The Effect of VATs on Government Balance Sheets

Alex Ufier[a,]*

[a] *Department of Economics, University of Oklahoma,.308 Cate Center Drive, Room 335 CCD1 Norman OK, 73019, United States*

Abstract:

The Value Added Tax, VAT, has become a popular means of raising funds around the world. Countries seeking to reduce variation in tax revenues as well as solve deficits often consider a VAT, and the IMF in particular has become an advocate for the tax. For all its popularity, its true fiscal impact remains understudied. This paper uses matching techniques to estimate the impact of a VAT on government debts and deficits. It finds that countries that pass VATs are able to reduce their external debt loads and improve deficits in the 5 years following the passage of the tax.

(JEL-H2)

* Corresponding Author

Email Address: alex.ufier@ou.edu, Phone Number: 405-325-1576

1) Introduction

Over the past half century the value added tax, or VAT, has become a major source of government funding for a significant number of countries around the world. Hines and Summers (2009) argue that this trend will continue, with consumption taxes like the VAT becoming increasingly important due to the increasing mobility of economic activity that will make it harder to assess income taxes. Countries often consider passing a VAT in order to solve federal budgetary shortfalls, considering it a particularly effective strategy to raise revenue and eliminate deficits (Keen 2010). Similarly, Ebeke and Ehrhart (2012) have found that countries with VATs tend to have lower variance in tax revenues as a share of GDP relative to countries without this tax. Widespread belief in the VAT's ability to gather revenue, solve deficits and reduce variance in tax receipts is apparently recently in the words and actions of lawmakers, as well as those of international entities such as the IMF. Theoretical papers agree with these findings, with Diamond and Zodrow (2013) considering the effectiveness of a VAT in reducing US government deficits in a CGE model. They find the tax it is able to rectify government budget issues but remain relatively progressive. However, it is not clear that the increase in government revenue will not then be immediately offset by increases in government spending, and so the net effect of the VAT on debt remains ambiguous.

This paper addresses the ability of a VAT to improve government balance sheets. I specifically test the VAT's effects on various measures of debt, government deficits, tax revenues and public expenditures as a share of GDP in a broad sample of countries that adopted the VAT between 1986 and 2007[1], composed of developing as well as developed countries. I consider both the level of these variables, as well as their variance, as VATs may improve the stability of some of these fiscal indicators in addition to affecting their volume. VATs are likely to affect

government revenue, government spending, and GDP growth simultaneously, so the policy's impacts on all of these measures are not immediately clear.

Despite its importance and promised benefits, the VAT is relatively understudied in economics. Several such studies including Keen and Lockwood (2010), Nellor (1987) and Ebeke (2010) look at the determinants of the VAT and generally find it increases tax revenues. Stockfisch (1985) considers its impact on government size in OECD countries, finding both adopter and non-adopter governments grow over time, with no differential effect of growth coming from the VAT. Ufier (2014) examines its macroeconomic impacts, finding it to be generally positive for investment and growth. Yet concerns still remain about the longer term fiscal impact of such a tax.

While many previous studies of the VAT use regression analysis, I follow Ufier (2014) in employing a matching framework to evaluate the fiscal impact of VATs. This method helps to address estimation problems in this setting. As a country chooses whether to adopt a VAT, adoption is a choice and naïve OLS estimates will not be capture the effect of the tax alone, but also pick up the effect of selection into the tax. Not all countries without a VAT are relevant comparisons to countries who adopt the VAT as countries select the treatment endogenously. Using matching should alleviate this issue by comparing countries that adopted the VAT only to those countries which are similar, but did not adopt the tax.

Estimation in this paper will follow a two-step process. First, using survival analysis, I will estimate the probability of a country adopting a VAT in a given year based on observable factors. Second, I will match two (or more) countries with similar probabilities of failure[2], in which one adopted the VAT and the others did not, in order to estimate the effect of a VAT in the 5 year span following its adoption. As a falsification test, I will also compare adopters and

similar non-adopters for 7 years before adoption in order to verify there were no pre-existing differences or trends that would invalidate the assumption countries were similar prior to choosing the treatment.

The findings of this paper are of great relevance to the United States, the exception to the general rule of VAT adoption among large and developed economies.[3] Several researchers have sought to evaluate reasons for and against the adoption of a VAT in the United States, with the primary motivation of adopting the tax being to solve the forecast U.S. structural budget deficit (Toder and Rosenberg 2010). Many researchers consider the VAT to be the most effective means among a set of politically feasible policies meant to close the budget gap (Gale and Harris 2010, Brown and Gale 2012). This policy opinion is seen as credible by the private sector; a recent KPMG report warns businesses that the number one reason for the passage of a VAT in the US would be to solve long run debt issues.

On the other hand, some researchers argue that this tax will not solve the problem of excessive spending in the US, will offer no efficiency gains over the current income tax system, will be significantly less progressive than other US taxes, and will compete with state tax collecting mechanisms, all of which make the tax a net loss for the United States (Holtz-Eakins 2011). Some policy makers fear a "money machine" with the VAT leading to the government's spending of all the additional funds it takes in, leaving balance sheets no better off than before the passage of the tax (Keen 2007). In previous general tax papers, authors had found that higher tax receipts did lead to higher tax expenditures in some cases (Manage and Marlow 1986) but not in others (Von Furstenberg et al 1986.) Lee, Kim, and Borcherding (2013), however, propose the opposite of the feared government tax spiral- instead of high revenues causing higher demand for public goods, people's preferences for higher levels of public goods tends to lead them to pass

more revenue collecting measures. The opinion on the VAT is thus mixed, and more solid empirical evidence of its impact on debt and deficits would help to better understand the possible policy uses of a VAT.

This paper is organized as follows. Section 1 provides a brief summary and introduction, and section 2 provides background on the VAT. Section 3 discusses the first part of the estimation, survival analysis, and section 4 discusses the second, matching. Section 5 covers results and section 6 concludes.

2) Background

France passed the first consumer-level VAT in 1954, reforming it to a modern manufacturing level VAT with a refund mechanism in 1968. By this time, Cote d'Ivoire had already passed a VAT in 1960 and the tax was beginning to spread to Latin America and Western Europe. Initial adoptions came slowly in the 1970s and early 1980s, spreading eventually to Southern Europe and Sub-Saharan Africa. By the early 1990s many countries in Eastern Europe and Asia began to acquire the tax. In the 2000s, small island nations in the Pacific and Caribbean became one of the last major groups to implement the tax, and currently the Middle East remains the only major holdout region, with the Arab Gulf states currently investigating a VAT in the immediate future. The sole major industrialized economy without a VAT as of 2014 is the United States.

2.1 Further Literature

A VAT, like any other tax, can be used to solve budget deficits and improve government balance sheets. However, it is not at all clear that the tax would be used to actually correct budget sheet imbalances faced by countries adopting it. The static benefits of raising revenue through an easy to collect tax mechanism may be counterbalanced by the dynamic effects of governments instead choosing to raise expenditures or cut other taxes, leaving its fiscal position no better than before the tax (Keen 2007, Toder and Rosenberg 2010). Additionally, Bird and Smart (2012) highlight the increasingly prominent role of the VAT as a tax intended to shore up large entitlement programs whose original funding streams prove insufficient. A number of theoretical papers predict the impact of a VAT on macroeconomic variables, but lack empirical tests of their theories. While Ufier (2014) considers the impact of a VAT on government consumption as a share of GDP, and Ebeke and Ehrhart (2012) considers stability of revenues in a regression framework, empirical evidence does not definitively state whether VATs tend to reduce debts and deficits in countries that have passed them.

