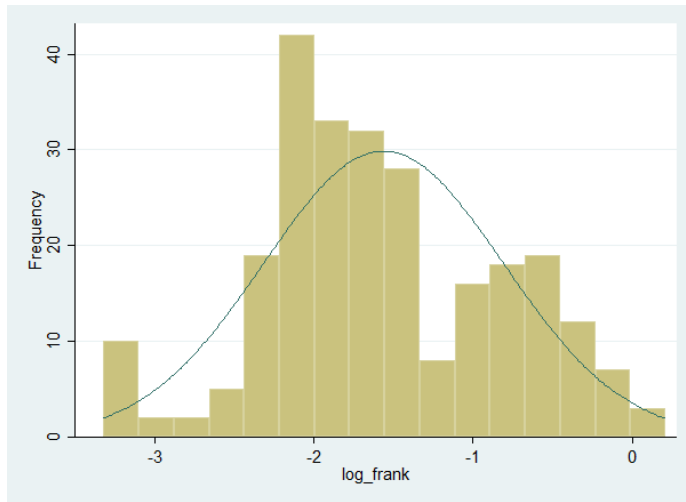

Figure 6: Residual plot – Log Frank index

Figure 7: Histogram – Bird index

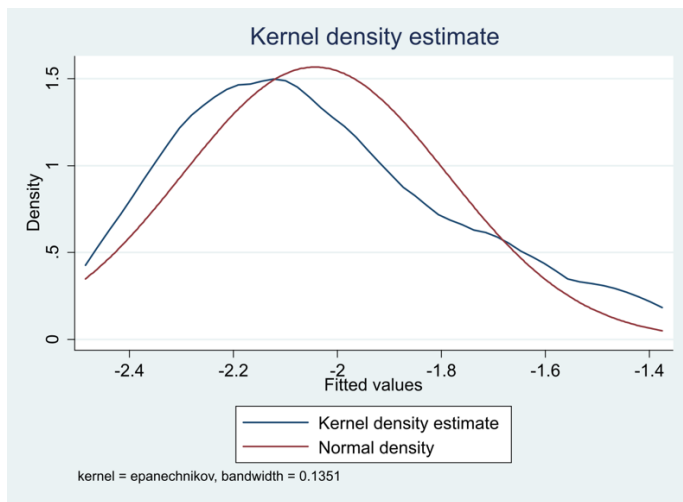

Figure 8: Kernel density estimate – Bird index

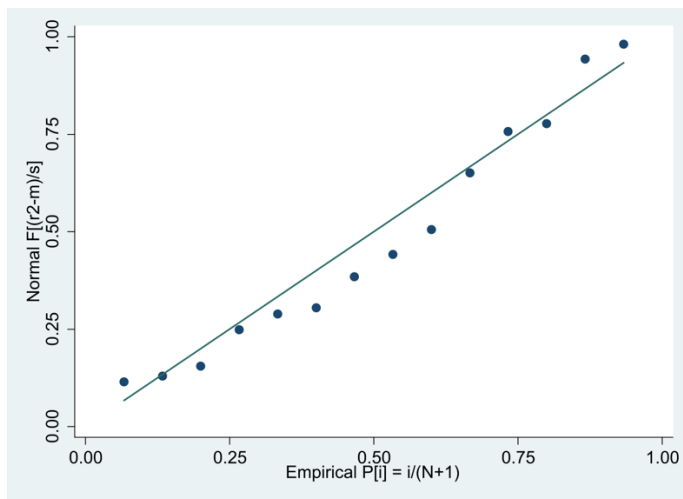