Asymmetry Equalizing Symmetry in Gravity:

Taxation and Trade in the OECD

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NOTE:

This paper is an incomplete draft of our paper. While it is very far along and some results are included, it cannot be stressed enough or strongly enough that this draft is submitted only for FREIT conference consideration purposes only. It should not be circulated for reasons other than consideration for the FREIT conference. In addition to adding a theoretical model where we analyze the impact of asymmetric trade barriers on price indexes in the gravity model, we also demonstrate the relative price equalization when calculated between bilateral and rest of the world trade. Furthermore, we have additional empirical tests of the impact of taxation on trade as well as general polishing and editing that remains to be completed. This version is only provided to demonstrate that the paper is quite far advanced but definitely, most definitely, not complete. We apologize for not being able to submit a final draft but can assure the committee, if selected the paper will be in final draft format with all things and others as noted from above.

Introduction

The question of whether taxes on corporate income distort economic exchanges between countries, or have the potential to increase national or worldwide welfare is not new, but far from resolved. Ideally, countries should trade according to their comparative advantages(Gravelle, 2010). Therefore, tax systems should raise revenue in ways that minimize behavioral responses of companies. Nevertheless, taxes on income and goods seem to affect companies' location choice, as well as real and portfolio investment decisions (Desai and Hines, 2003; Desai et al., 2004; De Mooij and Ederveen, 2005; Desai and Dharmapala, 2011). If trade flows depend on foreign direct investment (FDI) flows, and if corporate taxes significantly affect FDI, then corporate taxes should affect trade. This is however, far from obvious. First there is little if no evidence that taxes wedges affect trade. The trade literature finds that trade depends on country specific non-tax advantages, such as labor costs, access to local productive assets, or a stable economic policy. Second, public finance literature on the relationship between indirect and direct taxes on international trade is mixed (Desai and Hines, 2005; Slemrod, 2004; Keen and Syed, 2006). While evidence of intrafirm transfer pricing exists, there is little evidence of country wide shifts in trade. Combining datasets on bilateral trade and foreign direct investment, with the gravity model of trade, this paper links the trade and public finances literature to explore the relationship between international trade and taxes. This paper uses a variation on the gravity model of international trade to estimate the impact of corporate income taxes and VAT on international trade based on OECD countries from 1981 to 2008. We find that Our paper proceeds in four sections. First, we present a literature review linking trade with corporate and VAT taxes. Second, we present a theoretical model of the expected channel through which taxes may distort trade flows. Third, we lay out our empirical

model. Fourth, we present our results.

Motivation and Literature Review

One may think of various ways that corporate income taxes (CIT) affect trade. Take the following example. Assume that a parent company in country H exports to country L and imports from country L. Country L has a 10% CIT and country H has a 40% CIT. All else equal, it may make sense for the parent company in country H to create a subsidiary in country L in order to sell to both L's and H's consumers. All profits would be taxed at 10%. To the extent that repatriated profits are not taxed in L—if L has a territorial tax system--the tax burden would be smaller. Even if repatriated profits are eventually taxed—as with a worldwide system--they generally benefit from deferral. In this case, corporate taxes would not only affect firm's location or FDI, but also the direction of trade.

In spite of the direct effect of corporate taxes on the price of traded goods (Melvin, 1979) and the indirect effect through FDI, the empirical relationship between corporate taxation and international trade is unclear. Melvin (1979) develops a model where corporate taxes increase the price of traded goods in two ways—directly through the increased required rate of return by investors, and indirectly though the increase in the cost of inputs. He also provides evidence that this effect varies across industries depending on capital intensity. He concludes: "it was found that the corporate income tax tends to raise all commodity taxes […] and since imports are not subject to this tax, the overall effect must be to increase imports and decrease exports." He also finds that corporate taxes affect trade patterns, such as the capital intensity of traded goods, therefore offsetting the comparative advantage of the United States in such goods.

As was the case for the corporate income tax, the theory of international trade leads to different conclusions on the expected impact of VAT taxes on trade flows than the common belief among public finance economists. On the one hand,

destination based VAT, as is the case in most OECD countries, should encourage exports—which are not subject to the VAT--and possibly discourage imports— which are subject to the VAT (Desai and Hines, 2005). On the other hand, trade theory shows that in open economies, exchange rates adjustments should offset any impact of VAT taxes on trade flows (Keen and Syed, 2006). In other words, VAT taxes could have a trade inducing or trade reducing impact.

