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Base Erosion and Profit Shifting in Continental Africa and Beyond

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Base Erosion and Profit Shifting in Continental Africa and Beyond, a Comparative Analysis

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Abstract

Base erosion and profit shifting has become the latest burden on countries' tax revenue collection agencies the world over. Recent studies have found how it occurs in the both the developed and developing world, but these same studies haven't answered the question of why in the developing world. This thesis tries to answer that question concerning Africa, which is a continent full of developing nations. Using Base Erosion, Profit Shifting, and Developing Countries (Crivelli et. al, 2015) which outlines how the international economy is interconnected through a tax base spillover estimation, this paper turns its attention towards the developing nations of Africa. The analysis of the data collected showed trends towards increased base spillover in not simply African nations, but those which are simply more fragile in nature. This implies that resources should be used to bring fragile nations into the fold of sustainable countries where lost tax base revenues are minimized. Applying fixed effects regressions on a country-level panel dataset spanning 30 years (1990-2020) to explore the relationship between corruption and base spillover - the country level measurement of corporate tax avoidance, we find that corruption has a significant and negative impact on a country's tax base, and thus its revenue, in both the developing and developed world.

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ABBREVIATIONS

BEPS – Base Erosion and Profit Shifting

CIT – Corporate Income Tax Rate

CPI – Corruption Perception Index

IMF – International Monetary Fund

OECD – Organization for Economic Co-operation and Development

PIT – Personal Income Tax Rate

I. Introduction

Corporate tax avoidance has long been a practice in the Western world, taking on many forms. In recent years there has been an increase in its incidence rate. From this has come a greater interest in understanding its effects. We know why companies do it, we just want/need to understand what happens as a result. The International Monetary Fund wrote a paper in 2015 outlining how tax base spillovers affect economies around the world, including, but not limited to developing countries. The one exception to this being the inclusion of what effects it has on African countries, as a well as a predictive aspect. Africa is a large population base on its way to greater levels of development. Seeing as the West has long seen the effects of corporate tax avoidance and begun to understand them, it makes good political and economic sense to not only share the knowledge, but construct models in order to further understand it in a newly developing region.

Tax base spillover is when the tax revenue falls over a given period of time as a result of profit shifting by large corporations. As Africa has only recently become home to multinational corporations, like Coke, Pfizer, and Volkswagen tax base spillover as defined was not possible. Now, that such companies have come to Africa and been on the continent long enough for valuable information to be collected, comparative analysis of both pre and post multi-nation fiscal years is possible. There are challenges to this novel analysis that have appeared as the field has developed.

Africa is a continent composed of mostly third and developing world countries, with some exceptions like South Africa. Most of the countries in Africa spent the majority of the 20th century under the colonial rule of some European nation like England or France. History has shown these relationships to be deleterious to the colony in favor of benefiting the colonizer with whatever resources they can extract from the African country. In the wake of this parasitic relationship, when the colonizing power either leaves gracefully, or is expelled from the country by a revolution of some kind, the country is often left in a venerable state. Such states of venerability include a lack of structured government. With the departure of a ruling colonial power, the bureaucracy they created, and the people they sent to run it depart too. This forces the people native to the country to try and fill the personnel needs of that government when they may not be able to due to their systemic exclusion from such roles. As a result, there is a strong possibility for mismanagement of country resources, the invasion of another country to set up a pseudo-government which benefits them, or a forced regime change. All of these only worsen the likelihood and effects of BEPS and tax base spillover.

This venerable state typically leads to two outcomes, the first being a corrupt government, typically a dictatorship of some kind, the second an unstable democratic system, prone to collapse or replacement by coup at the hands of another entity. These other entities, whether they are internal or external, believe they have a greater perception of what the country and population at large want out of their newly independent country. What these two outcomes have in common is they lead to a similar level of disorder and lack of governmental productivity. This, in turn, allows for corruption to gain an even firmer hold on the fledgling country. Once these infrastructures of corruption have settled

within the government of any country, both developed and not, the energy required to remove it is vast. This amount of energy, both by man and technology is rarely available in fledgling countries, so the corruption goes unchecked once it has established itself. This leads to many negative externalities for both the government, and the people of the country, one of them being widespread tax avoidance and fraud.

