Value-Added Taxes and U.S. Trade Competitiveness

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Abstract

This paper discusses the trade implications of value-added taxes (VATs) that refund domestic taxes paid by exporters of domestic production while imposing taxes on imports of foreign production. VATs are used by over 140 countries of the world, including every member of the OECD less the United States. Our investigation of the implications of border-adjustable taxes on the U.S. trade balance suggests that VATs reduce trade volumes – both imports and exports – and that these impacts are stronger in extractive, location-intensive sectors. We use panel data over 12 years, 29 industries, and 146 countries to conduct the analysis.

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1. Introduction

This paper discusses the trade implications of valued-added taxes (VATs) that refund domestic taxes paid by exporters of domestic production while imposing taxes on imports of foreign production. The WTO allows for these border adjustments on indirect taxes, such as consumption (or value-added) taxes, to ensure trade neutrality of domestic taxation. The United States, however, generally employs direct taxes, such as on personal and corporate income, which cannot be border-adjustable under WTO obligations. Consequently, U.S. firms may carry forward a non-border-adjustable domestic tax burden that impairs their trade competitiveness.

We analyze the trade implications of VATs on the U.S. trade balance. Although some economic evidence suggests that the United States may be able to improve its business competitiveness if it were to replace certain elements of its existing tax structure, particularly the corporate income tax, with a border-adjustable tax, this paper does not address implications of a hypothetical U.S. value-added tax. We only consider evidence regarding the impact of existing tax regimes of U.S. trade partners, including VATs, on U.S. trade competitiveness, defined as a relative improvement in exports over imports. Specifically, we ask whether VATs in other countries of the world affect U.S. trade and whether the U.S. corporate income tax affects U.S. trade. We ultimately find that VATs tend to reduce trade volumes – both imports and exports – but that these impacts can differ substantially across sectors. The effects on exports are robust to specification and inclusion, but the effects on imports appear to be dominated by oil, gas, petroleum, and mineral imports from OPEC countries.

Section 2 provides background on VATs as they are in effect around the world. Section 3 sets up an empirical model for testing. Section 4 provides results, Section 5 discusses the implications of OPEC countries on the results, and Section 6 offers conclusions.

2. Background on Value-Added Taxes

The VAT has emerged in the popular press in recent months on a variety of issues, including health care, climate change mitigation, and the public debt burden.[2] Many commentators in the United States have referred to the VAT as a "European tax", given its origins in France and its use throughout the European Union: the VAT, however, has become a global standard. Currently more than 143 countries have VAT systems.[3] Since Australia adopted the VAT in 2000, the United States has been the only OECD country without one.[4]

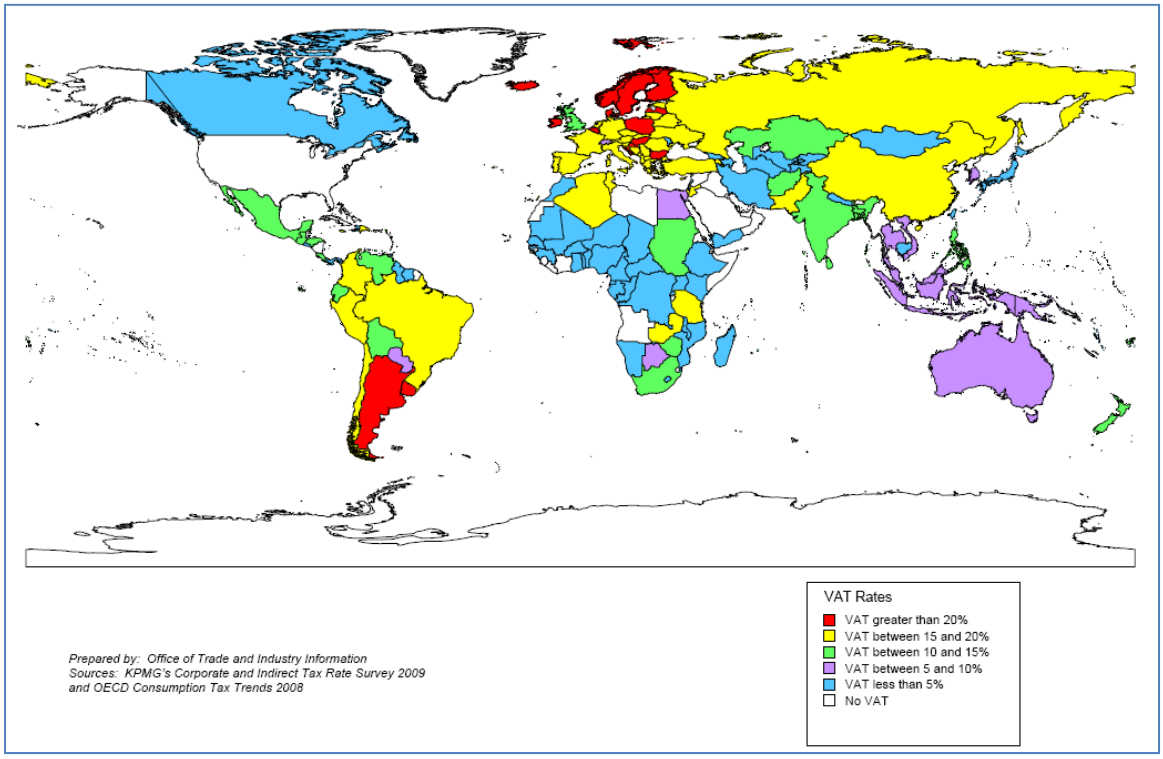
[2] In *The Washington Post* on October 13, 2009, Henry Aaron and Isabel Sawhill of the Brookings Institution point out that "mushrooming future deficits" attributable to Medicare and Social Security have produced an unsustainable fiscal outlook. They propose a VAT linked directly to public health-care spending. *The Economist* magazine from November 19, 2009, describes a potential bipartisan consensus that the VAT might be "the most promising way to raise revenue, reduce the deficit and make the tax system more efficient," although under a subheader that its advantages may be oversold. *The New York Times* on December 11, 2009, highlighted the VAT as a means of substantive deficit reduction in the context of an overhaul of the entire federal tax code, quoting Charles McClure of the Hoover Institution who said that a consumption tax would be the best and most obvious way "to start paying our bills." Fred Bergsten, in the November/December 2009 Foreign Affairs, references a consumption tax as the only plausible policy tool of the U.S. federal government to raise the rate of national savings without vulnerability to the problem of additionality. However, considerable public opinion also resists a federal consumption tax. On February 18 and February 19, 2010, *The Wall Street Journal* described the proposed Deficit Reduction Commission as a "VAT Commission", mentioning fears of a "European-style value-added tax that will raise federal revenues by about five percentage points of GDP." A March 14, 2010 *Washington Post* article discussing the bipartisan Wyden-Gregg reform plan quotes Bob McIntyre of Citizens for Tax Justice who points out that increasing economic efficiency by broadening the tax base creates winners and losers, whereas even if the gains from the losers far exceed the losses to the losers, the gains are spread widely while the losses are felt deeply.

[3] OECD (2008).

[4] Avi-Yonah (2005) points out that every other OECD country has a personal and corporate income tax in addition to VAT.

Figure 1 displays a map that highlights countries without VAT; a list limited to Cuba, North Korea, Laos, Burma (Myanmar), the United States, and a collection of oil-producing states.[5] Note that this figure reflects VATs adopted by 2010. The econometric analysis below takes into account the changes in VAT adoption since the 1990s to estimate the impact on U.S. trade – 32 of our 146 countries adopted the policy in that time.[6] OECD (2008) estimates that 94% of U.S. exports are now subject to a VAT in their destination countries.[7]

Figure 1: Countries with value-added taxes



[5] It is easy to suggest explanations for trading patterns among these particular countries independent of their choice of tax method. Greenland, an autonomous region of Denmark, also does not impose a VAT, but rather relies on domestic income taxes. See Jensen and Nielson (2003).

[6] Table A-1 in the Appendix lists the countries used for the analysis including their dates of VAT introduction.

[7] In our dataset, which represents a sample of over 90% of all U.S. trade from 1997-2008, 93% of U.S. imports and 94% of U.S. exports are with countries implementing value-added taxes. We use only a sample, rather than the full universe of trade data, due to the availability of information on certain variables.