This research has important policy implication, especially as countries have been increasingly relying on the VAT—for its efficiency and due to fiscal pressures--and less on corporate taxes. Because of competitiveness pressures, most countries have reduced their corporate income tax. In this global picture, the large tax differentials in statutory corporate tax rates between rich economies and in VAT tax rates, high-tax countries are under international pressure of reducing corporate income taxes, and potentially rely even more on indirect taxes.

There is a wide literature on the impact of corporate and VAT taxes on investment and firm's location.[1] There is also a vast literature on the relationship between VAT and international trade. However, because there is almost no research has investigated the direct relationship between corporate taxes and international trade. There is a natural explanation for the lack of research thereof. First, international trade is unlikely to be directly explained by corporate taxation. Corporate taxes should only affect trade patterns through firm's relocation. Therefore, the impact of corporate taxation on international trade is at most indirect through the direct impact of taxes on FDI. Second, tax wedges have an opposite effect on FDI and bilateral trade. For example, if te tax wedge is large enough to increase outbound FDI from A to B, this will increase imports from B to A and reduce exports from A to B. Third, the home treatment of foreign-source income affects the relationship between tax wedges and trade patterns.

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[1] There is another view developed by Scholes and Wolfson (1992) that links FDI decisions with changes in the definition of tax bases rather than tax rates. Swenson (1994) finds evidence in

Although many recognize that high corporate tax wedges hinder competitiveness, to our knowledge, the indirect relationship between corporate taxes and trade through FDI has not been studied.[2] In addition, models of international trade have become sophisticated enough to show that international trade is essentially explained by non-tax factors such as relative market sizes, distance between countries, and other specific factors that facilitate or restrict trade, such as bilateral treaties or multilateral trade barriers (Balding 2010 and Brainard 1997). Few models of international trade focus on corporate taxes, and therefore it is unclear that corporate income tax wedges between countries either directly or indirectly affect trade.

Although small differences between two countries taxation will have no impact on trade, it is likely that large and permanent differences in countries' taxation may affect the direction and the volume of trade. Hines (1996) takes advantages of differential state corporate tax rates in the United States to explain inbound FDI from foreign countries. Although he finds that corporate tax wedges significantly influence inbound FDI, he also finds that the results are essentially driven by states where the corporate income tax is zero. In other words, when the tax wedges are sufficiently large, they affect inbound FDI, but when tax wedges are smaller, their impact on FDI is not statistically significant.

Other research has found that lower corporate tax rates in home countries increase the level of inbound foreign direct investment (Benassy-Quere et al. 2005). Not only do higher corporate tax rates reduce the level of foreign investment in a country, they reduce the quality of investment further reducing the broader tax base (Becker et al. 2009). Larger cross sectional studies have found higher tax rates to be a significant deterrent to investment (Djankov et al. 2010).

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[2] For example, concerns about competitiveness were the principal reason for establishing a tax reform panel by Presidential executive order (E.O. 13369) in 2005. See President's Advisory Panel on Federal Tax Reform, *Simple, Fair, and Pro-Growth: Proposals to Fix America's Tax System* (Washington, November 2005).

While there is evidence that lower tax rates attract higher levels of investment, it remains far from clear how influential the tax factor is, whether this generates economic distortions—such as offsetting countries comparative advantages--, or whether the impact of corporate tax wedges on investment solve a market failure, such as the lack of investment in developing countries. In other words, does the impact of tax wedges on investment—if any—increases productive capacity for the world or merely shifts income from high tax to low tax states at the cost of real activity?