Both tax avoidance and fraud are methods of not paying one's share of taxes, with the former being a legal means of doing so, and the latter being illegal. Base erosion and profit shifting (BEPS) the namesake of this paper is a form of legal tax avoidance which large multi-national corporations perform in order to minimize their tax liability in any given year, in any given country they do business in. Many large companies look to the fledgling and unstable countries in Africa to establish satellites of their already highly developed and profitable companies that are suffering from high corporate tax rates (CIT) in developed nations. These developed multi-national firms capitalize on the lack of established government or tax infrastructure, and the willingness of these fledgling countries to welcome such established firms into their countries and economies in the hopes that they will bring prosperity, in an effort to minimize their own tax liability on a global scale.

Beyond the fact that these large multi-national corporations are supporting sometimes corrupt or poorly constructed governments with their presence in the country, they are also draining tax revenue from governments around the world. This is one of the main consequences of BEPS. The revenue which should have been generated and taxed in Country A by Multi-National A is lost because that company has shifted profits to Country B. Whether Multi-National A has done this by deceptive accounting practices

or moving operations to Country B, the potential amount of tax revenue that could have been generated has been eroded, hence the name. With Country B not having as great a CIT as Country A, if a CIT of any sort, Country B too has lost out on potential tax revenue.

This is where the importance for such an analysis and study of the effects of BEPS has on developing countries. However, given the unpredictable nature of such countries, as well as the quality of the information that is able to be extracted from them, information from all countries will be utilized in order to add validity to a comparative analysis. Although emphasis will be placed on the results found on African countries, developed countries, like the United States, Germany, France will be included in the data. Utilizing these it was found that there is no significant link between increased corruption in African countries and increased tax base erosion. It was found that as a country becomes more fragile, in other words, less stable that tax base erosion does increase. This is in the same vein as a nation which sees increased corruption, so this finding is still linked to the objective of the thesis.

These results and how they were attained will be outlined in this thesis in the following manner. Section 2 will cover a brief historic background of base erosion and profit shifting to increase understanding on this esoteric topic. Section 3 covers the literature reviewed for this topic, the first part concerning base erosion, the second concerning profit shifting. Section 4 discusses the data collected for the econometric model, as well as the models used to generate the regression analysis. This includes an estimation model along with the novel model which this thesis created. This section also includes the descriptive table and graph which will further describe the results. Section

5 pertains to the regression models and their analysis. Section 6 discusses what conclusions were drawn from the analysis, and this is followed by the bibliography.

II. Historical Context of Base Erosion, Profit Shifting, and the Role of Tax Avoidance in the Modern Multinational Company

As stated previously, base erosion and profit shift is just another manifestation of corporate tax avoidance. Profit shifting being the monetary transaction which lowers a company's tax burden in the country they are legal residing in, and base erosion being the effect profit shifting has on that same country's tax revenue, or its tax base. The reason BEPS has become such an increasingly popular topic of discussion in the world of economics is due to the rise of the multinational, high profit company. Over the past fifty years a number of companies have either transitioned or been created to cater to the global market, companies like Walmart, Amazon, and Apple. This has opened the door to firm profit shifting on a much larger scale, both in terms of the number of companies participating in the practice, as well as the sheer amount of capital they are moving abroad. If a company is not capable of shifting its profit from its parent company in its home country to another entity of the company in another country, this form of tax avoidance is not legally possible. That is not to say companies have not illegally shifted profit our of their home country, but that is no longer tax avoidance, but tax evasion which unlike the former is an illegal means of not paying your due share of tax.

Along with the increased feasibility of profit shifting due to an increase in the globalization of companies, there has also been a trend towards greater and greater revenue and profits in companies the world over. Although companies have always held generating higher revenue and profit as goals, following long periods of economic stagnation and recession during the 1970s, there was a collective desire to pursue to simply make more money in the West. This combined with an ideological shift in mainstream politics in countries like the United States and the United Kingdom, which came as a result of the poor economic state they faced in the 1970s, prioritized market freedom over government control. What came of this was lowered corporate tax rates and removing regulations typically imposed on large companies, like penalties imposed on those who shift profit overseas, to name one.

Prior to this historic deregulation tax avoidance was the job of company accountants to make prudent suggestions to executives to apply revenue to projects that benefited most from tax law within the country they operated in. Now, in an age without metaphorical borders, they could simply move their firm's money to a foreign country with a more favorable tax rate. From this, a new profit maximizing corporate culture had been established. There was no reason for a country to keep their money in their own country. This led to a loss in potential tax revenue for countries all over the world, but because the companies were still making more profit and revenue than they were before the new era of deregulation, it went mostly unnoticed. This produces the dilemma to those integral bodies trying to reduce profit shifting in an effort to minimize base erosion. By reducing the former, they may have minimized the latter, but subsequently, the former did not grow to its potential. This is the reason, and in no small part, that government

intervention in order to prevent the practice of profit shifting did not occur until it posed an economic threat. This is where we find the global economic climate in the 21st century, and why the interest in understanding and curbing its spread has reached the new heights we see today.