Trade implications for tax policy arise in part because international obligations, as well as U.S. bilateral treaties, treat consumption taxes and income taxes very differently. Unlike VATs, income taxes are not border-adjustable. The WTO allows for refunds of indirect (consumption) taxes but not direct taxes such as the corporate income tax.[8] Consumption taxes currently employed in the United States, such as state sales taxes, do not include provisions for export rebates because they are applied only one time, at the final sale.[9] A U.S. resident purchasing a good in Europe for consumption in the United States does not have to pay a European consumption tax (the VAT is levied at the point of sale and refunded at the border), but a European resident purchasing a good in the United States subject to a local sales tax must pay the sales tax even if the good will be consumed in Europe.[10] Neither Europeans nor Americans need to pay U.S. VAT on goods purchased and consumed in the United States because it does not exist; both Europeans and Americans must pay the consumption tax on goods purchased and consumed in Europe.[11]

The VAT has emerged as a tax policy of choice in the contest of increasing integration, and recent economic discussion has focused on the relationship among globalization, openness, and tax policy. Hines and Summers (2009) point out that these forces exacerbate economic distortions caused by direct taxes, such as personal or corporate income taxes, and that whereas the size of the U.S. economy had previously

[8] This exemption was established under GATT and is part of the Agreement on Subsidies and Countervailing Measures ("SCM Agreement").

[9] Sometimes, however, these sales taxes are adjustable across state borders, particularly with on-line transactions.

[10] Foreign residents may have to pay VAT if they return to a VAT country from the United States, depending on the amount imported. For example, the United Kingdom levies VAT on goods carried into the country above an allowance of £340 on goods.

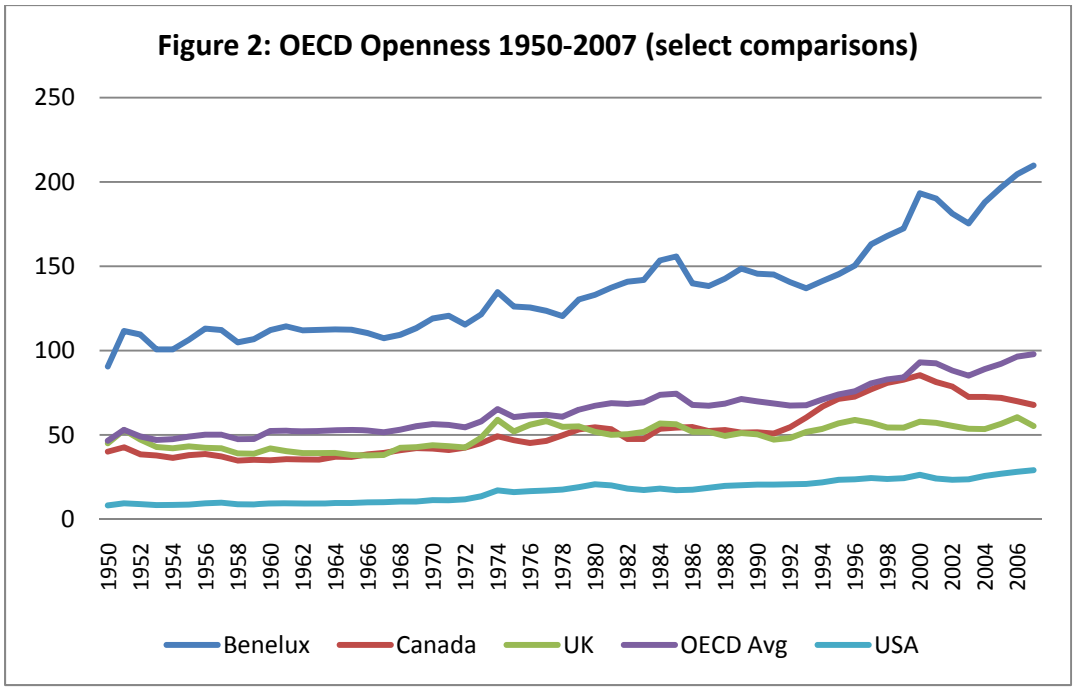
[11] Everyone must pay local sales taxes in the United States, but our research investigates only central government policies.

left it relatively unaffected by the international mobility of economic activity, the pace of globalization now greatly impacts the U.S. tax base. Although the VAT has proven to be an attractive method of taxation for other countries of the world, however, it may not be an ideal system for the United States due to certain factors, including domestic political considerations and its continuing role as a large economic power.[12]

Discussions of globalization generally turn on how the term is defined. Research on tax policy and trade has recently focused on "openness", as measured by the ratio of all trade (exports plus imports, or "X+M") to total output (gross domestic product, or "GDP"). The economic growth literature recognizes that these measures may not sufficiently identify the relative openness of an economy; rather, they denote "trade intensity" and not an orientation to a liberal, open trade policy.[13] Figure 2 shows openness as measured by (X+M)/GDP for the United States and select OECD comparisons from 1950 to 2007. By this standard, the United States is not a particularly open economy relative to small, central economies or the OECD average, but has been growing more open over time. Note that "Benelux" refers to an arithmetic average of Belgium, Netherlands, and Luxembourg: all three of those countries have combined exports and imports in excess of their gross domestic product.

[12] Keen and Lockwood investigate potential determinants of VAT such as involvement in IMF programs following financial crises, demographic factors, and federal government structure. They find that IMF programs may have a positive impact on the decision to adopt a VAT, that a federal government makes is less likely to adopt a VAT, and that demographic factors (such as an aging population) appear to have little impact.

[13] See, for example, Baldwin (2003) and Lee, Ricci, and Rigobon (2004).



2.1. Are border adjustments trade neutral?

Border-adjustable taxes, particularly as they refer to consumption taxes such as the VAT, have been well recognized as "trade neutral" for decades.[14] Some controversy, however, has arisen with regard to whether VATs may create a competitive disadvantage for U.S. firms due to the differential taxation in which U.S. firms receive no export rebate on their goods and they must pay a VAT when goods are imported into VAT-destination

[14] For a full discussion of this topic, see, among others, Grossman (1980). The President's Advisory Panel (2005) offers that "economic analysis indicates that destination-based taxes do not affect the balance of trade. To illustrate this proposition, suppose that the United States was trading with a foreign country in a completely tax-free environment. Trade would be conducted at a level at which each country enjoyed comparative advantage – selling to others the products and services that nation produces best. Now suppose that the United States imposed a destination-basis consumption tax. A domestic exporter would still sell its product in the foreign country at the same price as without the tax. Similarly, a good sold in the United States by a foreign producer would be subject to the U.S. consumption tax. As a result, the foreign importer would compete in the United States on the same basis as local sellers. Consumers in the United States would make the same choices regarding imports and domestically-produced goods as they had made before the tax was imposed, since both are subject to the same tax. Economic theory suggests, therefore, that imposing a destination-basis tax does not affect a country's trade position."

countries, but foreign firms receive an export rebate on their goods when exporting to the United States yet do not pay an import-related tax because a U.S. VAT does not exist.

Feldstein and Krugman (1990) make a definitive statement in the economic literature on this subject, stating that "a VAT is not, contrary to popular belief, anything like a tariff-cum-export subsidy. Indeed, a VAT is no more inherently pro-competitive than a universal sales tax, to which an 'idealized' VAT, levied equally on all consumption, is in fact equivalent. That VATs do not inherently affect international trade flows has been well recognized in the international trade literature."

These effects are relative, however, and recent empirical evidence suggests border-adjustable taxes may affect trade. Feldstein and Krugman posit that VATs will not be trade-neutral if they substitute for other taxes which might affect trade. Keen and Syed (2006) suggest that consumption taxes may affect export behavior depending on whether VAT rates change over time, whether effective rates of taxation vary across sector, and whether VAT rebates are perfectly refunded. Graetz (2008) specifically notes that "the extent that VAT revenues are used to replace corporate income taxes, this may help make American products become more competitive in the global economy."[15] Note the emphasis is on substitution and replacement: employing VATs as an alternative to the current regime.[16]

[15] Expectations for imports are mixed and warrant further study. According to Graetz, "The extent to which substituting a VAT for corporate income taxes will help imports of U.S. products is controversial. Most business executives believe that the current corporate income tax raises the prices of their products and that, by exempting exports, a VAT would make their products more competitive worldwide. The consensus among economists, however, has been that the corporate income tax does not affect prices but instead reduces returns to those who supply capital, although this may be changing with the internationalization of the economy. Economists have also concluded that adjustments to exchange rates will offset any trade advantages of taxing imports and exempting exports."