Numerous nations in recent years are looking at a VAT for the reasons of raising revenue and reducing deficits, usually under advisement from the IMF or in official IMF reports. Bird (2010) notes that the IMF often promotes VATs to countries experiencing persistently high deficits. Aruba's recent fiscal reforms selected to replace many current taxes with the VAT (IMF 2010). The Bahamas found numerous tax deficiencies and suggested reforming the government's tax structure by imposing a VAT, as it does often with many recent article IV missions (IMF 2013.) The new government of Afghanistan is considering the VAT along with taxes on natural resources to be its primary sources of revenue (IMF 2012). Burundi's stated goals in passing the VAT is to bring its tax code closer in line with the international standard, their de facto endorsement of the VAT as the standard world tax (African Development Bank 2010). The

Marshall Islands considers a VAT likely to be a successful means of securing revenue for the economy, if accompanied with other fiscal reforms (IMF 2008). Prior to acquiring the VAT, Palau considered their tax system in gross need of modernization and reform, with the VAT being the best way to reform it for fiscal stability (IMF 2012). More directly, the IMF recently demanded implementation of the VAT in Pakistan with no exemptions or changes allowed; If Pakistan were to try to alter the law as presented to them, they would cease future assistance in the country (Rana 2013). There are thus a fair number of countries considering a number of tax reforms recently, and their general consensus has been to side with the VAT as the best available of those options for raising revenue and keeping it stable.

The last major bloc of countries without a VAT, oil producing countries in the middle east, are now considering the VAT for revenue stability purposes. The Gulf Cooperation Countries, long reliant on oil revenues and banking taxes for funding, consider this tax to be the best means of acquiring a constant stream of revenue and reversing government deficits (Charalambous 2012). Officials in Bahrain, Kuwait, UAE, and Qatar have all spoken out in support of this action (Izzak and Saleh 2013, Kapur 2012, Peninsula 2012, Rafique 2011). There is a great deal of international support behind the VAT as a tool for solving budget deficits or raising revenue in the long run. Yet for all the strength with which this tax is promoted, there is a relative dearth of empirical evidence.

3) Survival Analysis

In order to properly account for the selection in acquiring to VAT, one first needs to model the decision to adopt a VAT. This paper uses the same selection equation and covariates to model VAT adoption as Ufier (2014), employing a Cox proportional hazard model with

countries surviving in a VAT-free state for a period until they acquire the tax and thus exit the estimation. I will only briefly cover the topic of selection equation and its determinant in this paper, as Ufier (2014) covers it in greater detail. This paper uses a propensity score matching technique, modeling the adoption of a VAT as a Cox proportional hazard model. The persistence of a VAT means that a survival model would provide a good fit to the observed data, as countries tend to acquire the tax and never repeal it. This analysis allows me to estimate the probability of failure, adopting a VAT, in each country in each period. I then compare countries at equal risk of failing in the case where one failed and the other did not in order to obtain an unbiased estimate of the effects of adopting a VAT, as actual time to failure is random conditional on countries having the same probability of failure (Lu 2005).

3.1 Determinants of Adoption

There is a great deal of theoretical guidance as to the determinants of a country choosing to pass a VAT, but the major determinants of tax adoption can be split into several groups. International pressure, in the form of IMF lending, could lead to more countries acquiring the VAT (Bird 2010). IMF lending is represented here as a dummy variable equaling 1 if a country is under an IMF lending program at any point in a given year. Proximity to other countries with a VAT could also lead to one acquiring it, either from the experience of seeing a neighbor implement it or tax competition, and so the share of neighboring countries with a VAT is included as a determinant (Cizek et al 2012). National economic composition, specifically countries with a large share of GDP coming from agriculture or natural resource production, likely affects the type of taxes a government chooses to collect. Countries that collect revenue from natural resources may be less likely to rely on other types of taxes, and agriculture is

considered difficult to monitor for providing reimbursement and collecting taxes necessary with a VAT system (Keen and Lockwood 2010, Cnossen 1998).

Geopolitical factors including landlocked status, island status and log land area are all included as dummy variables. These measures all potentially affect a nation's decision to acquire a particular tax due to their effects on enforcement, with landlocked countries having more difficulties in controlling smuggling of products to avoid VATs compared to countries with only a limited number of points of entry (Keen 2010). Historical factors, including French or British influence, as well as Warsaw pact membership all could affect a countries' legal system and thus decision to adopt the tax (Keen 2010). Decentralized federations may also avoid a tax that requires centralized collection like a VAT (Ebrill et al. 2001, Treisman 2002).

Demographic factors may affect the optimal tax system for a country, especially for ones with large safety nets for the elderly (Bird and Smart 2012). A tax system with a fixed setup cost may also not be considered worthwhile in very small or very poor, resource constrained countries. Therefore, I also include the log of population, population growth, log of GDP, and log of GDP per capita as determinants of adoption. Next, I include the macroeconomic outcome variables of growth, trade, inflation, investment and government consumption all as a share of GDP. These variables may determine legislator's decisions to implement the tax. Finally, as there is usually some lag between the planning and passage of a VAT and the tax actually being collected, I lag all determinants by 2 years. Thus, a country choosing to acquire a VAT in 1996 does so based on values of its covariates from 1994. This is in line with Ebrill et al. (2001) who state there is roughly an 18 month lag between and decision to pass the VAT and its collection, and Cizek et al (2012) who also use a 2 year lag.

3.2 Summary Statistics and Results

Table 1 presents summary statistics on determinants of VAT adoption, as well as the outcome variables, debts and deficits, affected by the VAT policy. The independent variables used in the survival analysis have coverage from 1986-2012, allowing me to model countries' VAT adoptions during this period. I consider independently seven outcome variables that summarize government fiscal positions, coming from three different data sets. First, the World Development Indicators collects an external debt (as a share of GDP) series, and it covers approximately 80% of the country-years during the period of interest. This data set has the best coverage of the three available datasets. Second, World Economic Outlook contributes four data series to this study: deficit or surplus, cyclically adjusted deficit, tax revenue, and government expenditure, all as a share of GDP. These series cover nearly as many years and countries as the World Development Indicator's external debt series, and also provide numerous alternative ways to consider the fiscal impact of a VAT.[4] Finally, Reinhardt and Rogoff, hereafter R&R, produce a data set on national debt positions. This data set has a series of both external debt and central government debt as a share of GDP. However, this data set covers a smaller share of the period in question, approximately 20% of total observations. Thus tests using this data series are likely to have much less power than tests using either of the previous series. Any null findings using R&R's debt data may be due to the low power coming from a smaller sample size rather than evidence of a lack of robustness across data sets.

Table 2 shows the result of the Cox proportional hazard regression used to model the decision to adopt a VAT, where failure is defined as adopting a VAT. Four variables are statistically significant determinants of choosing to enact a VAT. Countries receiving IMF assistance are more likely to pass a VAT, as are Francophone countries. Countries with large

TABLE 1
Summary Statistics, Right Hand Side Variables, 1986-2010

Variable	Obs.	Mean	Std. Dev.	Min	Max
RR Central Government Debt	251	65.52	61.64	3.4	640.1
RR External Debt	278	61.02	48.2	8	414.9
WDI Central External Debt	990	95.7	118.94	2.94	1380.77
WEO Surplus or Deficit	861	-2.2	7.28	-46.24	43.3
WEO Primary Surplus or Deficit	404	0.65	6.36	-17.36	31.81
WEO Tax Revenue	868	26.94	11.72	4.49	71.62
WEO Expenditure	876	29.32	10.84	6.44	82.08
Government Consumption	1287	14	10.01	1.11	69.83
Inflation	1287	53.96	777.6	-29.17	26762.02
Investment	1287	22.66	10.87	1.76	113.58
GDP per Capita Growth	1287	1.66	6.87	-47.29	90.47
Trade	1287	81.79	49.25	10.83	360.86
IMF Lending Dummy	1287	0.55	0.5	0	1
Agriculture	1287	22.5	16.93	0.21	80.07
GDP, Log	1287	22.18	2.25	18.76	30.09
GDP Per Capita, Log	1287	7.06	1.53	4.41	10.56
Natural Resource Rents	1287	10.48	14.29	0	80.69
Bordering Countries with VAT	1287	0.27	0.34	0	1
% of Population 0-14	1287	38.77	8.12	17.17	52.79
% of Population 65+	1287	4.49	2.65	0.5	14.48
Population Growth	1287	2.12	1.51	-7.53	14.78
Population, Log	1287	15.12	2.09	11.45	20.88
Size, Log Square Kilometers	1287	11.41	2.69	5.7	16.05
Association of Small Island States	1287	0.24	0.43	0	1
Former Warsaw Pact	1287	0.03	0.18	0	1
British Commonwealth	1287	0.45	0.50	0	1
Francophonie	1287	0.32	0.47	0	1
Island	1287	0.24	0.43	0	1
Landlocked	1287	0.22	0.41	0	1
Federal	1287	0.10	0.30	0	1
Asia	1287	0.27	0.44	0	1
Europe	1287	0.06	0.23	0	1
Africa	1287	0.45	0.50	0	1
North America	1287	0.12	0.32	0	1
South America	1287	0.04	0.21	0	1
Pacific	1287	0.06	0.24	0	1