III. Literature Review

Literature Discussing Base Erosion

The 2015 IMF funded analysis of how base erosion and profit shifting, although taking place across the globe has a greater impact on developing countries. These countries are those that have the weakest economies, most affected by economic shocks, like a dramatic shift of profits and thus tax revenue from one country to another. The paper by Crivelli et. al (2015) lays the foundation for how further analysis of base erosion is measured. They did so in two ways, measuring base spillover and strategic spillover. The former is the dollar measurement of how much Country A loses in tax revenue because of its own corporate tax policies. The latter is the measurement of how much tax revenue Country A loses because of the more alluring tax policies of Country B which drive business out of Country A. A complex topic, with a great deal of nuance involved in it and the equations used to calculate its derivation, it adds a scientific means of calculating such an esoteric figure.

Along with the two methods in which BEPS are defined and calculated, Crivelli et. al (2015) discusses what international events typically occur prior to a company

deciding to commit to an internal tax policy of profit shifting. Typically, there needs to be an oppressive rate of corporate tax in their primary country of business, as well as preferential tax relations with another country. These preferential relations are typically created by tax treaties. Such documents allow for companies in notoriously high corporate tax countries to find shelter from the high rates in neighboring countries with the approval of their own country. Popular tax haven countries include the Netherlands and Ireland, where in some cases companies pay no tax on their profits earned in such countries.

Through both of these methods of tax avoidance, sanctioned or not by one government or another, they still fuel the problem of base erosion and ultimate loss of tax revenue by countries that desperately need the income. Compounding this problem is the observed trend that as a developing country becomes more like first world nations, they lose tax revenue, beyond the effects of base erosion and profit shifting. (Aizeman and Jinjarak 2007) Globalization has many advantages for the developing world, but it also has its drawbacks. For example, when a country does get its first multi-national corporation, starts creating infrastructure, and developing its economy to compete in the new world, it must also rely on harder to collect taxes. These are taxes like personal and corporate income taxes which require their own governmental agencies in order to collect them efficiently and effectively. This requires money, which the developing nations already don't have, so they are forced further behind for the simple reason they didn't develop during the first wave of industrialization, usually at no fault of their own. Instead of these hard to collect taxes, they rely on easy to collect taxes like tariffs which can be collected immediate at points of entry, no extra governmental oversight required. What

all this equates to is a growing economy with less revenue than it had before it had started developing in the first place. This is a plight which effects developing nations across the globe.

Literature Discussing Profit Shifting

Profit shifting by large international firms both in the United States and abroad has been common place since late 20th century. In an era where profit maximization and tax liability minimization is the primary goal for financial officers, such a relatively easy, although deceitful practice makes sense (Keightley and Stupack 2015). In reality, these actions may seem beneficial to companies in the short run, have the ability to damage them permanently in the long run. As a result of their actions in avoiding tax payments to whatever countries their company resides, that country may deem it necessary to raise taxes at home, or penalize companies that chose to shift profits abroad. This results in a higher tax liability ten years down the road that eliminates whatever gains the company had made in the past ten with the tax avoidance practices. The Organization for Economic Co-Operation Development has made it a priority of theirs to minimize these unintended consequences by creating charter plans to reel in both companies and the most reactive countries to ensure economic stability, despite the increase in profit shifting as of late.

Corruption also plays a significant role in profit shifting and tax avoidance, not to mention tax fraud in both developed and developing countries explains Bilicka and Seidel (2020). With an increase in corruption within a given company will lead to increases in profit shifting. This corruption can range from personal goals of embezzling or company goals of minimizing tax liability leading to more radical and sometimes illegal internal tax policy. Regardless of the motive, or to what scale it manifests, such corruption affects

entire countries because of the lost tax revenue this corruption creates. There is also the possibility that the government itself is corrupt, with civil servants and other bureaucrats committing illegal acts against the state for their own interests. When corruption is as pervasive as this, and it does not discriminate between developed and non-developed countries, governmental oversight, as well as tax system reform has little effect as the problem has exceeded the reach of law and order. As a result, the corruption become institutionalized and all parties involved, especially those who must rely on the efficacy of government most heavily, suffer heavily.