[16] Toder and Rosenberg (2010) provide a recent analysis of the implication of paying down payroll and corporate taxes with a value-added tax. Militzer and Ontscherenki (1990) suggest that replacing income

This paper tests the trade-neutrality of VATs by investigating their impact on U.S. competitiveness. Our principle dependent variable is bilateral trade by country, by year, by 3-digit NAICS sector. We recognize two defining choices in the estimation: how to measure competitiveness and how to measure VAT. Desai and Hines (2005) point out that the "received wisdom" by economists that border adjustments cannot impact international trade carries sufficient acceptance that little empirical evidence has been attempted. However, they produce economic evidence that suggests VAT leads to decreased openness, as measured by (X+M)/GDP. Keen and Lockwood (2007) show evidence that may reverse this causality – more open economies are less likely to adopt a VAT – and thus these results should be interpreted with caution.

Table A-2 in the Appendix replicates the results of the Desai and Hines (2005) study using independently-obtained data to show that VAT is associated with fewer exports and imports. For purposes of comparison, Table A-2 is constructed identically to Desai and Hines (2005)'s Table 2, with the same controls on GDP and geography, and practically identical results.[17] The results for "Export Share" are less robust than those for "Openness". We extend the analysis for Table A-2 to measures of trade openness described by Squalli and Wilson (2006) and find that the results are robust to alternative measures. Whether the effects of a VAT dummy are coincident with liberal, open trade policies, or whether the effects are related to declines in exports and/or imports relative to GDP, the results are sufficiently robust to support the baseline conclusion from Desai and

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taxes with VAT would not impact U.S. competitiveness because personal income taxes do not directly affect either producers' costs or their prices.

[17] Geographic controls include: the area of the country, whether the country is landlocked, whether the country is an island, and 'remoteness' variables based on Anderson and Van Wincoop (2003) that proxy for distance in a multilateral setting. GDP controls include three powers of log GDP. Our sample includes 168 countries, instead of 136, due to expansion of the PWT data set.

Hines (2005): the presence of a VAT policy diminishes trade.[18]

Keen and Syed (2006) extend Desai and Hines (2005) to investigate effects of both the VAT and the corporate income tax. They use panel data for 27 OECD countries from 1967 to 2003. They also collect data on GDP and exports from *World Economic Outlook* and tax revenue data from OECD; they use "net exports", or X-M, as their dependent variable.[19] They identify corporate tax rates from Devereux, Griffith, and Klemm (2002), VAT rates from IMF data, and measure CIT as corporate tax revenue as a proportion of GDP.[20] Keen and Syed find "powerful and complex effects" for their proxies of the corporate tax: an increase in either the corporate tax rate or its revenues leads to a sharp, short-run decrease in net exports, which is quickly reversed and converges to zero. That is, higher corporate tax rates are associated high a stronger net export position.[21] The overall impact is convergence to zero, results consistent with the theory of source-based corporate tax. Keen and Syed posit that these results might be driven by anticipatory behavior, the Feldstein-Krugman effect, or perhaps incomplete funding of rebates.[22]

[18] Desai and Hines (2005) also investigate the activity of U.S. multinational affiliates and find that "foreign affiliates of American firms do less exporting from countries relying on VATs than they do from other countries, which is consistent with the incentives that they face from high rates of VAT and the inability to collect complete rebates for their exports."

[19] They show in an appendix that their results are robust to the use of export intensity as the dependent variable.

[20] If using the marginal effective rate of corporate tax, calculated by Devereauz, Griffith, and Klemm (2002), they find statistically insignificant results. These examples illustrate the challenge – and importance – of choosing appropriate measures of VAT and CIT.

[21] Moreover, the VAT proves insignificant in the presence of CIT controls, but the CIT remains robustly positive, suggesting that results such as Desai and Hines (2005) and Table A-1 above may be reflecting a proxy of CIT.

[22] In their simple model, Feldstein and Krugman (1990) suggest that VAT may only affect trade in the short-run, before exchange rates adjust, and that exemptions for such non-traded goods as owner-occupied housing and personal services would imply a substitution effect away from imported goods. That is, the effects of a VAT are likely to be felt only in the short run, if at all, and those effects are expected to be a decline in exports.

3. Empirics

This section develops an empirical model to investigate further the perceived effect of value-added taxes on international trade patterns. Economic theory says that a VAT is "trade neutral" if it is uniformly applied across the globe. In practice, it is not. The set of countries with a VAT changes over time, and these asymmetries impact trade flows. This section quantifies these impacts. The analysis employs a time-series cross-country dataset of U.S. bilateral trade disaggregated to 3-digit NAICS sectors to estimate the effects of border-adjustable taxes on U.S. trade competitiveness. The subsequent panel of data is analyzed in the context of the gravity model of international trade. Section 4 provides estimates as well as robustness checks and extensions.

3.1. Data

Three major categories of data are collected to analyze the implications of border-adjusted taxes on U.S. competitiveness: trade data, tax data, and country-specific geographic controls. Bilateral U.S. trade data are collected for 146 countries by 29 sectors by 12 years from the United States International Trade Commission (USITC) dataweb.[23] The larger number of countries allows for greater heterogeneity in the VAT dummy variable. As mentioned above, within the OECD every country had a VAT throughout our time period, 1997-2008, except Australia. The 29 sectors include NAICS 211, 212, and the 300's.[24] The sector disaggregation allows a focus on U.S. trade competitiveness in manufacturing and services. We limit the analysis to 12 years from 1997-2008 to ensure NAICS comparability; prior to 1997, the United States official data

[23] http://dataweb.usitc.gov/.
[24] Table 5 below lists the sector numbers with a brief description.

sources used the Standard Industrial Classification (SIC).[25] Like Desai and Hines (2005) and Keen and Syed (2006), we use the Penn World Tables for macroeconomic variables.[26] The USITC dataweb reports data in current year dollars, and thus we use current-year values for GDP on an exchange-rate basis (as defined by the PWT).

Like Desai and Hines (2005), our baseline results below employ a dummy variable for the presence of a VAT policy, the simplest measure of a value-added tax.[27] The dummy variable allows for a much broader comparison across countries and time than using VAT rates. We update VAT data from Ebrill, et al. (2001) into 2010 using data collected from the internet.[28] Table A-3 in the Appendix provides a list of variables with their sources.

[25] As part of our robustness checks below, we use data from 1989-1995 with 2-digit SIC sectors.

[26] http://pwt.econ.upenn.edu/

[27] Keen and Syed (2006) point out that the dummy becomes a country fixed-effect after adoption of the VAT and does not capture the breadth of VAT coverage; moreover, the use of a dummy loses the ability to investigate heterogeneity in VAT regimes. They restrict their data to OECD countries and thus incorporate VAT rates, instead of dummy variables, as the basis for their analysis. Alternative measures include the size of VAT rates and VAT revenues as a percent of GDP. Keen and Lockwood (2007) list a number of dimensions of a VAT regime, including: the number and level of rates; the extent of zero-rating and exemptions; the breadth of coverage; and the promptness and extensiveness of refunds. As Figure 1 makes clear, few countries after 2010 can be analyzed due to the presence or absence of a VAT law. Using only OECD countries, we extend the analysis to include VAT rates and find robust results, but do not report them in the interest of avoiding redundancy.