Notes: Observational units are country-year pairs.

natural resource rents as a share of GDP and that are governed as federations are less likely to pass a VAT. These are all consistent with the previous literature.

4) Matching

I use the results of the Cox proportional hazard model selection equation from Table 2 to generate propensity scores. For each country-year pair, I save the instantaneous probability of adopting a VAT from the hazard model. Using the process outlined by Lu (2005), for two observations wherein the difference in failure rates approaches 0, failure is random conditional on those observables. Thus I will be comparing country-years that fail and acquire VATs to country-years that do not fail but were otherwise similar.

Several methods are available to produce matching estimates. Most popular is nearest neighbor matching. I can compare the n nearest neighbors to a single treated observation, comparing the treated units to the average outcome of the n closest untreated country-years, both with or without replacing the pool of untreated units after performing a match. Alternatively, one could compare treated units to all untreated units with a propensity score within a given distance- a propensity score distance of .05, for example- of the treated unit. Finally, one could compare the treated unit to all untreated units, but weight them inversely based on the distance between the treated and untreated units propensity score. Thus, those with very similar propensity scores make up a larger share of the comparison group than those with very different ones. While one could use linear weighting, there are a number of other weighting kernels one could employ for this matching. This paper primarily uses the inverse propensity score weighting method

TABLE 2
Cox Hazard Regressions for VAT Adoption

	1986-2012
Government Consumption	-0.022
	(0.017)
Inflation	-0.007
	(0.005)
Investment	0.011
	(0.015)
GDP per Capita Growth	-0.010
	(0.019)
Trade	-0.003
	(0.004)
IMF Lending Dummy	1.253***
	(0.360)
Agriculture	-0.008
	(0.014)
GDP, Log	6.359
	(4.505)
GDP per Capita, Log	-5.968
	(4.491)
Natural Resource Rents	-0.030**
	(0.014)
Bordering Countries with VAT	0.512
	(0.450)
% of Population 0-14	-0.004
	(0.042)
% of Population 65+	-0.043
	(0.112)
Population Growth	0.004
	(0.090)
Population, Log	-5.930
	(4.491)
Size, Log of Square Kilometers	-0.032
	(0.106)
Association of Small Island States	-0.372
	(0.587)
Former Soviet Republic	-
	-
Former Warsaw Pact	-0.953
	(0.716)
British Commonwealth	0.005
	(0.316)
Francophonie	0.681**
	(0.300)
Island	0.685
	(0.484)
Landlocked	0.076
	(0.321)
Federal	-2.056***
	(0.654)
N	1287
Pseudo-R^2	0.118
Log Likelihood	-313.114
Chi Squared	83.686
Subjects	112
Adoptions	90

t statistics in parentheses.
* $p < .1$, ** $p < .05$, *** $p < .01$

Notes: Observational units are country-year pairs; Values are coefficients for linear hazards, not hazard ratios. A coefficient of 0 thus implies no effect. To find the hazard ratios, exponentiate the coefficient; All independent variables are lagged 2 periods; All estimates performed with regional dummies for North America, South America, Europe, Asia, Africa, and Pacific, the last being omitted for co-linearity.

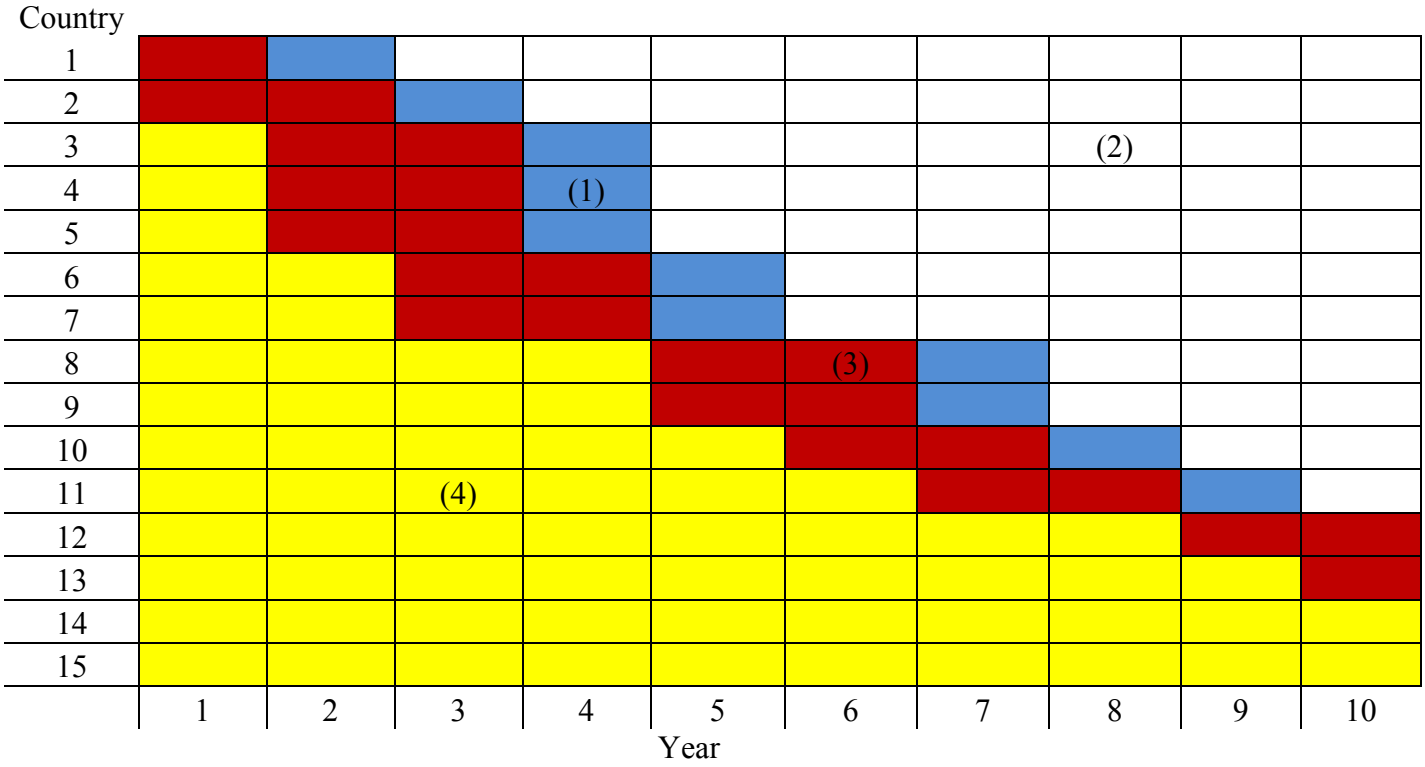
employing a normal kernel, or normal kernel matching for short. I employ several other methods as a robustness check to see if results vary by matching methodology.