The gap in the information on these two subjects, and where this thesis seeks to fill said gap is specifically how this economic phenomenon affects African countries. The working paper published by the IMF does an excellent job laying a framework from which to build on, but their categorization of countries is broad in scope. For example, they group a country like the Russian Federation with Rwanda, and then compare it to a group including the United States and the Bahamas. Not that we are casting stones at the IMF and its reasoning or methods, it is just apparent that a shifting of categories, like focusing on just Africa compared to the rest of the world would produce meaningful conclusions.

IV. Data and Econometric Model

This section has the purpose of describing the data used for the model estimation. There are six sources of data for the nine variables, although both Africa Dummy and OECD Dummy do not require data. Given the multiple databases this thesis and analysis requires, there is the situation that the number of observations varies by spreadsheet. In order to maximize accuracy while still maintaining some diversity in information, the number of observations was reduced from in excess of 6,000 to 4,324. The sources of those observations are as follows.

The corruption variable data was drawn from the Corruption Perception Index[1] or CPI as it will be referred to for the duration of this paper. A creation of Transparency International, a global organization with the goal ending corruption around the world, the index is a composite of multiple factors used to generate a single figure. Although these factors vary from country to country, as well as from year to year, they produce a value the organization deems accurate in terms of what it is trying to describe. The database spans twenty-five years, from 1995 to 2020. The organization changed its methodology on how it wished to calculate CPI in 2011, but due to the fact that they also ranked each

[1] https://www.transparency.org/en/

country along with its CPI score this fault in the data was a solvable issue. Along with the inconsistency in methodology there was also an inconsistency in the number of countries included over the years the index has been published. During the first year of the index, only 41 countries were included in its analysis of corruption. While this number steadily grew to 180 by the year 2020, it waivered from year to year. For the years and countries that are blank, predictions were made for the CPI value, based on values which related to bother the year and country they represented.

The GDP variable draws its data from the World Bank database[2]. This was the most complete set of data included in the model, having contained information spanning from 1990 to 2020. This was the original time frame set at the beginning of the thesis, but due to the restrictions posed by other datasets, it was reduced to 1995 to 2018. Regardless, it is collective GDP database that is used as the base from which other databases and information will be added to. Additionally, the countries that are included by the World Bank in this, and all of their datasets, will be the benchmark for the list of countries that will be included in the analysis. Some of the other datasets include countries or territories, but these are dropped to ensure cohesive analysis of the combined data. which any country will be included from other databases.

Import and export data is drawn from the OECD database[3] for international trade based on firm size. The size of firms utilized for this draw on the data are those companies who have an excess of 250 employees. This is to simulate the revenue generated by large multinational firms, in an attempt to replicate the actions of those large, multinational

[2] https://data.worldbank.org/
[3] https://data.oecd.org/

firms this analysis is supposed to integrate. The pitfall which presents itself for the collection of the data this set provides is the inconsistency of years between it and the master GDP file from which all entries are merged on to.

Furthermore, the personal income tax rate, or PIT, as it will be referred to from here on out comes from Our World in Data[4], a venture of the University of Oxford in the United Kingdom. Admittedly, this is a highly specific origin of the data, but given the nature of taxation rates, and how they are measured as a percentage of the total revenue any country *i* generates, they are inconsequential to the tax base spillover estimation. Beyond the crucial nature to country specific PIT rate, the same peculiar and highly specific nature of these figures also creates credibility. Oxford University is a known the world over as a highly prestigious institution, specializing in the pursuit of novel research, as such the figures they associate their name with are no doubt representative of the aspect of the economy they are trying to represent. This dataset, like that reporting the GDP of each country for each year of interest for the study, is descriptive for all the years initially proposed to be included in the analysis, 1990-2020. However, like the GDP based data, the years included in the survey needed to be abridged to accommodate the less comprehensive datasets.

The information relating to corporate income tax, or CIT, which is crucial in estimating the tax base spillover rate per country per year comes from the Tax Foundation[5], the premier non-profit organization dealing with taxation both in the United States and abroad. This dataset is that which holds the greatest value to the analysis of

[4] https://ourworldindata.org/grapher/taxes-on-incomes-of-individuals-and-corporations-gdp?country=
[5] https://taxfoundation.org/publications/corporate-tax-rates-around-the-world/

all the data collectively, as it is from this data that we draw one of the base level figures for the tax base spillover estimation, but also the summation of the relevant CIT rates required, as well as the weighted average which is added to the end of the estimation. Although it comes from a different source than the PIT data, the Tax Foundation versus Oxford, they share plenty of similarities. These similarities, beyond the obvious factors like the countries both databases chose to include, include the means in which they came to the tax figures for each year. Although both databases concerning PIT and CIT information present only one tax rate, federal taxation systems all over the world have multiple tiers. Thankfully, the manner in which both datasets calculate the singular taxation rate they provide for every year each country is represented are identical. This generated 5518 observations for CIT, but as with all of the datasets save the GDP database, this number had to be reduced to 4,324 observations in order to align with the least comprehensive data.