[28] Sources include: http://www.tmf-vat.com/; http://www.rma.org.bt/; http://www.africaneconomicoutlook.org/en/countries/east-africa/djibouti/; http://www.state.gov/r/pa/ei/bgn/7221.htm; http://www.gov.gd/vat.html; http://country.alibaba.com/profiles/CU/Cuba/market_access.htm; http://www.deloitte.com/print/en_GX/global/services/tax/article/5715912aff1fb110VgnVCM100000ba42f00aRCRD.htm; http://www.revenuegy.org/laws/Value-Added%20Tax%20Act%202005/Value-Added%20Tax%20Principal%20Law/Value-Added%20Tax%20Act%20PL01%20[2005].pdf; http://www.pwc.com/en_SG/sg/mergers-and-acquisitions-asian-taxation-guide-2008/assets/maasiantaxguide-2008-my.pdf; http://www.imf.org/external/pubs/ft/wp/2009/wp09215.pdf; http://www.thestkittsnevisobserver.com/2010/03/12/vat-november.html; https://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Tax/Intl%20Tax%20and%20Business%20Guides/2010/dtt_tax_highlight_2010_Yemen.pdf; http://www.oecd.org/dataoecd/13/39/40577125.pdf

3.2. Gravity Model

The gravity model of international trade, which explains the empirical tendency of such trade to increase with size of economies (GDP) and decrease with distance, provides an empirical basis for the estimation.[29] The basic empirical structure is:

(1) Gravity Model: $$T_{i,j} = k^{\beta_0}\left(\frac{GDP_i^{\beta_1} * GDP_j^{\beta_2}}{DISTANCE_{i,j}^{\beta_3}}\right)\varepsilon_{i,j}$$

Where $T_{i,j}$ is the trade volume (exports, imports, or both) between country i and country j, k is a parameter and $\varepsilon_{i,j}$ is a residual. The above equation expressed in logs becomes:

(2) $$\ln(T_{i,j}) = \beta_0 \ln(k) + \beta_1 \ln(GDP_i) + \beta_2 \ln(GDP_j) - \beta_3 \ln(DIST_{i,j}) + \mu_{i,j}$$

where $\mu_{i,j} = \ln(\varepsilon_{i,j})$.

Note that the above equation compares directly to Desai and Hines (2005)'s use of "Export Share" and "Import Share" if $T_{i,j}$ were defined as trade shares and restrictions held $\beta_2=1$. Statistical estimation of (2) using trade volumes allows the effect of GDP to change by country, year, or sector.

3.3. Methodology

Data collected for the analysis yield panel regressions over countries, time, and sector. The empirical equation is:

(3) $$\ln(TRADE_{cit}) = \alpha_0 + \alpha_i + \alpha_t + \beta_0 VAT_{ct} + \beta_1 USGDP_t + \beta_2 \ln GDP_{c,t} - \beta_3 \ln DIST_c + \beta_c GEO_c + \varepsilon_{cit}$$

where α_i and α_t are sector and year fixed effects. U.S. GDP does not change by country or industry and merely shifts the parameter on year fixed effects; we thus drop it from the empirical analysis for simplicity. In line with Desai and Hines (2005) and Keen and Syed (2006), equation (3) includes "geographic controls", identified by "GEO", obtained from Rose (2002), for landlocked country (Landlocked), island country (Island), common

[29] See, among others, Anderson (1979), Bergstrand (1985), Deardorff (1998), and Anderson and Van Wincoop (2003) on the gravity specification.

language (ComLang[30]); member of free trade agreement (FTA) with trading partner (which becomes a "NAFTA" dummy for the 1989-1995 period); and member of World Trade Organization (WTO). Like other log-linear analysis, (3) faces the "zeroes problem" in that many of the country-sector-year cells show zero imports or exports and the log of zero is undefined. For tractability, we thus limit the data set to positive values in the OLS specification.

Silva and Tenreyro (2006) argue that an OLS log-linear analysis could exhibit inconsistent estimators, especially in the context of the gravity model. They suggest the use of Poisson estimation on LHS level variables with RHS log-linear variables. This estimation solves "zeroes" problem, and also the issue of inconsistent OLS estimator due to heteroskedasticity.

Using Poisson estimation, as recommended by Silva and Tenreyro, (3) becomes:

(4) $$TRADE_{cit} = f(\alpha_0, \alpha_i, \alpha_t, VAT_{ct}, \ln GDP_{c,t}, \ln DIST_c, GRAVITY_c, \varepsilon_{cit})$$

Estimation of (4) provides baseline results for the empirical analysis.

4. Results

4.1. Baseline Results

Results for estimation of (3) and (4) are shown in Table 1.[31] The middle column uses the Poisson estimation without zeroes similar to the OLS estimation; like Silva and Tenreyro (2006), these results are much closer to Poisson estimation of the full data set than OLS estimation of a smaller data set. This indicates that the major concern with the OLS estimation is heteroskedasticity rather than the zeroes problem.

[30] As we use only bilateral U.S. trade data, the common language in our set is always English.
[31] All regressions undertaken on Stata 10.

Table 1: Baseline Results for 1997-2008

	OLS (no zeroes)		Poisson (no zeroes)		Poisson (zeroes)	
	ln(Exports)		**Exports**		**Exports**	
	n = 35,913		n = 35,913		n = 38,929	
	R^2 0.7787		R^2 = 0.8872		R^2 = 0.8900	
	Coef.	t-stat	Coef.	z	Coef.	z
VAT	-0.308	-10.970	-0.602	-7.880	-0.588	-7.670
Landlocked	-0.689	-29.230	-0.245	-2.890	-0.251	-2.950
Island	0.675	28.660	0.358	9.400	0.357	9.400
ComLang	0.699	35.680	0.573	18.430	0.575	18.490
FTA	0.755	22.890	0.918	18.720	0.916	18.680
WTO	0.418	13.240	0.693	8.460	0.753	9.050
lnDISTANCE	-1.968	-109.410	-0.894	-26.340	-0.894	-26.320
lnGDP	1.028	249.150	0.797	107.070	0.798	107.310
	ln(Imports)		**Imports**		**Imports**	
	n = 30,708		n = 30,708		n = 37,381	
	R^2 = 0.5836		R^2 = 0.6741		R^2 = 0.6892	
	Coef.	t	Coef.	Z	Coef.	z
VAT	-0.230	-4.320	-0.607	-5.120	-0.566	-4.740
Landlocked	-0.341	-7.690	-0.605	-8.680	-0.660	-9.350
Island	0.440	9.350	0.059	0.550	0.047	0.450
ComLang	0.174	4.650	0.134	2.000	0.136	2.020
FTA	0.530	8.680	1.135	12.080	1.142	12.200
WTO	0.741	13.110	0.234	1.670	0.349	2.450
lnDISTANCE	-1.069	-31.200	-0.401	-4.970	-0.404	-5.010
lnGDP	1.290	164.520	0.833	39.180	0.850	41.170

The results in Table 1 are broadly consistent with those of Table A-2, and consequently with Desai and Hines (2005) and Keen and Syed (2006). The presence of a VAT regime decreases trade volumes as measured by both exports and imports. Note that extensions below suggest that the empirical relationship is much stronger for exports than imports. That both specifications have the same sign provides some explanation for why (X+M)/GDP (openness) has stronger statistical explanatory power in Table A-2 and Desai and Hines (2005) than just X/GDP (export intensity): the two effects appear additive.

4.2. Robustness Tests

In this section we subject the baseline results of Table 1 to various alternative specifications, including: analysis of non-OECD countries only; comparison to 1989-1995 SIC 2-digit sectors; and an interaction with the U.S. corporate income tax.

Table 2 juxtaposes the full-sample baseline results with non-OECD measures. As noted above, the only OECD country with heterogeneity in the VAT dummy variable over time is Australia, which did not have a VAT from 1997-1999. VAT rates are available for many non-OECD countries, but the data are less reliable. Keen (2007), among others, discusses the implementation challenges of VATs in developing countries, in particular large informal markets in which the VAT is not applied (and thus becomes an input tax) as well as broken administrative systems that fail to recover the VAT at various stages of the production chain.

Table 2: Non-OECD results

	Exports (n = 31,121)		**Imports (n = 29,606)**	
	R^2 =0.8045		**R^2 = 0.6616**	
	Coef.	**z**	**Coef.**	**z**
VAT	-0.683	-8.560	-0.176	-1.530
Landlocked	-0.511	-5.560	-1.425	-10.460
Island	1.293	18.720	0.595	4.510
ComLang	0.210	3.230	-0.666	-6.270
FTA	0.933	17.190	0.378	2.940
WTO	0.935	10.350	0.769	5.340
lnDISTANCE	-0.766	-14.530	0.900	7.580
lnGDP	0.911	77.280	0.885	36.070

As shown, the coefficient on VAT dummy remains negative and statistical for exports, but not for imports. The presence of a VAT has a negative impact on U.S. imports from wealthier countries but not from developing countries. From another

perspective, for non-OECD countries, adopting a VAT could decrease their imports *from* the United States but may not affect their exports *to* the United States. This result is consistent with the possibility that VATs in developing countries are applied disproportionally to goods entering at the border; a form of non-tariff barrier.