Figure 1 presents a diagram for illustrative purposes of country-years that will be studied by this matching method. Going from time 0 to time T, countries acquire a VAT, and region (1) of these country-years, forming the treatment group. Country-years after this point already have VATs, in region (2), and are not used for matches and do not contribute to survival analysis. As I will be considering the effect of a VAT 5 years after its adoption, I cannot use any country-year observations less than 5 years before that country adopts as a control, in region (3). If I do, some control units would acquire the treatment during the studied 5-year period and bias the treatment effect of the VAT downward. They still can be used to estimate VAT adoption probabilities. If a country will not get a VAT for 5 or more years, and has not yet adopted one, region (4), it can be used a control observation for matching as well as affect the survival equation. Therefore I compare treated country-years from region (1) to untreated country years from region (4) to obtain an unbiased estimate of the effects of adoption of a VAT. There is no time restriction on matching, so adoption events in a given country-year can be matched to a different country that is also in a different year. Restricting the time dimension to match only within the same year will significantly reduce the number of control observations available for a given adoption event, especially in later years when many countries have adopted a VAT and thus exited estimation.

4.1 Identification Assumptions

In order for the estimation method to be valid, the matched controls need to be similar to the treated units on all observable covariates. If the two groups differ on average on any covariates, it will not be clear if the difference in outcomes among groups comes from the treatment or one of the covariates. Table 3 summarizes these differences. Prior to matching, the

FIGURE 1
Visual Explanation of Matching



Region (1) are country-years that have adoption events. These are the treatment observations. Information from these country-years are used in both the selection equation and matching.

Region (2) are country-years after adoption events. Information from this region is neither included in the selection equation nor the matching equation.

Region (3) are the 5 country-years pre-adoption that cannot be used for matching due to the need to have control country-years that do not adopt VATs for 5 years after being assigned as a control. They still provide information to the selection equation.

Region (4) are country-years 5 years or more before an adoption event. This is the pool of controls. Information from these country-year pairs are included in both the selection equation and matching.

Matching for this paper covers more countries than the 15 listed and a longer period than the 10 listed above, and so this figure is presented solely for demonstration purposes.

TABLE 3
Balance of Covariates for Matching

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Government Consumption	Unmatched	11.82	15.03	-3.21	1.18	-2.71***
	ATT	11.82	9.84	1.98	1.32	1.5
Inflation	Unmatched	12.20	77.66	-65.46	105.71	-0.62
	ATT	12.20	11.11	1.09	4.07	0.27
Gross Capital Formation	Unmatched	22.21	22.73	-0.52	1.25	-0.41
	ATT	22.21	22.23	-0.02	1.78	-0.01
GDP per Capita Growth	Unmatched	1.63	1.63	0.00	0.73	0.00
	ATT	1.63	1.06	0.57	0.92	0.61
Trade	Unmatched	74.66	84.43	-9.77	5.50	-1.78*
	ATT	74.66	62.99	11.67	8.07	1.45
IMF Lending Dummy	Unmatched	0.72	0.47	0.26	0.06	4.63***
	ATT	0.72	0.69	0.03	0.08	0.4
Agriculture	Unmatched	22.47	22.38	0.09	1.91	0.05
	ATT	22.47	23.78	-1.31	3.04	-0.43
GDP, Log	Unmatched	22.66	22.04	0.63	0.26	2.41***
	ATT	22.66	23.27	-0.60	0.47	-1.29
GDP Per Capita, Log	Unmatched	7.07	7.10	-0.03	0.17	-0.19
	ATT	7.07	7.14	-0.07	0.31	-0.24
Natural Resource Rents	Unmatched	6.76	11.82	-5.06	1.61	-3.14***
	ATT	6.76	7.92	-1.16	1.94	-0.6
Bordering Countries with VAT	Unmatched	0.38	0.21	0.17	0.04	4.60***
	ATT	0.38	0.28	0.10	0.07	1.43
% of Population 0-14	Unmatched	35.99	39.83	-3.84	0.85	-4.52***
	ATT	35.99	36.53	-0.55	1.72	-0.32
% of Population 65+	Unmatched	5.62	4.14	1.48	0.27	5.41***
	ATT	5.62	5.53	0.09	0.64	0.15
Population Growth	Unmatched	1.82	2.17	-0.35	0.17	-2.12**
	ATT	1.82	2.01	-0.19	0.23	-0.8
Population, Log	Unmatched	15.60	14.93	0.67	0.24	2.82***
	ATT	15.60	16.12	-0.52	0.36	-1.46
Size, Log Square Kilometers	Unmatched	11.77	11.25	0.52	0.31	1.7
	ATT	11.77	12.44	-0.66	0.45	-1.46
Asia	Unmatched	0.19	0.31	-0.12	0.05	-2.37**
	ATT	0.19	0.23	-0.04	0.07	-0.6
Europe	Unmatched	0.18	0.02	0.16	0.02	8.33***
	ATT	0.18	0.12	0.06	0.06	1
Africa	Unmatched	0.44	0.43	0.01	0.06	0.25
	ATT	0.44	0.48	-0.03	0.09	-0.37
North America	Unmatched	0.07	0.14	-0.08	0.04	-2.05**
	ATT	0.07	0.09	-0.02	0.05	-0.41
South America	Unmatched	0.06	0.04	0.02	0.02	0.9
	ATT	0.06	0.03	0.02	0.04	0.58
Association of Small Island States	Unmatched	0.17	0.27	-0.11	0.05	-2.17**
	ATT	0.17	0.11	0.06	0.06	0.9
Former Warsaw Pact	Unmatched	0.11	0.01	0.10	0.01	7.41***
	ATT	0.11	0.01	0.10	0.04	2.66***
British Commonwealth	Unmatched	0.40	0.46	-0.06	0.06	-1.09
	ATT	0.40	0.44	-0.04	0.09	-0.5
Francophonie	Unmatched	0.39	0.28	0.11	0.05	2.25**
	ATT	0.39	0.34	0.04	0.08	0.52
Island	Unmatched	0.21	0.26	-0.05	0.05	-0.98
	ATT	0.21	0.18	0.03	0.07	0.48
Landlocked	Unmatched	0.23	0.21	0.03	0.05	0.55
	ATT	0.23	0.19	0.04	0.08	0.58
Federal	Unmatched	0.08	0.11	-0.03	0.03	-0.97
	ATT	0.08	0.13	-0.06	0.06	-0.89
Year	**Unmatched**	**1996.98**	**1994.46**	**2.52**	**0.70**	**3.6*****
	ATT	**1996.98**	**1992.39**	**4.59**	**1.13**	**4.06*****
Propensity Score	**Unmatched**	**8.07**	**6.31**	**1.76**	**0.80**	**2.22****
	ATT	**8.07**	**8.05**	**0.02**	**0.17**	**0.14**