If states compete over tax rates merely to attract foreign investors seeking to minimize tax payments, this may result in the under provision of businesses' and residents' services or reduced economic activity in high corporate tax states (Devereux et al. 2008a). The advent of the European Union crystallized fears of corporate tax competition within an economic area as corporations would flee to low tax states. One economist wrote:

> *This is Europe's new problem. The fall of barriers will increase the possibility of tax avoidance and provide more elasticity to a number of economic activities. Those who perform these activities will in future be handled with kid gloves. They will be the winners in an uncoordinated process of tax harmonization, for they cannot be forced to pay more than simply benefit taxes* (Sinn 1990)

This concern about differing tax rates and capital mobility is prevalent. More recent theoretical work has focused on the heterogenous nature of firms under cross country tax competition which may lead to capital outflows and "inefficiently low tax rates" (Davies and Eckel 2010 Krautheim and Schmidt-Eisenlohr 2011). Derisively called "the race to the bottom", tax competition has attracted extensive research focusing on a variety of questions such as the welfare

impacts and whether increased capital mobility places downward pressure on tax rates (Hong and Smart 2010 and Garretsen and Peeters 2006). Despite extensive research on the effects, provision of social services, and impact on investment the case of tax harmonization is "far from clear-cut (Zodrow 2003)."

There has however been a lack of evidence as to how tax competition specifically impacts international trade. Reducing corporate income and VAT tax rates has helped economies like Ireland causing disputes with high tax states like Germany, there is little research as to how specifically a low tax state alters trade and real economic activity. There are a couple of theories that have attracted attention. First, as noted above, lower corporate or value added taxes may cause increased foreign direct investment into the low tax state shifting productive capability. Second, tax competition may induce transfer pricing to ensure that corporate profits are taxed at the lowest possible rate. The fact that companies are able to price goods traded intra-firm above or below the true price of the good through transfer pricing could distort profit recognition. Grubert and Mutti (1991) find evidence that the United States "import(s) more from and export(s) more to low tax countries" implying a distortion in the natural recognition of profits.. More recently, Clausing (2003) finds similar results in the United States, providing evidence that firms engaged in transfer pricing by raising import prices and lowering export prices to locate corporate profits in low tax states. Focusing on Europe, Bartelsman and Beetsma (2003) find evidence of income shifting due to lower reported income through transfer pricing but little evidence of distortion of real economic activity. Bucovetsky and Haufler (2008) find that a key factor of tax avoidance is the flexibility of companies' organization, which enables them to respond to variations in cross country tax rates. In other words, companies with multiple production facilities and subsidiaries in different countries will be better positioned to take advantage of the divergent tax rates across countries. The ability of corporations to shift profits between states with divergent tax rates has

prompted some to argue for a "destination" based corporate income tax regime rather than a "source" based system (Devereux 2008b).[3]

Third, the trade literature shows that other factors appear to outweigh tax factors, indicating that tax policy does not impact real economic activity. For instance, industrial concentration and agglomeration factors appear to be greater influences on firm location decisions than tax rates (Baldwin and Okuba 2009 and Baldwin and Krugman 2004). Focusing on the United States, Wheeler and Mody (1992) find that industrial concentration or agglomeration decisions are "the dominant influence on investors calculations." Factors such as high quality industrial sectors and other public goods seem to be more likely to attract companies than tax factors. Not only companies but also developed countries may compete on quality of economy and public goods rather than simply after tax prices. Bretschger and Hettich (2002) indicate that governments may trade-off lower tax rates to attract investment and increasing compensation to losers of cross border trade and investment. Despite the fear of a race to the bottom, research indicates that higher social expenditure as a percentage of GDP is positively related with FDI, suggesting that multinationals value public spending (Gorg et al. 2009). While there is much concern and empirical evidence over the race to the bottom and shifting of real economic activities (e.g., FDI) due to tax competition, the evidence is mixed, and the trade literature evidence that taxes may not affect trade suggests that this may be due to accounting mastery.

Fourth, while transfer pricing may reduce reported profits and locally captured tax revenue, the bigger concern is whether it causes economic distortions and specifically the flow of goods and services between states, which is our concern in this paper. Early theoretical research indicated that distortions to international trade occurred under restrictive assumptions (Whalley 1979).

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[3] A "destination" based tax for corporations taxes their profits based upon the destination of the product rather than the location or "source" of the product.