Finally, the fragility index from which the variable of the same name is derived is a product of the Fragile States Index[6]. This index uses indicators from multiple sectors of their 178-country sample base like economic factors, as well as both political and social indicators to generate a value which effectively portrays the degree to which a given country is perceived in terms of its strength and cohesiveness, or lack thereof. This dataset is one of the least comprehensive. Having only begun in 2006, the fragile states index not only has far fewer observations than the other datasets used in this analysis, it also has altered its methods of producing a fragility index score over time. This is to be expected, as those responsible for this index are venturing into uncharted territory.

[6] https://fragilestatesindex.org/

Afterall, they are attempting to give a fixed value of measurement to a quality which is constantly in flux.

- Tax base spillover estimation model

$$b_{it} = \lambda b_{it-1} + \varphi\tau_{it} + \gamma \boldsymbol{W_{-i}\tau_{-i}} + \boldsymbol{\zeta' X_{it}} + \alpha_i + \mu_t + \varepsilon_{it}$$

where *i* equals a given country and *t* equals a given year

- b_{it} – tax base spillover estimation for country *i* and year *t*
- λb_{it-1} – percent change in tax base spillover from year *t-1*
- $\varphi\tau_{it}$ – weighted CIT for country *i* and year *t*
- $\boldsymbol{W_{-i}\tau_{-i}}$ – weighted summation of tax rates in all countries except *i*
- $\boldsymbol{\zeta' X_{it}}$ – vector for controls relating to country and year specific fixed effects for country *i* and year *t*
- α_i – error for country *i*
- μ_t – error for year *t*
- ε_{it} – error for country *i* given year *t*

The estimation of tax base spillover for a given country during a specified year, shown as b_{it} is a rather complex summation of variables. The first variable (λb_{it-1}) is equivalent to the percent change in tax base spillover calculated from the previous year, which in of itself is a cumulative value from the years which proceeded that particular year. The following variable ($\varphi\tau_{it}$) is the simply weighted corporate income tax rate. This CIT is specified in the econometric model for the given country and year in

question. The next value ($\boldsymbol{W_{-i}\tau_{-i_t}}$) is this averaged summation figure. This value takes the summation of all corporate income tax rates for a given year then subtracts the country in question (referred to as *i*) and then multiplies that figure by a GDP multiplier. This GDP multiplier referenced has been calculated by the Tax Foundation, a trusted source and reference for this thesis. Finally, there is $\boldsymbol{\zeta' X_{it}}$ which controls for country specific factors needed to produce effective results. These include population size and GDP percentages related to different sectors of a nation's economy. They are needed to create a sense of validity from the dataset as some variables fall short to compare to others, both in terms of country and year. Combined with the country, year, and country given year error variables they produce the tax base spillover value of the regression and its derivatives.

- Novel Econometric Model

$$\text{Tax Base Spillover} = \beta_0 + \beta_1(\text{Corruption})_{it} + \beta_2(\text{Imports})_{it} + \beta_3(\text{OECD Dummy})_{it} + \beta_4(\text{GDP})_{it} + \beta_5(\text{PIT})_{it} + \beta_6(\text{PIT})_{it} + \beta_7(\text{Africa Dummy})_{it} + \beta_8(\text{Fragility})_{it} + \beta_9(\text{Exports})_{it} + \varepsilon_{it}$$

- Corruption – value taken from Corruption Perception Index; scored out of 100, 100 being the mark of a corruption free nation. This figure is generated by Transparency International, an international organization with a mission to eliminate corruption around the world.
- Imports – amount of revenue spent on service from firms over 250 employees in size.

- OECD Dummy – dummy variable denoting whether or not the country is a part of the OECD.
- GDP (in billions) – the size of the country's gross domestic product.
- Personal Income Tax Rate (PIT) - the average rate for individuals on which their income is taxed.
- Corporate Income Tax Rate (CIT) - the average rate for corporations on which their income is taxed.
- Africa Dummy – dummy variable denoting whether a country is in Africa.
- Fragility - how fragile a nation is from either revolting against its sitting government, or that government collapsing under its own incompetence.
- Exports - amount of revenue generated on services sold by firms over 250 employees in size.