* $p < .1$, ** $p < .05$, *** $p < .01$

Total Observations: 863
Untreated Observations: 773
Treated Observations: 90

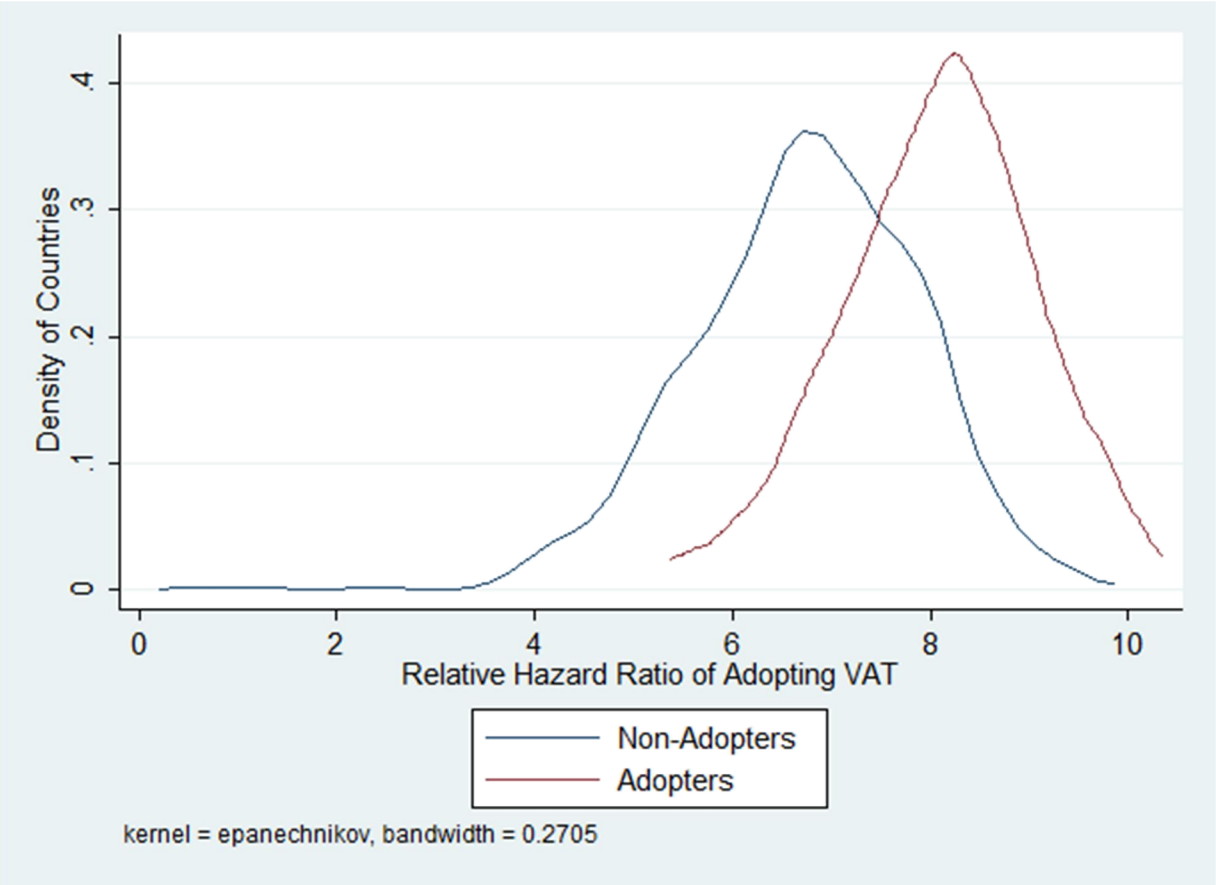
treated and untreated groups differ on 16 of the 28 covariates at least at a 10% level. After matching, they differ on only 1 of 28 covariates at least at a 10% level, with more Warsaw pact country-year observations being in the treated (VAT adopter) group than the control group. One may expect some of these variables to be statistically significantly different from zero by random chance since I am comparing 28 covariates, so this difference is not cause for undue concern. Further, figure 2 provides the distribution of propensity scores of adopters versus non-adopters. There is a large area in which there is overlap of propensity scores, or common support, where adopters and non-adopters both have similar probability of adopting the treatment, which is necessary for this method to function.

Additionally, while not explicitly a covariate and hence marked in bold on the table, VAT adoption country-years tend to be later in the panel than either the matched or unmatched controls. As countries exit estimation over time when they adopt a VAT, there should be more country-years available for controls at early dates then at later ones as seen in Figure 1. While the difference in years could be cause for concern, possibly affecting outcome variables, it would have to affect the observed outcome variables through a channel other than one of the included covariates, as there is no statistically significant difference between the groups in all but one of those variables. This evidence indicates that the matching method significantly reduces the bias resulting from a country's selection of tax policy, allowing me to estimate the treatment effect of a VAT more accurately.

5) Results

Using the failure rates generated in Table 2 as propensity scores, one can compare countries with equal probabilities of adopting a VAT in cases where one country did and the

FIGURE 2
Evidence of Common Support- Kernel Density Plot



other countries did not. Countries are matched using a normal kernel, in which countries with propensity scores closer to the adopter are weighted more heavily than those further from the adopter. As demonstrated in Table 3, this matching significantly reduces the selection on the observables, leaving the control and treatment groups on average nearly identical on observable variables. Comparing their mean outcomes should reduce the bias of the estimate of the treatment effect of passing a VAT, as one is comparing only similar countries, making the control countries a relevant comparison to the treatment group. Table 4 compares the treated units to matched controls.

5.1 Deficits

There is evidence of changes in WEO Deficits (2) as well as primary adjusted deficits (1) in the years following the VAT adoption. In the span of time after adoption, the change from 2 years before adoption[5] to 5 years after, average deficits fell in treated countries compared to untreated ones as indicated by a positive T statistic. This corresponds to approximately 3.56 percentage points of GDP. However, there is no evidence of such a change over time, from 2 years before adoption to 5 years after, in the variance of surplus/deficits, implying that revenue sources do not becomes significantly more stable. It is possible that countries that pass VATs are able to improve their fiscal balance sheets when compared to their peers. But these countries do not see an improvement in stability of deficits when compared to similar countries that may also be pursuing policies to achieve similar ends but do not acquires VATs. Note that there is no statistically significant change in expenditure (6) or tax revenue (7) as a share of GDP as measures from changes 2 years before adoption to 5 years after, which one may expect if deficits are to fall. While tax revenue rises and expenditure falls, neither change is significant on its own.

TABLE 4
Summary of Matching Results, Normal Kernel

T Statistic, Mean Difference, Treated and Matched Controls, measures all % of GDP

	(1) WEO Primary Surplus/Deficit	(2) WEO Surplus/Deficit	(3) WDI External Debt	(4) RR External Debt	(5) RR Central Government Debt	(6) WEO Expenditure	(7) WEO Tax Revenue
7 Years Pre-Adoption	0.1	0.29	1.33	2.68***	1.98*	0.63	1.02
6 Years Pre-Adoption	-0.5	0.48	0.85	0.98	2.17**	0.65	1.01
5 Years Pre-Adoption	-0.4	0.01	0.96	2.49***	2.06**	0.7	0.76
4 Years Pre-Adoption	0.39	-0.05	0.95	2.35**	1.94*	0.63	0.66
3 Years Pre-Adoption	-0.85	0.2	0.76	1.73*	1.54	0.72	0.87
2 Years Pre-Adoption	-1.84*	-0.61	0.62	1.39	1.1	1.36	0.96
1 Year Pre-Adoption	-1.41	-0.37	0.19	1.27	1.14	1.41	1.12
Year of Adoption	-0.93	-0.53	-0.18	2.62***	1	1.56	1.04
1 Year Post-Adoption	-0.91	0.16	-0.22	0.88	0.99	1.03	0.95
2 Years Post-Adoption	-0.67	0.42	-1.17	0.79	1.62	0.89	0.97
3 Years Post-Adoption	-0.31	0.75	-1.35	1	1.67*	0.58	0.91
4 Years Post-Adoption	0.04	1.21	-1.85*	0.53	1.4	0.03	0.73
5 Years Post-Adoption	0.57	1.48	-2.03**	-0.18	0.74	0.23	0.99
Change 2 Years Pre-Adoption to 5 Years Post-Adoption	**2.21****	**1.9***	**-2.86*****	**-2.19****	**-0.01**	**-1.35**	**0.15**
Change 7 Years Pre-Adoption to 2 Years Pre-Adoption	-0.81	-0.66	-0.93	-0.24	-0.21	0.61	-0.06
Variance 2 Years Pre-Adoption to 5 Years Post-Adoption	-0.57	-0.13	-0.38	0.54	0.08	-0.71	-0.51
Variance 7 Years Pre-Adoption to 2 Years Pre-Adoption	-0.04	-0.06	-1.30	0.12	0.21	-0.07	0.47
Treated Observations	14	38	55	30	26	39	38
Untreated Observations	124	302	501	124	92	312	305

$^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$

Notes: T statistics above for mean differences, treated (adopters) minus untreated (matched controls).
Propensity scores for matching are generated by hazard regression on Table 2.