Transport costs, trade and investment barriers, and plant scale relative to firm scale appear to be larger factors than though "corporate headquarters will migrate to the location with the lower income tax, *all else equal*….(Brainard 1997).[4]" However, as has already been noted, not all things are equal and tax rates are merely one even less important factor than industrial concentration and available public goods. Firms appear to favor multiple production centers especially in the presence of trade costs, minimizing the impact of tax competition between states on decisions of where to locate manufacturing facilities (Ferrett and Wooton 2010). In other words, lower tax rates may have an infra-marginal effect, inducing complementary investment to other existing production capabilities rather than a shift of productive assets to low tax states.

Investment becomes less attractive with higher corporate income taxes but politicians become concerned when "international investment tax policy of one country…affect(s) resource allocation and income distribution in both countries *even in a small country world* (Batra and Ramachandran 1980)."[5] The concern of policy makers is not just income shifting between high and low tax states but the whether tax differentials between countries have the potential to reallocate resources to where they can be more productive, hence generating higher profits. While the lower revenue from profit shifting is not an insignificant concern to high tax state authorities, it is more worrisome if manufacturing and services begin moving to other countries driven to some degree by lower tax rates. The concern has been that small open states would adopt low tax rates to attract investment prompting larger high tax states to adopt similar policies. The evidence supporting a link between trade levels or openness and tax competition, however, is mixed (Overesch and Rincke 2011 and Clausing 2008). One paper considering corporate income tax rates, capital flows, and trade found that

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[4] Emphasis added and not in the original text.
[5] Emphasis added and not in the original text.

reductions in a trading partner's corporate tax rates resulted in a short term increase in net exports but quickly returned to the initial trend with no long term impact (Keen and Syed 2006). This appears to support the theory that there is no production shifting but rather infra-marginal investment effects.

If it is true that divergent tax rates distort economic activity, and are not just used by creative accounting to shift profits to lower tax states, then this production shifting will appear in trade data. High tax domiciled corporations will invest through FDI in a low tax state, which would either results exports back to the home country or in a substitution of exports for a base of production to sell goods locally to other countries. In either case, production will shift from the high tax state to the low tax state, exports from the high-tax country will decrease, and exports from the low tax country will increase. High tax states will likely import more from low tax states. Therefore, the outbound foreign direct investment from the high-tax to the low tax states should increase the propensity to import for the high tax states. This implies that low tax states *should* run structural surpluses with high tax states that increases over time as production shifts in response to tax rates.

Turning our attention to the impact of VAT taxes on trade flows, the literature is also mixed. On the one hand, public finance literature find that destination-based VAT affect the volume of exports and imports. Using OECD data over time, Desai and Hines (2005) find mixed results on the impact of VAT increased reliance on VAT revenues significantly reduce exports and total trade. On the other hand, the trade literature shows that in open economies, VAT taxes should not affect trade in the short or long run. Using data for 27 OECD countries over 37 seven years, Keen and Syed (2006) estimate a static and a dynamic model of trade and find that VAT taxes are trade neutral.

Asymmetric Trade Barriers With a Gravity Framework

Theoretical model to be added prior to FREIT conference.

Data and Methodology

To test for the distortionary impact on international trade of heterogeneous corporate and VAT taxes, we integrate a comprehensive dataset of corporate and value added taxes of OECD countries into a revised form gravity model. The gravity model is empirically sound as a trade model but also fits with public finance. Evidence of tax competition along variables that are similar to gravity models' variables indicates that high tax states have a higher probability of lower tax rates in the presence of low tax neighbors (Heinemann et al. 2010). In other words, gravity and distance matter to both trade and the determination of corporate tax rates. A bilateral gravity trade model allows to estimate whether divergent tax rates across similar economies have a distorting impact on trade flows.

Our study is limited to OECD countries for three reasons. First, the majority of horizontal trade is between developed countries, which are more likely to be similar in non-tax factors. Second, multinationals in developed country are best positioned to take advantage of corporate tax rate divergences between states given countries' global operations and large legal and accounting environment. Third, the OECD publishes the most comprehensive and reliable corporate income and VAT tax database.