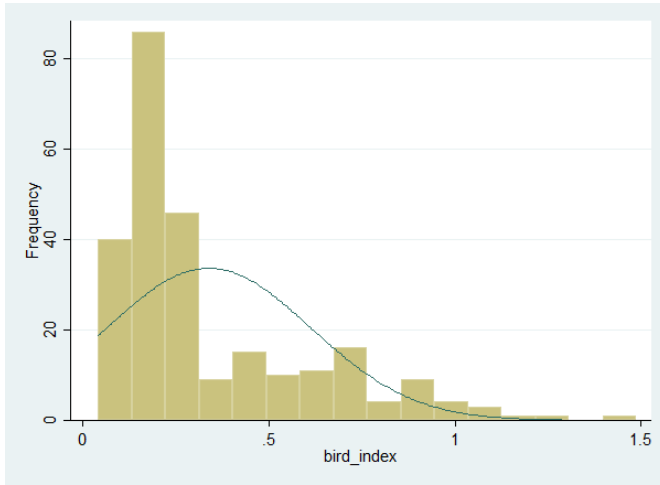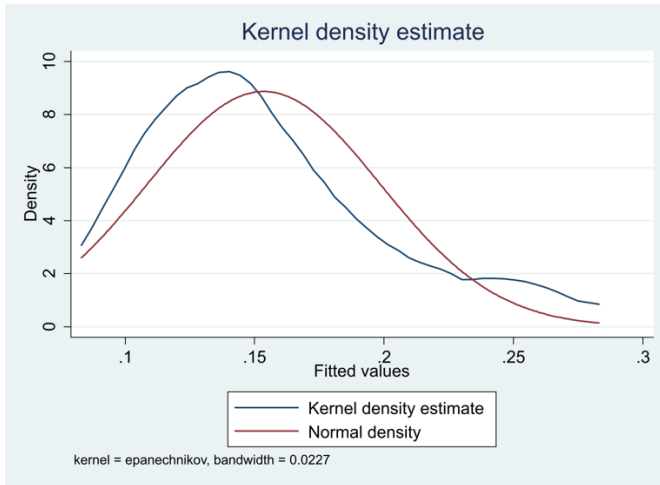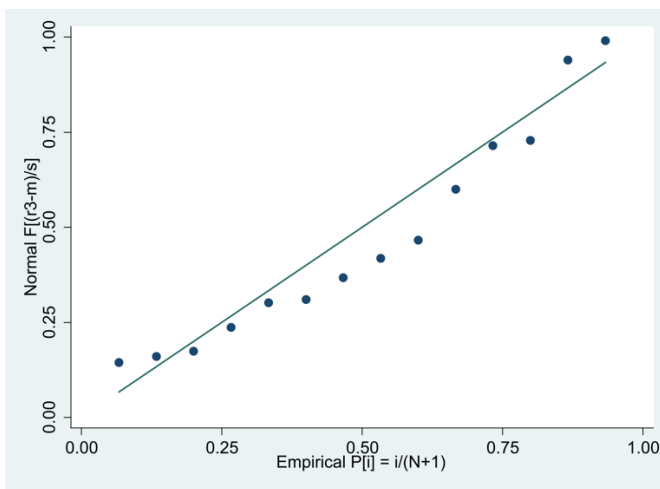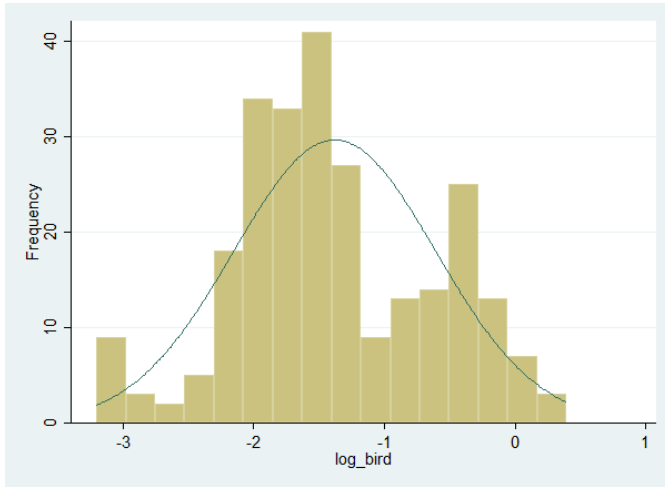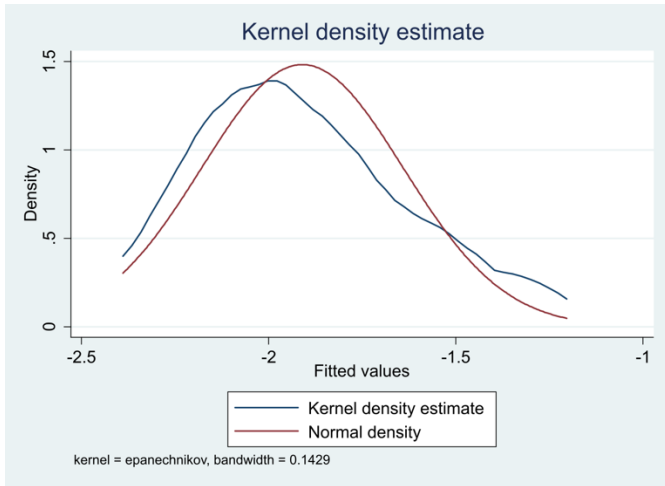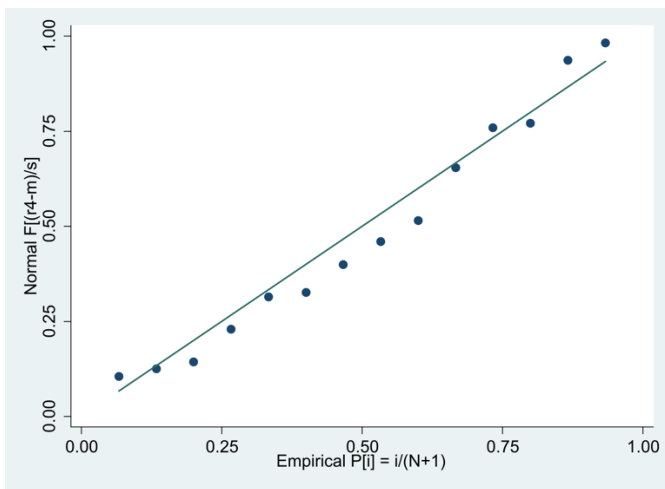**Figure 9:** Residual plot – Bird index