Table 3 shows the baseline results are robust to earlier periods of measurement are also important because of further heterogeneity in the VAT dummy variable. The WTO variable is not included in this estimation and "FTA" refers specifically to NAFTA.[32]

Table 3: Cross-time comparisons

	Exports				Imports			
	Baseline (1997-2008)		SIC (1989-95)		Baseline (1997-2008)		SIC (1989-95)	
	n = 45,285		n=24,119		n = 43,774		n=22,415	
	R^2 =0.8866		R^2 =0.8780		R^2 = 0.7134		R^2 = 0.7235	
	Coef.	z	Coef.	z	Coef.	z	Coef.	z
VAT	-0.473	-6.59	-0.137	-2.76	-0.515	-4.28	-0.396	-4.07
Landlocked	-0.290	-3.47	-0.574	-6.60	-0.516	-7.82	-0.780	-7.09
Island	0.410	11.07	0.611	13.63	-0.064	-0.59	0.775	9.04
ComLang	0.589	20.19	0.823	23.85	0.118	1.90	0.579	8.47
FTA	0.890	18.49	0.443	5.87	1.296	13.22	0.647	4.03
lnDISTANCE	-0.908	-27.32	-1.166	-39.21	-0.312	-3.83	-0.996	-15.21
lnGDP	0.805	110.92	0.778	98.18	0.924	38.50	0.838	51.76

[32] The United States had entered an FTA with Israel prior to 1989, but Israel is one of the few countries not included in our data set.

4.3. Analysis of U.S. corporate income tax

In this section, following Keen and Syed (2006), we investigate the interaction between VAT and the corporate income tax (CIT). To supplement the VAT dummy by year by country, we construct data on CIT by sector in 2004, using information from the 2006 CBO study "Computing Effective Tax Rates on Capital Income." Tax rates for CBO sectors were calculated by computing the percentage of total sector capital accounted for by each type of capital, which were used as weights to compute a sector tax rate.[33] These computations enable a VAT*CIT interactive term by country, industry, and year.

We expect that higher U.S. CIT will decrease U.S. trade competitiveness and that the impact of CIT on competitiveness will be exacerbated by presence of VAT in foreign country. The latter prediction assumes that tax revenues remain constant regardless of the regime: if no VAT exists, the country must obtain revenues from alternative sources, presumably income taxes; if a VAT exists, then country can use these revenues to pay down its CIT to lower rates. As shown in columns (i) and (iii) of Table 4, the CIT does not affect U.S. exports, but is related to import penetration, which would diminish trade competitiveness as defined by net exports.

[33] Chris Rasmussen conducted the exercise.

Table 4: CIT Analysis

	Exports (n=45,285)				Imports (n=43,774)			
	(i)		(ii)		(iii)		(iv)	
	$R^2 = 0.8866$		$R^2 = 0.8869$		$R^2 = 0.7134$		$R^2 = 0.7158$	
	Coef.	z	Coef.	z	Coef.	z	Coef.	z
VAT	-0.473	-6.59	5.973	5.44	-0.515	-4.28	-8.244	-5.08
VAT*lnCIT			-2.030	-5.68			2.492	4.74
lnCIT	0.128	0.68	2.073	5.63	3.641	11.31	0.064	2.32
Landlocked	-0.290	-3.47	-0.290	-3.47	-0.516	-7.82	-0.516	-7.84
Island	0.410	11.07	0.411	11.08	-0.064	-0.59	-0.063	-0.57
ComLang	0.589	20.19	0.589	20.21	0.118	1.90	0.118	1.90
FTA	0.890	18.49	0.890	18.51	1.296	13.22	1.295	13.22
lnDISTANCE	-0.908	-27.32	-0.908	-27.35	-0.312	-3.83	-0.313	-3.84
lnGDP	0.805	110.92	0.805	110.79	0.924	38.50	0.924	38.49
_cons	10.033	15.56	3.857	3.23	-7.156	-4.86	2.694	2.41

Columns (ii) and (iv), which include an interactive term, show a more complex story. Note that the net effects of VAT on trade shares become -0.352 for exports and -0.478 for imports, comparable to the sign and magnitude of earlier results.[34] The positive, statistically significant sign on the coefficients for "lnCIT" for both imports and exports is consistent with Keen and Lockwood (2007). The coefficient on the interactive term indeed suggests that in the presence of a foreign VAT, a higher CIT will decrease exports and increase imports (i.e. lower U.S. competitiveness).

4.4. Sector Analysis

This section considers whether the VAT impacts on trade may differ across sectors. In addition to being trade neutral, a VAT is also considered sector-neutral,

[34] These are calculated by 5.973-2.030*CIT=-0.352 and -8.244+2.492*CIT=-0.478, where CIT is set equal to its mean value 3.116.

depending on exemptions granted in the taxation system, since VAT rates are levied at constant rates across sectors while corporate tax rates fluctuate significantly.[35] Although VATs do not affect international trade through the border adjustments, they may affect imports and exports to the extent that they are applied at different rates for different sectors. Desai and Hines (2005) point out that a country may tend to impose higher effective VAT rates on traded sectors than on non-traded sectors, which might potentially induce a negative relationship between VAT and exports.

Disaggregated trade data allow for an investigation of these distortions by sector. Table 5 ranks trade over the 1997-2008 period by 3-digit NAICS sector. Note the major trading sectors of 334 (Computer and Electronic Products), 336 (Transportation Equipment), 325 (Chemicals), and 333 (Machinery, Except Electrical). The United States imports a considerable volume in 211 (Oil and Gas) but exports relatively little.

Table 5: Total U.S. Trade 1997 to 2008 by 3-digit NAICS sector

NAICS	Sector	Exports	Rank	Imports	Rank	Total Trade	Rank
211	OIL AND GAS	37,274,132	20	1,327,441,766	3	1,364,715,898	5
212	MINERALS AND ORES	82,443,185	15	50,222,777	23	132,665,962	22
311	FOOD AND KINDRED PRODUCTS	338,854,181	6	297,033,862	12	635,888,043	12
312	BEVERAGES AND TOBACCO PRODUCTS	54,183,190	19	128,705,507	19	182,888,697	19
313	TEXTILES AND FABRICS	89,550,946	13	77,577,536	21	167,128,482	20
314	TEXTILE MILL PRODUCTS	27,319,716	23	117,463,510	20	144,783,226	21
315	APPAREL AND ACCESSORIES	74,121,449	16	756,649,087	7	830,770,536	9
316	LEATHER AND ALLIED PRODUCTS	33,137,765	22	282,407,119	13	315,544,884	15
321	WOOD PRODUCTS	54,429,707	18	205,481,488	17	259,911,195	17
322	PAPER	189,842,453	11	231,230,109	15	421,072,562	14
323	PRINTED MATTER AND RELATED PRODUCTS	63,649,712	17	56,272,838	22	119,922,550	23
324	PETROLEUM AND COAL PRODUCTS	181,367,891	12	534,120,863	10	715,488,754	10
325	CHEMICALS	1,166,157,819	3	1,215,629,170	4	2,381,786,989	3

[35] Hufbauer and Grieco (2005) point out that the U.S. corporate tax rate varies across sectors, with taxes ranging from 0.5% to 2.9% on sales and from 1.1% to 8.0% on value-added. This range ignores the outlier of the petroleum sector, which pays 5.0% on sales and over 25% on value added. In addition, as suggested by Nicely (2008), the export rebates may constitute a subsidy to a particular industry if the application of VAT rates is differentiated along the vertical chain of production.