Only the net effect of combining changes in revenues and expenditures, which would be seen in the reduction of deficits, is statistically significant.

5.2 Debt, Revenue, and Expenditure

Next, there is also a statistically significant effect of VATs on externally held debt, both as measured by the WDI (3) and by R&R (4). Both data sets show a statistically significant decrease in debt in the years following VAT adoption, looking from 2 years before adoption to 5 years after adoption. This evidence is consistent with both the earlier findings that governments reduce deficits as a share of GDP after getting a VAT as well as VAT's promotion by the IMF that a country can use the tax to get a countries' fiscal house in order.

However, there is limited evidence that there is a reduction in overall government debt (5). While in the years before a VAT is passed, central government debt as a share of GDP is higher among adopters than it is afterward, there is no strong change over time as one found with the deficit or external debt data. Similarly, there is no evidence of a change in expenditures (6) or tax revenue (7) as a share of GDP in the years following the VAT's implementation, or any overall difference in changes over time. Although tax revenue increases and expenditure decreases, both findings are insignificant. This is not inconsistent with the evidence from Ufier (2014), who found that VATs reduced government consumption as a share of GDP. The directions of the effect are the same, and it is possible this lack of evidence for an effect comes from a lack of power brought on by the smaller data set used here.

It is important to note that none of these measures show any differences in changes over time before adoption, the change 7 to 2 years pre-adoption, which would indicate that adopters were facing different trends than non-adopters that otherwise looked similar. There are also no

differences in variances either before or after VAT adoption for any of these measures. However, R&R data show that in several years before adoption adopters had higher debt loads than comparable non-adopters. This difference disappears after they get VATs, indicating an improvement in their debt loads.

5.3 Comparison to Results Without Matching

To show how results would differ without correcting for selection, Table 5 compares the difference between VAT adopter country-years and non-adopter country-years before any matching is applied. Thus any differences will be capturing not only the treatment but also the selection into the treatment, including countries that are not relevant comparisons to adopters, which may be biasing the results. There does not appear to be a significant change in surplus/deficit over time for either primary adjusted (1) or unadjusted surplus/deficits (2) from 2 years before VAT adoption to 5 years after, although for the primary adjusted deficit VAT adopters tend to run higher deficits in the years around the time of adoption. This could imply some higher costs from setting up the tax system. However, in the years following VAT adoption, surplus and deficits both tend to have lower variance among VAT adopters than non-adopters. This could indicate that a VAT is able to broaden the tax base and secure a more stable source of revenue than previous tax policies, a result which does not change once one accounted for selection as seen in Table 4. However, there is no long run improvement in deficits as there is in Table 4, a possible a results of selection rather than the effect of the tax.

VAT adopters do have much higher external debt loads as measured by R&R (4) than non-adopters, but this effect goes away before the VAT is even in effect, indicating that a country's fiscal condition is improving well before the tax goes into effect. There is no evidence

TABLE 5
Comparison of Means without Matching

T Statistic, Mean Difference, Treated and Unmatched Controls measures, all % of GDP							
	(1) WEO Primary Surplus/Deficit	(2) WEO Surplus/Deficit	(3) WDI External Debt	(4) RR External Debt	(5) RR Central Government Debt	(6) WEO Expenditure	(7) WEO Tax Revenue
7 Years Pre-Adoption	0.33	0.40	1.33	3.65***	0.08	-1.94*	-2.43**
6 Years Pre-Adoption	0.11	0.23	0.85	3.47***	0.56	-1.99**	-2.19**
5 Years Pre-Adoption	0.13	0.01	0.96	3.12***	0.41	-2.23**	-2.54***
4 Years Pre-Adoption	-0.70	-0.04	0.95	2.6***	0.56	-2.31**	-2.59***
3 Years Pre-Adoption	-0.37	0.28	0.76	1.51	0.22	-2.27**	-2.18**
2 Years Pre-Adoption	-2.28**	-1.05	0.62	1.00	-0.04	-1.49	-2.15**
1 Year Pre-Adoption	-2.29**	-0.9	0.19	1.30	0.55	-1.3	-1.87*
Year of Adoption	-2.09**	-1.56	-0.18	0.66	0.25	-1.02	-2.1**
1 Year Post-Adoption	-1.71*	-1.15	-0.61	0.69	0.19	-1.38	-2*
2 Years Post-Adoption	-1.41	-1.05	-1.26	0.55	0.8	-1.28	-1.73*
3 Years Post-Adoption	-1.57	-1.18	-1.29	0.98	0.66	-1.35	-1.74*
4 Years Post-Adoption	-1.37	-1.08	-1.55	0.27	0.18	-1.92*	-2.06**
5 Years Post-Adoption	-1.01	-1.13	-1.63	-0.28	-0.31	-1.59	-1.91*
Change 2 Years Pre-Adoption to 5 Years Post-Adoption	**-1.05**	**-0.11**	**-1.17**	**-1.03**	**-0.29**	**0.23**	**0.19**
Change 7 Years Pre-Adoption to 2 Years Pre-Adoption	-1.15	-1.01	-1.59	-1.75*	-0.11	1.02	0.1
Variance 2 Years Pre-Adoption to 5 Years Post-Adoption	-1.74*	-1.94*	-0.72	-0.04	-0.54	-1.72*	-2.32**
Variance 7 Years Pre-Adoption to 2 Years Pre-Adoption	-0.40	-0.80	-1.18	-0.32	-0.26	-0.66	-1.01
Treated Observations	14	38	55	30	26	312	305
Untreated Observations	124	302	501	124	92	39	38

$^{*}p < .1$, $^{**}p < .05$, $^{***}p < .01$

Notes: T statistics above for mean differences, treated (adopters) minus untreated (non-adopters).
Propensity scores for matching are generated by hazard regression on Table 2.

of changes in debt as measured by the WDI (3) or central government debt (5) in any period. Thus, without accounting for selection, I would not have found an effect of VATs on measures of debt. Only after accounting for selection did I identify long term effects of a VAT on debts or deficits: without accounting for selection there appears to only be a transitory worsening of deficits. This provides significant evidence in favor of the VAT's ability to improve fiscal balance sheets.

Without using matching and accounting for selection on observables, countries that eventually acquire a VAT have lower expenditures as a share of GDP (6) in the years prior to adoption but not after adoption, with the variance of expenditure also falling after adopting. Tax revenue as a share of GDP (7) is smaller for countries with VATs over the entire period, with their variance falling after the tax is passed. However, there were no such differences in countries when using the matching methods, and thus these differences may be driven by selection into the treatment rather than the treatment itself.

These effects, taken together, might lead one to infer that the VAT will reduce variance in government expenditure, tax revenues, and surplus/deficits, as well as raise government expenditures as a share of GDP. This would lead credence to the argument that the VAT is a money machine, leading to an increase in the size of government, but that it also would support the argument it broadens and stabilizes the tax base. However, these differences in means are not capturing the effect of VAT adoption alone, as one is comparing countries that acquire the VAT to all other countries. As countries passing the tax likely look different on a number of observables as well as un-observables, this difference represents not only the effect of the treatment but also the selection into the treatment. After controlling for selection on observables, there is evidence instead for an improvement in external debt levels and deficits, but no evidence

for increases in government expenditure or tax revenues independently. Matching methods thus show the fears of VAT as a money machine are unfounded, and also strengthen the case for a VAT's debt reduction and deficit improvement abilities.