The data comes from several sources. First, bilateral direction of trade and gross domestic product data comes from the International Monetary Fund. As noted, given the use of the revised gravity model, the only gravity variable considered is the interacted natural log of nominal GDP. Second, statutory corporate income and VAT tax rates are from the OECD. We use top statutory

corporate tax rates of 30 OECD countries from 1981 to 2011. They include federal tax rates, but also combined federal and local corporate tax rates as combined tax rates are known to be more representative of the actual tax burden faced by corporations. VAT rates are provided by types of goods and for 30 OECD countries from 1976 to 2011. Third, for a number of countries, we correct federal corporate tax rate by each country's depreciation allowances and run separate regressions on this set of results to evaluate if depreciation allowances significantly affect the results, based on data from the Institute of Fiscal Studies.[6]

As suggested in the motivation part, we expect the impact of taxes on trade to be different if the home country imports from a territorial or a worldwide taxation regime. Territorial tax regimes with high corporate tax rates will be more attracted to invest in low tax states that worldwide tax regimes. Therefore we expect two types of results. First, low tax states should import less from and export more to high-tax territorial regimes than high tax states. Second, low tax states should import less from and export more to high-tax territorial regimes than they do from high-tax states. Except for a few exceptions—such as the UK and Japan in 2009--, most OECD counties over the period considered have remained relatively stable in their way to treat foreign-based income.[7]

We create an interaction variable combining the VAT and the corporate income tax rate from 1981 to 2008 into a single measure, which captures the

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[6] Depreciation allowances are taken from the Institute for Fiscal Studies (Devereux et at., 2002). They are calculated for a panel of 16 OECD countries from 1979 to 2005. New investment is assumed to be financed by equity or retained earnings. Economic depreciation is assumed to be uniform across countries, at 12.25% for machinery and equipment. The common inflation rate is 3.5% and the real interest rate is 10%. The expected rate of economic profit is 10%. The combined corporate tax rate includes federal and local tax corporate tax rates.
http://www.ifs.org.uk/publications/3210

[7] Appendix table A2 provides the list of OECD countries and their tax treatment of foreign-based income in 2005 and 2010. Information on tax regimes if from the OECD (2007, Table 4.1) and Deloitte's Taxation and Investment Guides (2010).
http://www.deloitte.com/view/en_GX/global/services/tax/cross-border-tax/international-tax/taxation-and-investment-guides/all-jurisdictions/index.htm

intensity of a country's taxation. Nevertheless, the impact of this interaction term is likely to be unclear, since the relative tax burden across countries depends on other taxes such as property and sales taxes, capital gains taxes, or customs' duties. However, it is interesting to note that only a few countries would qualify as low tax states when considering both corporate and VAT tax rates. This suggests that countries may substitute between income and VAT taxes in order to meet total revenue requirements. As suggested in Hines (1996), tax wedges may only have a significant effect when they are large enough. Therefore we also replace the interaction tax terms by a variety of dummy variables for high and low tax countries. To define high and low tax states, we use different classifications such as the bottom quartile, tax rate differentials between countries, and an interaction terms that consider the joint tax burden.

To estimate the relationship between bilateral trade flows and tax rates, we use the modified gravity model specified by Baldwin and Taglioni (2006).[8] Following their specification, we extend the baseline gravity model in several ways. First, we disaggregate the dependent variable into imports rather than total real trade. The importance of disaggregating into the components of total trade has been stressed elsewhere (Balding 2010). Second, we use the nominal value of trade rather than deflating into the real value based upon United States CPI data. Third, we use time variant country dummies and time invariant country pair dummies rather than the fixed importer, exporter, and year effects widely used elsewhere. The use of this model while econometrically more accurate is therefore computationally intensive, given the size of our dataset, it has been shown to produce unbiased results. Fourth, due to our use of the Baldwin and Taglioni reduced form gravity model, we omit most country and pair specific invariant variables like distance and land area which are already accounted for in

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[8] Please note that this paper is not intended to exhaustively summarize Baldwin and Taglioni but will only highlight our use of their revised gravity model.

the array of dummy variables. A primary factor in the attractiveness of the gravity model is the exogenous nature of the explanatory variables. However, these exogenous variables variables—such as distance--are invariant. Therefore, to prevent multicollinearity of the country or pair variables with the fixed effects, as Baldwin and Taglioni have pointed out, it is better to omit many country and pair variables and instead include a comprehensive set of country and pair dummy variables.