326	PLASTICS AND RUBBER PRODUCTS	213,296,780	10	250,513,344	14	463,810,124	13
327	NONMETALLIC MINERAL PRODUCTS	83,839,705	14	179,672,481	18	263,512,186	16
331	PRIMARY METAL MANUFACTURING	326,216,113	7	636,893,442	8	963,109,555	7
332	FABRICATED METAL PRODUCTS, NESOI	275,591,179	9	365,003,697	11	640,594,876	11
333	MACHINERY, EXCEPT ELECTRICAL	1,059,968,650	4	1,048,766,568	5	2,108,735,218	4
334	COMPUTER AND ELECTRONIC PRODUCTS	1,910,330,241	1	2,664,433,146	1	4,574,763,387	1
335	ELECTRICAL EQUIPMENT, APPLIANCES, AND COMPONENT	324,210,199	8	535,057,262	9	859,267,461	8
336	TRANSPORTATION EQUIPMENT	1,735,868,882	2	2,643,287,381	2	4,379,156,263	2
337	FURNITURE AND FIXTURES	34,242,991	21	218,276,536	16	252,519,527	18
339	MISCELLANEOUS MANUFACTURED COMMODITIES	385,894,326	5	792,345,075	6	1,178,239,401	6

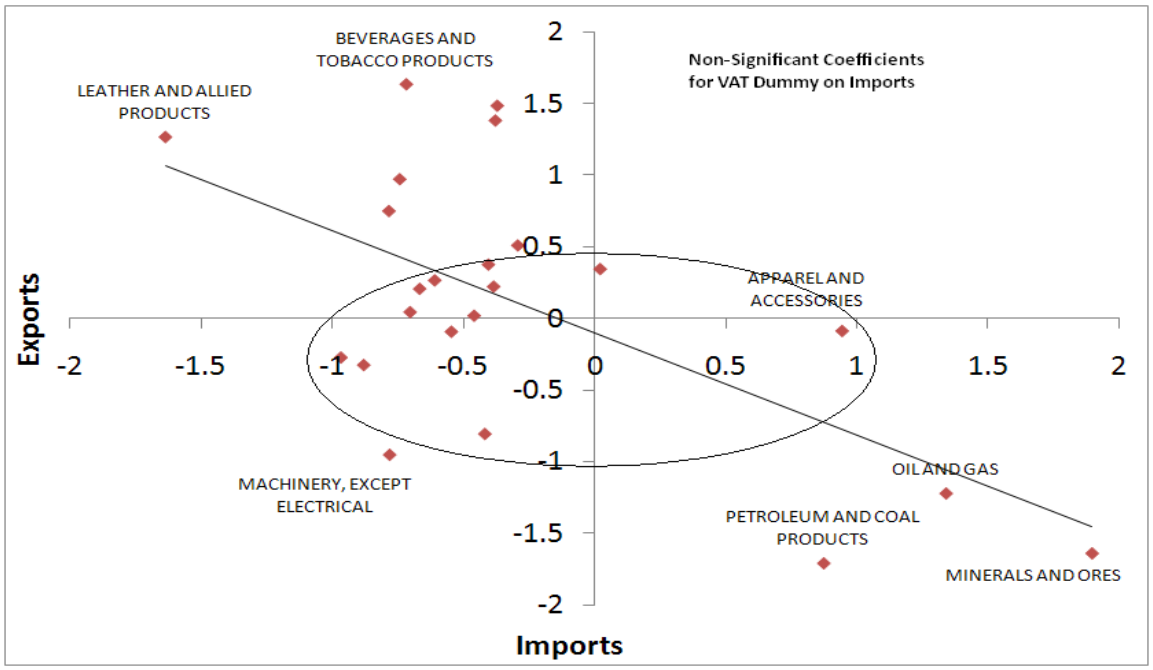
To isolate these effects, we run regressions on equation (4) separately for each sector. The panel regressions, with pooled data, force all the coefficients to be the same. Separate regressions allow the VAT coefficients to vary. In the individual regressions the control variables broadly maintain their sign and magnitude (e.g., distance is negative and GDP is positive). The sign and magnitude of the VAT dummies, however, exhibit considerable differences by sector. Table 6 shows the range of sign and magnitude for the coefficient on VAT dummy by sector.

Table 6: Range of sign and magnitude for VAT dummy coefficient

	Negative Significant	Negative Insignificant	Positive Insignificant	Positive Significant
Exports	22	2	3	5
Imports	5	7	9	10

Figure 3 displays the VAT dummy variables by size of their coefficient for imports and exports. The oval line identifies regions of statistical significance for the import regressions – points outside the oval, including the extreme values, are statistically significant for both the export and the import VAT coefficient.

Figure 3: Coefficients on VAT Dummy Variables 1997-2008



By the results of the pooled regressions, most of the coefficients would be expected in the lower left quadrant. In fact, they are along a line of opposite sign by sector with a correlation coefficient of about -0.631. As shown, the import results from above could be determined by three sectors: oil and gas; petroleum and coal products; and minerals and ores. These sectors are all notably in extractive industries. Table 7 highlights the extreme values on the VAT dummy coefficient for both exports and imports.

Table 7: Extremes for the VAT dummy coefficients

Top Exports

		Exports	ExpZ	Imports	ImpZ
211	OIL AND GAS	1.896	5.47	-1.638	-4.59
212	MINERALS AND ORES	1.340	7.86	-1.220	-4.19
315	APPAREL AND ACCESSORIES	0.943	3.92	-0.086	-0.47
324	PETROLEUM AND COAL PRODUCTS	0.873	5.75	-1.708	-6.10
114	FISH, FRESH, CHILLED, OR FROZEN AND OTHER MARINE PRODUCTS	0.511	1.91	0.765	3.63

Top Imports

		Exports	ExpZ	Imports	ImpZ
312	BEVERAGES AND TOBACCO PRODUCTS	-0.718	-3.11	1.635	3.98
336	TRANSPORTATION EQUIPMENT	-0.371	-2.09	1.486	9.13
322	PAPER	-0.378	-3.01	1.382	5.46
316	LEATHER AND ALLIED PRODUCTS	-1.636	-6.57	1.267	4.46
331	PRIMARY METAL MANUFACTURING	-0.743	-4.42	0.973	4.3

Bottom Exports

		Exports	ExpZ	Imports	ImpZ
327	NONMETALLIC MINERAL PRODUCTS	-0.784	-4.41	0.751	4.84
112	LIVESTOCK AND LIVESTOCK PRODUCTS	-0.788	-3.63	0.456	1.08
335	ELECTRICAL EQUIPMENT, APPLIANCES, AND COMPONENT	-0.880	-6.94	-0.324	-1.47
337	FURNITURE AND FIXTURES	-0.967	-5.58	-0.271	-0.92
316	LEATHER AND ALLIED PRODUCTS	-1.636	-6.57	1.267	4.46

Bottom Imports

		Exports	ExpZ	Imports	ImpZ
323	PRINTED MATTER AND RELATED PRODUCTS, NESOI	-0.419	-3.44	-0.805	-2.79
334	COMPUTER AND ELECTRONIC PRODUCTS	-0.781	-4.12	-0.950	-3.09
212	MINERALS AND ORES	1.340	7.86	-1.220	-4.19
211	OIL AND GAS	1.896	5.47	-1.638	-4.59
324	PETROLEUM AND COAL PRODUCTS	0.873	5.75	-1.708	-6.10

5. On OPEC

Our dataset of 29 sectors and 146 countries comprises over 93% of all U.S. trade from 1997-2008, and 93% of that trade is subject to VATs. In a more striking difference, only 1.8% of U.S. exports are to OPEC countries but 4.6% of U.S. imports are from OPEC countries – it is probably no surprise that the United States carries a substantial negative trade balance with OPEC countries. These relationships may have an impact on the VAT analysis. As shown in Figure 4, 19% of U.S. non-VAT exports are to OPEC countries, while 27% of U.S. non-VAT imports are from OPEC countries. This section investigates whether this small set of countries in three particular sectors (Oil and Gas, Petroleum and Petroleum Products, and Minerals and Ores) could be driving the results of VAT imports.