5.4 Alternative Matching Methods

The findings in Table 4 could be driven by the choice of matching method, and so several different matching methods are attempted in Table 6. To conserve space, only overall changes in outcomes after VAT and before VAT are compared. No matching methods should show statistically significant differences changes in the years prior to VAT adoption or else the validity of the method may be called into question, while if the VAT has an effect that there should be some change in the years after the tax is passed. The additional methods used in this case include single nearest neighbor with and without replacement, three nearest neighbor with replacement, caliper matching of size .1 and .05, as well as Epanechnikov kernel weighting to accompany normal kernel weighting.

Generally speaking, the results are robust to alternative matching methods. There is an improvement in government deficits as measured by the WEO (cyclically and non-cyclically adjusted) in the years following VAT implementation, and a reduction in external debt (from WDI and R&R) as a share of GDP in most of the matching methods attempted. There is no evidence for any changes in government expenditure or tax revenue as a share of GDP, or changes in central government debt as measured by R&R.

Table 7 compares the changes in variance of outcomes before and after the VAT treatment under various matching methods, finding a relatively null picture, with the few statistically significant findings being in favor of the VAT improving fiscal conditions in a

TABLE 6
Comparison of Matching Methods, Levels

Variable, Change 2 Years Pre-Adoption to 5 Years Post-Adoption	Single Nearest Neighbor, No Replacement	Three Nearest Neighbors	Single Nearest Neighbor	Caliper .1	Caliper .05	Epanechnikov Kernel	Normal Kernel	Total Significant 10% level
WEO Primary Surplus/Deficit	3.4***	3.84***	2.53***	3.24***	2.14**	2.07**	2.21**	7
WEO Surplus/Deficit	1.85*	2**	2.1**	1.76*	1.19	1.32	1.9*	5
WDI External Debt	-1.82*	-2.72***	-1.65	-2.29**	-2.31**	-2.34**	-2.86***	6
RR External Debt	-1.56	-2.39***	-2.66***	-1.37	-0.97	-0.70	-2.19**	3
RR Central Government Debt	-0.72	-0.66	-0.50	-0.83	-1.15	-1.10	-0.01	0
WEO Government Expenditure	-0.74	0.75	-0.69	-0.94	-0.28	-0.40	-0.71	0
WEO Tax Revenue	0.79	0.25	1.19	0.38	0.60	0.56	-0.51	0

Variable, Change 7 Years Pre-Adoption to 2 Years Pre-Adoption	Single Nearest Neighbor, No Replacement	Three Nearest Neighbors	Single Nearest Neighbor	Caliper .1	Caliper .05	Epanechnikov Kernel	Normal Kernel	Total Significant 10% level
WEO Primary Surplus/Deficit	0.03	-1.42	-1.06	-1.67*	-1.02	-0.90	-0.81	1
WEO Surplus/Deficit	-1.13	-0.92	-0.36	-1.04	-1.58	-0.81	-0.66	0
WDI External Debt	-0.24	-0.97	-0.48	-1.06	-1.08	-1.05	-0.93	0
RR External Debt	-0.56	-0.61	0.00	-0.83	-0.73	-0.71	-0.24	0
RR Central Government Debt	0.84	0.42	0.6	0.49	0.62	-0.71	-0.21	0
WEO Government Expenditure	0.77	-0.99	0.64	0.83	1.39	0.95	-0.07	0
WEO Tax Revenue	-0.28	0.06	0.23	-0.20	0.25	0.32	0.47	0

t statistics listed
* $p < .1$, ** $p < .05$, *** $p < .01$
Notes: Propensity scores for matching are generated by hazard regression on Table 2.

TABLE 7
Comparison of Matching Methods, Variance

Variable, Change 2 Years Pre-Adoption to 5 Years Post-Adoption	Single Nearest Neighbor, No Replacement	Three Nearest Neighbors	Single Nearest Neighbor	Caliper .1	Caliper .05	Epanechnikov Kernel	Normal Kernel	Total Significant 10% level
WEO Primary Surplus/Deficit	-2.01**	-2.20**	-1.66*	-1.47	-2.33**	-0.71	-0.57	4
WEO Surplus/Deficit	0.44	0.48	0.10	-0.02	0.49	0.25	-0.13	0
WDI External Debt	-0.84	-0.54	-0.74	-0.32	-0.32	-0.28	-0.38	0
RR External Debt	1.62	0.57	1.40	0.75	1.02	0.88	0.54	0
RR Central Government Debt	1.05	0.62	1.03	-0.22	-0.23	-0.31	0.08	0
WEO Government Expenditure	-0.38	-0.93	-0.80	-0.94	-0.68	-0.68	-0.71	0
WEO Tax Revenue	-0.69	-1.12	-0.27	-0.36	-1.08	-1.08	-0.51	0

Variable, Change 7 Years Pre-Adoption to 2 Years Pre-Adoption	Single Nearest Neighbor, No Replacement	Three Nearest Neighbors	Single Nearest Neighbor	Caliper .1	Caliper .05	Epanechnikov Kernel	Normal Kernel	Total Significant 10% level
WEO Primary Surplus/Deficit	0.47	-0.47	-0.84	0.36	-3.17***	-3.14***	-0.04	2
WEO Surplus/Deficit	0.92	0.20	0.93	-0.13	-0.24	-0.05	-0.06	0
WDI External Debt	-1.37	-0.78	-0.77	-1.34	-0.94	-1.14	-1.30	0
RR External Debt	2.02**	1.59	2.13**	-0.01	1.15	0.06	-0.12	2
RR Central Government Debt	1.95*	1.86*	2.07**	-0.08	1.05	0.03	0.21	3
WEO Government Expenditure	0.43	-0.15	0.28	-0.18	-0.87	-0.13	-0.07	0
WEO Tax Revenue	0.97	0.15	0.67	0.81	-0.01	0.26	0.47	0

t statistics listed
$^{*}\ p < .1,\ ^{**}\ p < .05,\ ^{***}\ p < .01$

Notes: Propensity scores for matching are generated by hazard regression on Table 2.

country. First, under some matching methods, VATs were able to reduce the variance of the primary adjusted deficit in adopter countries compared to matched controls. However, many of those countries had lower variance in primary deficit before the VAT was even adopted. Similarly, a few matching methods found that variance in external debt or central debt as a share of GDP was higher among VAT adopters prior to adoption than it was among the matched control countries. This could indicate a potential difference in variances of debt levels prior to VAT adoption not corrected for by the matching method. It could also simply be a type I error, erroneously rejecting a false null of no effect. Alternatively, it could be driven by the choice of matching method. There is thus some evidence that VATs can reduce variance of debt or deficits, although this evidence is not robust.

6) Conclusion

The VAT has been considered or implemented in numerous countries as an important tool for raising revenue in order to reduce government deficits and debts, being entertained recently even by policy makers in the largest VAT-free nation, the United States. Yet there is mixed opinion as to whether this tax is actually effective at lowering deficits and decreasing debt. This paper has provided novel evidence that a VAT can indeed be an effective tool in reducing one's external debt stocks and government deficits. The primary takeaway from this exercise, is that VATs are able to reduce fiscal deficits and external debt levels, while at the same time they do not lead to a large increase in government expenditure. Without employing matching methods, I would have not detected these effects. This study found little evidence of VAT's ability to increase the stability of revenues, expenditure, debts, or deficits, as measured by their variance.

While the findings of this paper are strongly suggestive and may push many holdouts to once again consider acquiring a VAT, the results should be approached with caution. First, the method does not differentiate between various other factors that are important to the success of a VAT, including taxation rates and operation of the rebate system (Edmiston and Fox 2006). Popular VAT exemptions given to staples, such as food, may be expensive and ultimately unwise policies (Iorwerth and Whalley 2002.) Second, this paper does not explicitly consider the welfare effects of the tax or its incidence of payment, both of which could be of concern to policy makers due to the burden placed on consumers and poorer individuals (Politi and Mattos 2011, Stiglitz 2008, Emran and Stiglitz 2005.) Third, this analysis is only able to address countries that have gotten VATs from 1986-2007, thus only studying some developing countries that implemented a VAT and fewer developed ones. Finally, this paper uses numerous data sets in order to show the proposed effects on debts and deficits, and many of these data sets are missing a significant number of observations. Assuming their omission is random, this is not cause for concern. If selection is at work, it could be biasing the effects of a VAT upward, as countries missing data may have poorer institutions that are less able to benefit from the tax or implement it. Results are generally consistent between data sets, and if the sample size were to increase the power of the test for difference in means should increase, likely strengthening the evidence of effects of a VAT. Yet despite some shortcomings, these findings are still highly supportive of the fiscal balancing effects of a VAT and should provide a basis for further study of the tax.