Figure 10: Histogram – Log Bird index

Figure 11: Kernel density estimate – Log Bird index

Figure 12: Residual plot – Log Bird index

Table 4: Correlation matrix independent variables

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	log_gdp_pc	1.00																			
2	log_tax_rev	0.71	1.00																		
3	infl	-0.80	-0.55	1.00																	
4	trade	-0.71	-0.22	0.71	1.00																
5	imports	-0.69	-0.21	0.77	0.99	1.00															
6	agric	-0.60	-0.01	0.56	0.51	0.51	1.00														
7	ind	-0.06	-0.67	0.03	-0.15	-0.15	-0.71	1.00													
8	serv	0.61	0.90	-0.55	-0.36	-0.36	0.18	-0.80	1.00												
9	corrp	-0.08	0.39	0.17	0.04	0.08	0.78	-0.85	0.62	1.00											
10	account	0.05	0.55	0.06	0.02	0.05	0.74	-0.94	0.74	0.96	1.00										
11	r_law	-0.02	0.54	0.11	0.13	0.15	0.79	-0.96	0.72	0.92	0.98	1.00									
12	gov_ef	0.32	0.66	-0.08	-0.13	-0.09	0.48	-0.83	0.80	0.82	0.90	0.88	1.00								
13	gini	-0.10	-0.12	0.29	-0.21	-0.18	0.37	-0.16	0.04	0.44	0.34	0.32	0.38	1.00							
14	pop_g	-0.41	-0.88	0.43	-0.02	0.03	-0.30	0.84	-0.88	-0.50	-0.67	-0.72	-0.70	0.11	1.00						
15	inf_mor	-0.03	-0.65	-0.01	-0.21	-0.20	-0.73	0.99	-0.76	-0.83	-0.93	-0.97	-0.84	-0.18	0.85	1.00					
16	age_depen	-0.07	-0.66	0.04	-0.17	-0.16	-0.70	0.99	-0.78	-0.82	-0.93	-0.96	-0.85	-0.16	0.86	1.00	1.00				
17	labor_part	-0.10	0.12	0.40	0.19	0.26	0.28	-0.32	0.19	0.37	0.39	0.41	0.55	0.26	-0.15	-0.34	-0.34	1.00			
18	educ_gdp	0.40	0.74	-0.40	-0.32	-0.32	0.42	-0.87	0.92	0.76	0.87	0.85	0.86	0.19	-0.82	-0.85	-0.88	0.22	1.00		
19	gov_exp	0.15	0.63	-0.13	-0.04	-0.04	0.64	-0.95	0.81	0.84	0.94	0.94	0.87	0.23	-0.81	-0.95	-0.97	0.32	0.95	1.00	
20	gov_debt	0.10	-0.52	-0.15	-0.21	-0.23	-0.82	0.94	-0.64	-0.92	-0.94	-0.94	-0.77	-0.34	0.66	0.94	0.92	-0.31	-0.77	-0.89	1.00