Figure 4: Percent of Non-VAT Trade Accounted by OPEC Countries

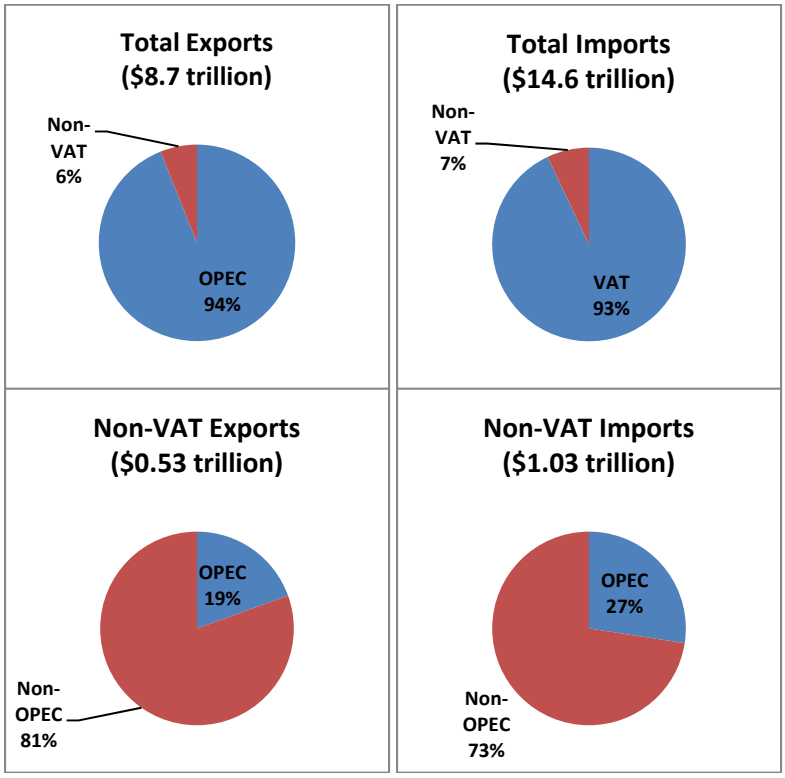


Figure 5 illustrates the importance of these trade patterns by replicating Figure 3 weighted by the size of the sector. As can clearly be seen, the circles in the extractive sectors are much larger for imports, and driving the results.

Figure 5: Coefficient on VAT Dummy by Volume of Trade

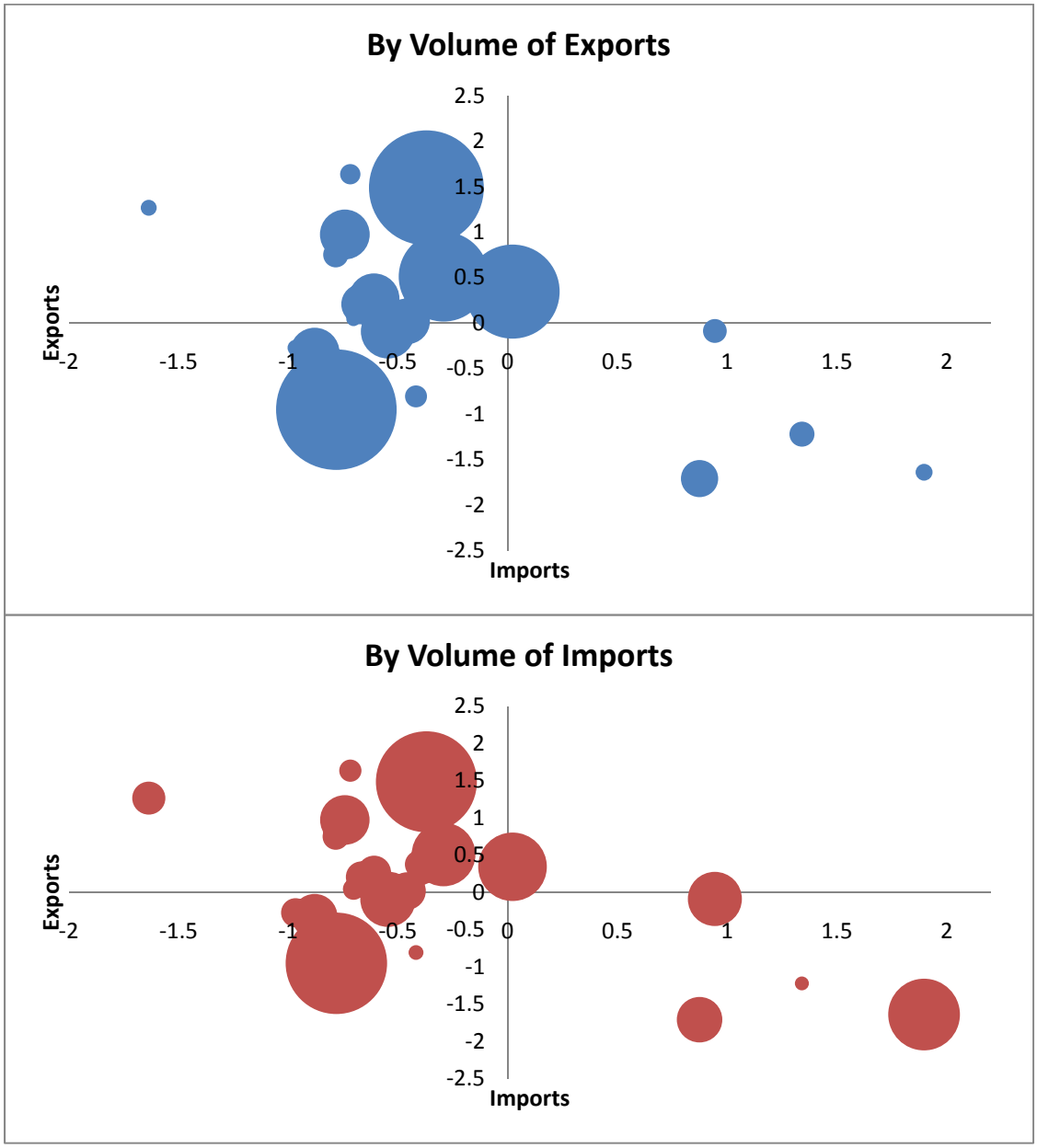


Table 8 provides results for regressions that have either dropped the three noted sectors ("Non-Extractives") or differentiate between OPEC and non-OPEC countries. For exports, there is no substantive change in any of the results, but for imports the coefficient on the VAT dummy loses statistical significance under the "non-extractives" and "Non-OPEC" regressions. The implication is that general conclusions cannot

necessarily be drawn about the impact of VAT policies amongst U.S. trading partners on U.S. imports, given the relative importance that oil, gas, petroleum, and mineral imports from OPEC countries feature in the trade data. The results about U.S. exports remain robust.

Table 8: Regressions With/Without OPEC

	EXPORTS						IMPORTS					
	Non-Extractives		Non-OPEC		OPEC		Non-Extractives		Non-OPEC		OPEC	
	n = 35,651		n = 38,877		n=1,599		n=34,799		n = 37,318		n=1,622	
	R^2 = 0.8907		R^2 = 0.8903		R^2 = 0.7687		R^2 = 0.7498		R^2 = 0.7134		R^2 = 0.7450	
	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z	Coef.	z
VAT	-0.495	-6.80	-0.59	-6.410	-0.86	-10.8	-0.190	-1.31	-0.630	-4.370	0.263	1.320
Landlocked	-0.244	-2.90	-0.26	-3.070	(omitted)		-0.54	-0.341	-5.13	-8.520	(omitted)	
Island	0.405	10.62	0.352	9.190	(omitted)		0.007	-0.134	-1.15	0.460	(omitted)	
ComLang	0.598	20.17	0.587	18.200	0.392	1.660	0.062	0.96	0.107	1.510	0.535	2.090
FTA	0.894	18.15	0.904	18.340	(omitted)			1.492	13.2	1.173	(omitted)	
WTO	-0.894	-26.34	0.873	12.790	1.218	9.930	-0.126	-1.36	0.546	3.760	-0.69	-3.36
lnDIST	0.814	107.92	-0.89	-26.040	-3.86	-5.76	1.014	35.74	-0.408	-4.760	0.067	0.150
lnGDP	-0.495	-6.80	0.793	106.590	1.865	6.830	-0.190	-1.31	0.871	42.060	0.494	3.050

6. Conclusions

This paper presents empirical estimation of the effects of border-adjustable taxes on U.S. trade competitiveness. In general, the implementation of value-added taxes has lead to a decline in both U.S. exports and U.S. imports over the past decade. The results for exports are fairly robust to specification and inclusion, but the VAT effect for imports appears to be dominated by OPEC countries and extractive sectors. The results for imports are small and statistically insignificant when accounting for these particular influences. These three sectors – Oil and Gas, Petroleum and Petroleum Products, and Minerals and Ores – also provide much of the U.S. trade deficit.