The methodology used for this thesis is country level panel data regressions with fixed effects for country and year. The limitation for the econometric model is the fact that it is based on an estimation. This estimation, although accounting for many possible hidden variables, is still an approximation of the value this thesis is based on. As for the data, the limitations stem from the inconsistency between datasets. Sets like the fragility and corruption indexes did not encompass all the years datasets like those pertaining to GDP or CIT. This came from either the index changing how their values were generated or reported, or they simply didn't exist prior to a certain year. There also was the issue of differing data collection methodology between the reporters of CIT and PIT, the Tax Institute versus Oxford, respectively. The solution to these data

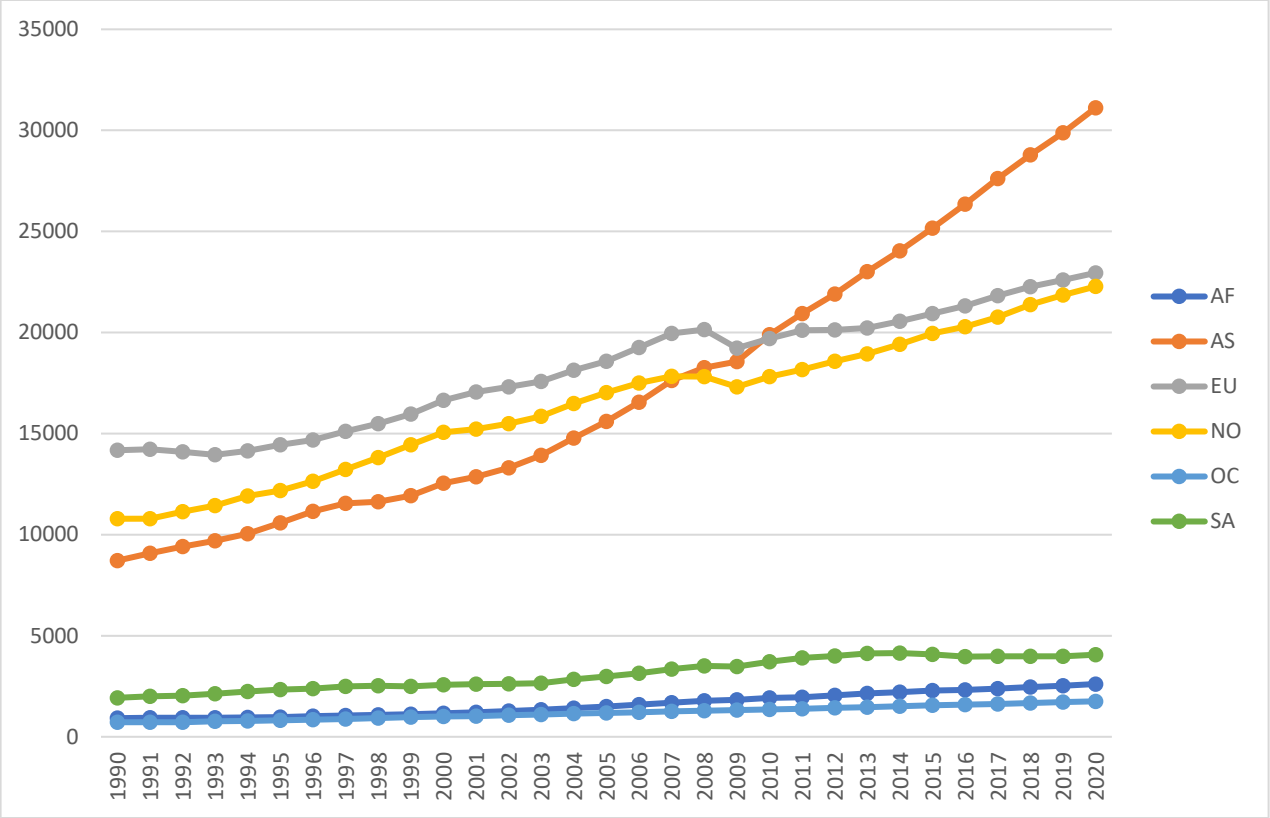
based problems would be to either reduce the number of years included in the data, or to replicated this analysis in ten or fifteen years' time.