Table 5: OLS regression - Log Frank index

VARIABLES	(1) log_frank	(2) log_frank	(3) log_frank	(4) log_frank
labor_part	0.0129	0.0040	0.0108	-0.0158*
	(0.0115)	(0.0045)	(0.0104)	(0.0091)
gini	0.0660***	-0.0093**	0.0396***	
	(0.0081)	(0.0043)	(0.0084)	
corruption	-0.0055**			
	(0.0027)			
pop_growth	0.0368		0.0101	-0.0916
	(0.1037)		(0.0947)	(0.0744)
log_gdp_pc		-1.0149***		
		(0.0391)		
gov_exp		-0.0090		-0.0436***
		(0.0070)		(0.0140)
trade_gdp			0.0099***	
			(0.0024)	
agriculture_gdp			0.0486***	0.0731***
			(0.0187)	(0.0169)
inflation_cp				0.0151***
				(0.0048)
Constant	-5.2781***	7.6505***	-5.0798***	-0.3127
	(0.9869)	(0.5947)	(0.8917)	(0.7097)
Observations	132	128	131	175
Number of country_number	17	16	16	17

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: OLS regression - Log Bird index

VARIABLES	(1) log_bird	(2) log_bird	(3) log_bird	(4) log_bird
labor_part	0.0134	0.0047	0.0114	-0.0147
	(0.0119)	(0.0052)	(0.0106)	(0.0094)
gini	0.0649***	-0.0108**	0.0376***	
	(0.0084)	(0.0050)	(0.0086)	
corruption	-0.0056**			
	(0.0028)			
pop_growth	0.0205		-0.0051	-0.1069
	(0.1069)		(0.0971)	(0.0765)
log_gdp_pc		-1.0159***		
		(0.0450)		
gov_exp		-0.0114		-0.0461***
		(0.0081)		(0.0144)
trade_gdp			0.0107***	
			(0.0024)	
agriculture_gdp			0.0476**	0.0714***
			(0.0192)	(0.0174)
inflation_cp				0.0152***
				(0.0049)
Constant	-5.0811***	7.8777***	-4.8949***	-0.1673
	(1.0173)	(0.6853)	(0.9147)	(0.7300)
Observations	132	128	131	175
Number of country_number	17	16	16	17

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Arellano-Bond test for autocorrelation – Log Frank index

VARIABLES	(1) log_frank	(2) log_frank	(3) log_frank	(4) log_frank
log_frank = L,	0.7074***	0.0837	0.7375***	0.7960***
	(0.0703)	(0.0536)	(0.0711)	(0.0706)
labor_part	0.0113	0.0048	0.0035	0.0020
	(0.0104)	(0.0047)	(0.0100)	(0.0087)
gini	0.0066	-0.0091**	0.0063	
	(0.0093)	(0.0041)	(0.0092)	
corruption	-0.0021			
	(0.0023)			
pop_growth	0.0532		0.0398	-0.0154
	(0.1007)		(0.0966)	(0.0542)
log_gdp_pc		-0.8796***		
		(0.0559)		
gov_exp		-0.0147**		0.0072
		(0.0070)		(0.0126)
trade_gdp			0.0036	
			(0.0022)	
agriculture_gdp			-0.0422**	-0.0274**
			(0.0166)	(0.0139)
inflation_cp				0.0007
				(0.0035)
Constant	-1.5165	6.6039***	-0.9572	-0.3618
	(1.0149)	(0.6933)	(0.9771)	(0.6374)
Observations	94	91	94	142
Number of country_number	11	11	11	16

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Arellano-Bond test for autocorrelation – Log Bird index

VARIABLES	(1) log_bird	(2) log_bird	(3) log_bird	(4) log_bird
log_bird = L,	0.7013***	0.1055*	0.7230***	0.7729***
	(0.0729)	(0.0616)	(0.0739)	(0.0755)
labor_part	0.0115	0.0063	0.0036	0.0028
	(0.0110)	(0.0056)	(0.0106)	(0.0092)
gini	0.0054	-0.0105**	0.0045	
	(0.0096)	(0.0048)	(0.0096)	
corruption	-0.0021			
	(0.0025)			
pop_growth	0.0308		0.0193	-0.0174
	(0.1062)		(0.1026)	(0.0569)
log_gdp_pc		-0.8483***		
		(0.0647)		
gov_exp		-0.0176**		0.0034
		(0.0081)		(0.0131)
trade_gdp			0.0043*	
			(0.0024)	
agriculture_gdp			-0.0413**	-0.0266*
			(0.0175)	(0.0148)
inflation_cp				0.0008
				(0.0038)
Constant	-1.4062	6.5107***	-0.8837	-0.3670
	(1.0612)	(0.8139)	(1.0242)	(0.6743)
Observations	94	91	94	142
Number of country_number	11	11	11	16

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1