Works Cited

African Development Bank Group. Domestic Resource Mobilization for Poverty Reduction in East Africa: Burundi Case Study. November 2010.

Bird, R. M., and M. Smart. “Financing Social Expenditures in Developing Countries: Payroll or Value Added Taxes?” International Center for Public Policy, Andrew Young School of Policy Studies, Georgia State University, No. 1206, 2012.

Bird, R. Taxation and Development. Washington, DC: © World Bank, 2010.

Charalambous, Lorys. “GCC VAT could Arrive in Four Years.Tax-News.com November 29, 2012.

Christie, Perry. “A Value Added Tax within a Reformed Tax System.” Government White Paper. February 2013

Cizek, P., J. Lei, and J. E. Ligthart. “The Determinants of VAT Introduction: A Spatial Duration Analysis.” Center Discussion Paper Series No. 2012-071, 2012.

Cnossen, S. “Global Trends and Issues in Value Added Taxation.” International Tax and Public Finance, 5(3), 1998, 399–428.

Diamond, John W., and George R. Zodrow. "Promoting Growth, Maintaining Progressivity, and Dealing with the Fiscal Crisis CGE Simulations of a Temporary VAT Used for Debt Reduction." *Public Finance Review* 41.6 (2013): 852-884.

Ebeke, C., and H. Ehrhart. “Tax Revenue Instability in Sub-Saharan Africa: Consequences and Remedies.” Journal of African Economies, 21(1), 2012, 1–27.

Ebrill, L. P., M. Keen, J. P. Bodin, and V. Summers The Modern VAT. International Monetary Fund: Washington, DC, 2001.

Edmiston, Kelly D., and William F. Fox. 2006. A fresh look at the VAT. In The challenges of tax reform in a global economy, edited by James Alm, Jorge Martinez-Vasquez, and Mark Rider, 249-66. New York: Springer

Emran, M. Shahe, and Joseph E. Stiglitz. "On selective indirect tax reform in developing countries." *Journal of Public Economics* 89.4 (2005): 599-623.

Gale, William G., and Samuel Brown. "Tax Reform for Growth, Equity, and Revenue." *Public Finance Review* 41.6 (2013): 721-754.

Gale, William H., and Benjamin H. Harris. "A value-added tax for the United States: Part of the solution." (2010).

Hines, J. R. Jr., and L. H. Summers “How Globalization Affects Tax Design, ” in Tax Policy and the Economy, Vol. 23 University of Chicago Press 1427 E 60th St Chicago IL, 2009, 123–57.

Holtz-Eakin, Douglas. "The Case Against VAT." *The VAT Reader, edited by Martin Sullivan* (2011): 96-101.

IMF, IMF Financial Data Inquiry 2013

IMF, Islamic Republic of Afghanistan: First Review under Extended Credit Facility. IMF country report No. 12/245 August 2012.

IMF, Republic of the Marshall Islands: Selected Issues and Statistical Appendix. IMF country report No. 08/186 June 2008.

IMF, Kingdom of the Netherlands-Aruba: Concluding Statement of the 2010 Article IV Consultation Mission, 2010

IMF, Republic of Palau: 2012 Article IV Consultation—Staff Report. IMF Country Report No. 12/54 2012.

IMF, World Economic Outlook 2014.

Iorwerth, Aled Ab, and John Whalley. "Efficiency considerations and the exemption of food from sales and value added taxes." *Canadian Journal of Economics/Revue canadienne d'économique* 35.1 (2002): 166-182.

Izzak, B and A. Saleh, “Government Wants to Impose VAT.” Kuwait Times 01-17-2013

Kapur, V. “VAT May Come to the UAE in 2014: What Will it Mean for you?” Emirates24/7, November 27, 2012.

Keen, M. “VAT attacks!.” International Tax and Public Finance, 14(4), 2007, 365–81.

Keen, M. Taxation and Development Again. Fiscal Affairs Department IMF: Mimeo, IMF, 2010.

Keen, M., and B. Lockwood. “The Value Added Tax: Its Causes and Consequences.” Journal of Development Economics, 92(2), 2010, 138–51.

Lee, Dongwon, Dongil Kim, and Thomas E. Borcherding. "Tax structure and government spending: Does the value-added tax increase the size of government." *National Tax Journal* 66.3 (2013): 541-70.

Lu, B. “Propensity Score Matching with Time-Dependent Covariates.” Biometrics, 61(3), 2005, 721–28.

Manage, Neela, and Michael L. Marlow. "The Casual Relation between Federal Expenditures and Receipts." *Southern Economic Journal* 52.3 (1986).

Nellor, David. "The Effect of the Value-Added Tax on the Tax Ratio." (1987): 1-28.

Peninsula," Qatar weighs value-added tax proposal." Zawya Connecting Intelligence with Intelligence, January 30 2012.

University of Pennsylvania, Penn World Tables.

Politi, Ricardo Batista, and Enlinson Mattos. "Ad-valorem tax incidence and after-tax price adjustments: evidence from Brazilian basic basket food." *Canadian Journal of Economics/Revue canadienne d'économique* 44.4 (2011): 1438-1470.

Rafique, Mahmood. "Bahrain may introduce VAT or Corporate Tax." 24x7 News May 29th 2011.

Rana, Parvaiz Ishfaq, "IMF tells Pakistani Government to Introduce VAT." Asia News Network, 01-24-2013

Reinhardt, Carmen and Rogoff, Kenneth. Debt to GDP ratios, 2014.

Stiglitz, Joseph E. "Development-Oriented Tax Policy." Initiative for Policy Dialogue Working Paper Series. (2009).

Stockfisch, Jacob A. "Value-added taxes and the size of government: some evidence." *National Tax Journal* (1985): 547-552.

Toder, E., and J. Rosenberg. "Effects of Imposing a Value Added Tax to Replace Payroll Taxes or Corporate Taxes." Tax Policy Center Publication Washington, DC, April 7, 2010

Treisman, D. "Decentralization and the Quality of Government." Manuscript UCLA, 2002.

Ufier, Alex. "Quasi Experimental Analysis of the Effect of the Adoption of a Value Added Tax." Forthcoming Economic Inquiry, 2014.

Von Furstenberg, George M., R. Jeffery Green, and Jin-Ho Jeong. "Tax and spend, or spend and tax?." *The Review of Economics and Statistics* (1986): 179-188.

World Bank, World Development Indicators 2014.

Lead Footnote:
Thanks to my committee members Kevin Grier, Daniel Hicks, Gregory Burge, Scott Linn, and chair Robin Grier for their helpful revisions. Special thanks from Ross Hallren for help with the mechanics of matching. Thanks to the entire University of Oklahoma Department of Economics department for their support.

[1] While I model adoptions in years following 2007, I cannot look at the impact of these adoptions as I lack sufficient data on government balance sheets to look at the impact of taxes in these most recent years of adoption.
[2] A "Failure" in this case is referring to VAT adoption.
[3] Many of the countries studied in this paper are developing countries or poorer OECD countries, but due to data availability I do not study many VAT adoptions among richer OECD countries.
[4] The World Development indicators have data on many of these measures as well, but they cover less than 10% of the country years being studied and so may not provide useful results.
[5] Recall the determinants are lagged 2 years in the selection equation.