Descriptive Statistics

Table 1

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Corruption	4,324	42.41	19.37	8	92
Service Imports	3,710	20,406	53,577	9.757	588,363
Service Exports	3,710	21,157	61,694	3.425	875,830
Fragility	2,389	70.40	23.83	16.80	114.9
PIT_rate	4,324	2.570	3.742	0	26.23
GDP	4,324	38.38	137.7	0	1,398
CIT_rate	4,324	0.229	0.134	0	0.600
Tax Base Spillover	4,324	349.7	1,329	0	18,177
Number of country_id	163	163	163	163	163

Graph 1



V. Regression Results

The section will serve to interpret the presented results of four different regressions which vary in scope based on their controls, and subsequently the data the draw upon. For the sake of consistency, those models labeled one and two (located directly below) will be referred to as the "Preliminary Regression Results". The first model included in this output provides the baseline model which includes only the two true independent variables of interest, in terms of the topic of the thesis, those variables being corruption and corporate income tax rate. The second model pertains to the subgroup of the data collected that too emphasizes the purpose of this paper, the countries within continental Africa.

Preliminary Regression Results

Table 3

VARIABLES	(1) Total Spillover	(2) African Country Spillover
Corruption	-0.0649	0.492
	(3.659)	(0.683)
GDP		2.279*
		(1.338)
Corporate Tax Rate	-248.6***	6.003
	(92.42)	(6.045)
Personal Tax Rate		-1.185**
		(0.538)
Service Imports		0.00361***
		(0.00108)
Service Exports		0.00267**
		(0.00121)
Corruption x GDP		-0.00176
		(0.0450)
Constant	299.6**	-33.40

	(147.9)	(21.09)
Observations	4,324	1,066
R-squared	0.059	0.829
Number of country_id	173	51
Country FE	YES	YES
Year FE	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From the first model in the preliminary regression results, we observe that when looked through the lens of all of the countries and years from the entire dataset, corruption does not have a significant effect on the dependent variable, spillover. We do see that corporate income tax rate (CIT) has a significant and negative relationship with tax base spillover. This relationship represents a point increase in a country's CIT for a given year decreasing the amount of tax base spillover that country encounters by 248.6 million USD. This large quantity decrease seems counterintuitive to the notion of tax base spillover, described in the data section above. However, because the measurement of tax base spillover is tailored towards developed nations with larger value CIT rates, this makes sense. Also, this may be linked as to why CIT holds such significance and corruption does not. On a similar vein, the lack of significance seen in the corruption variable can also be explained by a collinearity between tax base spillover and CIT, as a CIT estimation is used in the tax base spillover calculation.

The model which follows this rudimentary model is that which includes all of the control variables described in the data section. The regression does not, in fact, include all of the data which the set used for the first model, but on the data which is linked to a country in the continent of Africa. Once again, like the model before it, corruption is not significant in this model. Although, unlike the first model, GDP is significant at a 10%

significance level. For every increase in one-million USD in an African country's GDP sees a rise in 2.28 million USD of tax base spillover. Another contrasting variable to the first model is the personal income tax rate (PIT) has significance, but the CIT no longer does. Much like the relationship the PIT had to tax base spillover, in this model, a one point increase in the PIT rate for a given country in Africa results in a 1.185 unit decrease in tax base spillover seen. Following this significant variable are those which relate to the imports and exports of services from a given country. As framed in the data section, a one-million USD increase in service imports results in a 0.00361 unit increase tax base spillover, while a one-million USD increase in service exports results in a 0.00267 unit increase in tax base spillover.

Complimentary Regression Results

Table 3

VARIABLES	(3) OECD Country Spillover	(4) Fragile Nations Spillover
Corruption	-17.04**	-2.427*
	(8.271)	(1.356)
GDP	26.03	20.17***
	(21.35)	(6.626)
Corporate Tax Rate	-226.9	15.31
	(250.1)	(26.87)
Personal Tax Rate	-6.297	0.0250
	(6.813)	(1.714)
Service Imports	0.000930	0.00622*
	(0.00206)	(0.00329)
Service Exports	0.00303*	0.00155
	(0.00162)	(0.00282)
Corruption x GDP	0.503**	0.0155

	(0.206)	(0.0496)
Fragility		1.770
		(1.317)
Fragility x GDP		-0.125**
		(0.0488)
Constant	176.5	-252.0*
	(775.8)	(146.7)
Observations	887	2,170
R-squared	0.890	0.811
Number of country_id	37	163
Country FE	YES	YES
Year FE	YES	YES

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

These next two models, which we will call the complimentary regression models, illustrate other observations seen by the data. This is in an effort to add context to the first two regressions which stemmed from the novel concepts this thesis brought to the analysis of base erosion and profit shifting, and their subsequent effects on a given country. As such, in the third model, designed to analyze the effects of corruption and fragility on OECD member nations, we see the following trends. As a note, it is understood that the nations in this group of countries are typically developed, so this model is used to contrast the information derived from the solely African nations data.