Other results include:

- The impact of the VAT on trade differs substantially by sector. U.S. exports have a positive, statistically significant sign for the extractive sectors, but they play a small part of U.S. trade relative to exports in other sectors and imports in these sectors. The VAT effect for U.S. imports appears to be dominated by these particular sectors, particularly given the relatively high shares of trade with non-VAT, OPEC countries.
- Imports from non-OECD countries are not affected by the introduction of a VAT; the estimated coefficients are small and statistically insignificant;
- The U.S. corporate income tax tends to decrease exports and increase imports (by definition, therefore, hurting U.S. trade competitiveness).

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Appendix

Table A-1: List of Countries and Year of VAT introduction

Country	VAT	Country	VAT	Country	VAT
ALBANIA	1996	FRANCE	1968	NETHERLANDS	1969
ALGERIA	1992	GABON	1995	NEW_ZEALAND	1986
ANGOLA	x	GAMBIA	x	NICARAGUA	1975
ANTIGUA_BARBUDA	2007	GERMANY	1968	NIGER	1986
ARGENTINA	1975	GHANA	1998	NIGERIA	1994
ARMENIA	1992	GREECE	1987	NORWAY	1970
AUSTRALIA	2000	GRENADA	2010	PAKISTAN	1990
AUSTRIA	1973	GUATEMALA	1983	PANAMA	1977
AZERBAIJAN	1992	GUINEA	1996	PARAGUAY	1993
BAHRAIN	x	GUINEA-BISS	x	PERU	1973
BANGLADESH	1991	GUYANA	2005	PHILIPPINES	1988
BARBADOS	1997	HAITI	1982	POLAND	1993
BELARUS	1992	HONDURAS	1976	PORTUGAL	1986
BELGIUM	1971	HONG_KONG	x	ROMANIA	1993
BELIZE	2006	HUNGARY	1988	RUSSIA	1992
BENIN	1991	ICELAND	1990	SAO_TOME&PRINCIPE	x
BHUTAN	2004	INDIA	2005	SAUDI_ARABIA	x
BOLIVIA	1973	INDONESIA	1985	SENEGAL	1980
BRAZIL	1967	IRAN	2009	SEYCHELLES	x
BULGARIA	1994	IRELAND	1972	SIERRA_LEONE	x
BURKINA_FASO	1993	ISRAEL	1976	SINGAPORE	1994
BURUNDI	2009	ITALY	1973	SLOVAKIA	1993
CAMBODIA	1999	IVORY_COAST	1960	SLOVENIA	1999
CAMEROON	1999	JAMAICA	1991	SOUTH_AFRICA	1991
CANADA	1991	JAPAN	1989	SPAIN	1986
CAPE_VERDE_IS.	2004	JORDAN	1996	SRI_LANKA	1998
CENTRAL_AFR.R.	2001	KAZAKHSTAN	1992	ST.KITTS&NEVIS	x
CHAD	2000	KENYA	1990	ST.LUCIA	x
CHILE	1975	KOREA,_REP.	1977	ST.VINCENT&GRE	2007
CHINA	1994	KUWAIT	x	SWAZILAND	x
COLOMBIA	1975	KYRGZ_REP	1992	SWEDEN	1969
COMOROS	x	LATVIA	1992	SWITZERLAND	1995
CONGO	1997	LEBANON	2002	SYRIA	x
COSTA_RICA	1975	LESOTHO	2003	TAJIKISTAN	1992
CROATIA	1998	LITHUANIA	1994	TANZANIA	1998
CUBA	x	LUXEMBOURG	1970	THAILAND	1992
CYPRUS	1992	MACAO	x	TOGO	1995
CZECK_REP.	1993	MADAGASCAR	1994	TRINIDAD&TOBAGO	1990
DENMARK	1967	MALAWI	1989	TUNISIA	1988
DOMINICA	2006	MALAYSIA	2008	TURKEY	1985
DOMINICAN_REP.	1983	MALI	1991	TURKMENISTAN	1992
ECUADOR	1970	MALTA	1995	U.K.	1973
EGYPT	1991	MAURITANIA	1995	UGANDA	1996
EL_SALVADOR	1992	MAURITIUS	1998	UKRAINE	1992
EQ_GNEA	1999	MEXICO	1980	URUGUAY	1968
ERITREA	x	MOLDOVA	1992	UZBEKISTAN	1992
ESTONIA	1992	MONGOLIA	1998	VIETNAM	1999
ETHIOPIA	2003	MOROCCO	1986	ZAIRE	2009
FIJI	1992	MOZAMBIQUE	1999	ZAMBIA	1995
FINLAND	1994	NEPAL	1997	ZIMBABWE	2004

Table A-2: Replication of Desai & Hines (2005)

Dependent Variable: Openness in 2000								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	1.0171 (0.0718	1.0171 (0.0692)	-36.4259 (16.3411)	-35.8126 (15.9678)	1.0944 (0.0634)	1.0773 (0.0629)	-33.7593 (16.2939)	-33.1655 (16.1255)
VAT Dummy	-0.1557 (0.0853)	-1.4396 (0.3586)	-0.1945 (0.0795)	-0.1702 (0.0802)				
VAT *ln (cgdp)		0.1486 (0.0404)						
VAT share of tax revenue					-0.9723 (0.2814)	-4.1650 (1.3810)	-0.8283 (0.2613)	-0.7257 (0.2612)
VAT share*ln (cgdp)						0.3874 (0.1644)		
GDP controls?	N	N	Y	Y	N	N	Y	Y
Geographic controls?	N	N	N	Y	N	N	N	Y
No. Obs.	168	168	168	168	162	162	162	162
R-Squared	0.0197	0.0940	0.1767	0.2609	0.0743	0.1055	0.1968	0.2655
Dependent Variable: Exports Share in 2000								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.4641 (0.0866)	0.4641 (0.0860)	-36.5841 (19.5696)	-34.6863 (19.8603)	0.4907 (0.0761)	0.4808 (0.0769)	-35.8227 (19.5125)	-33.9694 (19.8649)
VAT Dummy	-0.0312 (0.1010)	-0.7420 (0.4157)	-0.0787 (0.0996)	-0.0863 (0.1046)				
VAT *ln (cgdp)		0.0824 (0.0468)						
VAT share of tax revenue					-0.2556 (0.3187)	-1.7139 (1.5798)	-0.1800 (0.3177)	-0.1713 (0.3306)
VAT share*ln (cgdp)						0.1783 (0.1892)		
GDP controls?	N	N	Y	Y	N	N	Y	Y
Geographic controls?	N	N	N	Y	N	N	N	Y
No. Obs.	151	151	151	151	151	151	151	151
R-Squared	0.0006	0.0212	0.0696	0.0985	0.0043	0.0102	0.0676	0.0958

Table A-3: Variable Description and Data Sources

Variable	Description	Source
Imports	# imports to U.S. by 3-digit NAICS or 2-digit SIC	USITC dataweb
Exports	# exports from U.S. by 3-digit NAICS or 2-digit SIC	USITC dataweb
VAT dummy	=1 if country has VAT, =0 otherwise	Ebrill, et al. (2001) and *supra* note 28
Landlocked	=1 if country is landlocked, =0 otherwise	faculty.haas.berkeley.edu/arose/RecRes.htm
Island	=1 if country is island, =0 otherwise	faculty.haas.berkeley.edu/arose/RecRes.htm
ComLang	=1 if English is primary language, =0 otherwise	faculty.haas.berkeley.edu/arose/RecRes.htm
FTA	=1 if in FTA with USA, =0 otherwise	www.ustr.gov/trade-agreements
WTO	=1 if member of WTO, =0 otherwise	www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm
lnDISTANCE	Log of distance from trading partner	faculty.haas.berkeley.edu/arose/RecRes.htm
lnGDP	Log of trading partner's GDP	Penn World Table 6.3
OECD	=1 if member of OECD, =0 otherwise	www.oecd.org/pages/0,3417,en_36734052_36761800_1_1_1_1_1,00.html
CIT	Sector-specific corporate income tax	CBO (2006)
OPEC	=1 if member of OPEC, =0 otherwise	www.opec.org/opec_web/en/about_us/25.htm