In this third model we see that corruption has a negative and significant effect on tax base spillover. This is seen with a one unit increase in corruption in other nations leads to a 17.04 unit decrease in overall tax base spillover in the country in question. This is to be expected as an increase in corruption in other developed nations will result in those nations which are not included to have business flock to their shores. This results in a greater tax base, less profit shifting out of the country, and in turn less tax base spillover. We see next that it is the exports of services which is the next significant

variable, with a one-million USD increase in service exports results in a 0.00303 unit increase in tax base spillover. This is understandable as these service exports are directly linked to large multinational corporations, so in essence a portion of these exports are part of profit shifting practices. Finally, the interaction variable between GDP and corruption has a positive and significant relationship with tax base spillover. The relationship seen is that for every single unit increase in corruption of other nations, but the one-million USD increase in the nation in question, increases by 0.503 million USD of tax base spillover. This alludes to the fact that GDP affects corruption within a nation, causing it to increase as the wealth of a nation increases.

The final model, which pertains to the countries and years from which the Fragile States Index had data on, all told it was a loss of only ten country IDs when compared to the list of countries the Total Spillover model drew upon, that number being 173. First, we note that corruption is once again negative and significant in its relationship to tax base spillover, although not at as great a magnitude as it was seen in the OECD model. This effect is measured by an increase in one unit of corruption leading to 2.427 unit decrease in tax base spillover for the same reason it was seen in the OECD countries, just for the large scope of nations. Next, we see the significant and positive impact GDP has on tax base spillover, increasing by 20.17 million USD of tax base spillover for every one-million USD increase in a nations GDP. This makes reasonable sense as a nation with a greater GDP is more likely to have higher CIT, which would lead large corporations to find cheaper places to declare their profits. Service imports are a positive and significant relationship with tax base spillover as well. Relating to a one-million USD in imports increase to a 0.00622 unit increase in tax base spillover. Although it is

not a large effect on tax base spillover, like that compared to GDP which is measured in the same units of million USD, it still has an impact on increasing it. Finally, we have the relationship that the interaction between the GDP and the fragility of a country have on tax base spillover. This relationship is seen to be negative and significant, resulting in a decrease of 0.125 million USD of tax base spillover for every one-million USD multiplied by one fragility unit increase in the interaction. This leads one to see that a poorer nation, as well as a more fragile one results in more tax base spillover seen by that nation. Such nations will no doubt seem troublesome to investors, both home and abroad, which will no doubt drive companies and profits overseas.

Conclusion

Ultimately, a relationship between increased corruption and increased tax base spillover can be seen from this data. Unfortunately, this relationship cannot be seen directly in the data which was specifically intended for this conclusion to be drawn, that being African countries. It can be seen in more fragile nations, but this sub-category of countries cannot be directly linked to the continent in question. Tax base spillover has a great link to fluctuations in PIT and CIT, although these two variables are not significant collectively. Furthermore, the amount of service imports and exports by large companies within a particular nation serve a significant relation to tax base spillover. For both of them to have a link to base spillover's reduction as their values increase is an observation

unexpected, given their directly opposite nature on perceived effect on a nations economy. On a slightly more concrete note of productive conclusions would be the link between fragility and tax base spillover. It is seen from the last model analyzed in this paper that a fragile nation, especially one that has a smaller GDP, is more likely to experience tax base spillover.

Reflecting on this process, I would certainly have revised some of the steps that were taken to reach this final product. Chief among which would be to find a more easily calculated estimation for tax base spillover by country. As insightful as the IMF paper was for this paper, its lack of data directly linking the estimation model, the values it produced, and the countries in which those values came from made this paper's own estimation difficult to generate, as well as lacking in validity. Another alteration I would make is waiting for all of the data sources which were incorporated into this thesis to all possess thirty years of data, the number which was planned from the beginning. Due to either restructuring of how datasets were calculated, or the fact that datasets did not exist the first year of the data proved to generate holes in the set which are believed to have produced the lacking results. This, however, is an uncertain assumption.

Africa still must become a higher priority for the economic community. The pool of people which remain a lacking part of the global economic equation, especially in a predictive aspect is too great if we wish to continue building a cohesive understanding of the future of all the world's countries. The effects of BEPS remain a shifting understanding even in the developed world, where information is plentiful, and analysis are constantly happening. I believe it is a necessity that more comprehensive questions, questions like those asked in this paper, need to come from those bodies like the World

Bank, IMF, and United Nations that have the resources to effectively change the course of Africa's future.

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