Empirically our model can be expressed in the following manner:

(1) $\ln IMP_{ijt} = \ln(GDP_{it} * GDP_{jt}) + TVX_{it} + TVI_{jt} + TICP_{ijt} + d(TAX_{it}$
        $TAX_{jt}) + e_{ijt}$

Expressed in words, the dependent variable is the natural log of nominal imports of country i from country j at time t. The only observed variable is the natural log of joint nominal GDP of countries i and j at time t. TVX and TVI are a comprehensive set of time variant exporter and importer dummy variables. TICP is a comprehensive set of time invariant country pair dummy variables. The exporter and importer time variant dummies control for unobserved characteristic of a country that affect its propensity of trade, such as its remoteness, the preferences of its citizens. The country-pair dummy controls for unobserved characteristics of pairs of countries, such as bilateral trade agreements or distance. As noted, research has demonstrated this prevents the econometric bias present in previous gravity model work stemming from the multicollinearity of observed variables and the additional fixed country and year effects (Baldwin and Taglioni, 2006). The variable of interest here is $d(TAX_{it}, TAX_{jt})$ which captures the tax-related bilateral trade barrier between the two counties. This paper focuses on the trade barrier from differential corporate taxes and value added taxes. The function d(.) is the distance between the two tax systems. When the distance between two

countries' tax rate increases, the bilateral cost increases, creating a distortion to trade. We account for d(.) in a variety of methods. These methods are further described in greater detail in the results section.

The concern over low tax states focus on the potentially distortionary impact of trade falling on high tax states. It therefore is incumbent to focus on the trade relationships with large differentials in either VAT or corporate tax rates which should induce non-normal trade flows. For instance, if a pair of countries has similar corporate tax rates then we would expect no distortion to trade, while if a country pair was composed of a low and a high tax state we would expect to find higher bilateral tax avoidance driven trade. Consequently, our tax variable will focus in a variety of ways on the differential between the country pair and not on the individual tax rates of each country. Our baseline variable will be 1 if the importing country is a high tax state and the exporting country is a high tax state, 0 is the states are similar in tax level, and -1 if the importing country is a low tax state and the exporting country is a low tax state. This variable represents the predicted direction of trade between high and low tax states. Low tax states *should* import less and export more than high tax states.

The Results

We begin our study of the impact of business taxation of international by focusing on the differentials between states. If divergent tax rates are distorting international trade flows, then it would seem most obviously to goods or services move between states with medium to large corporate or value added tax differentials. For instance, in 2008 Ireland maintained a corporate tax rate of 12.5% while Germany assessed a tax of 30.18% on corporate profits. The large

differential between corporate tax rates would appear to provide a large enough incentive to distort the natural flow of international trade to gain excess post tax profits. To address this possibility we create two dummy variables, one equals unity when the difference between the importing and exporting country corporate tax rate is greater than 10% and the other when it is less than -10%. We then repeat for differentials of 20%. Due to the smaller variation in value added taxes, we create the dummy variables the same but shrink the differences to 5 and 10% respectively. Our results from testing the corporate and value added tax differentials between states is presented in Table 1. The big news is no news at all. At no point do the dummy variables for tax rate differentials enter the regressions as statistically significant. Interestingly, neither the 'source' in the form of VAT or 'destination' tax in the form of corporate taxes differ in their impact on international trade flows. In other words, countries with large differences in their corporate and value added taxes demonstrate no higher or lower propensity to trade than with countries with matching or similar tax rates.

We then turn to test the impact of total business taxation on international trade levels. To accomplish this, we first study whether joint level of business taxation can impact international trade levels. To study the impact of the joint corporate tax burden, we created an interacted dummy variable which equaled unity when the country was below the yearly OECD average in both corporate and value added taxes. In other words, given that countries may maintain a constant total business tax environment by having higher corporate profits tax but lower VAT, we investigate whether the overall level of taxation impacts the propensity to trade. The dummy variable equals unity for states that maintain low corporate and VAT regimes. Our results for regressions testing corporate and value added tax interaction are presented in Table 2. As can be seen from Table 2, again there is no statistically significant result from the interacted dummy

variable signaling low corporate and value added tax rates. Countries with low value added and corporate tax rates demonstrate no significant impact on trade at reasonable intervals allowing rates to change. Though many may fear that low tax countries will distort or draw away economic activity from higher tax states, our results fail to support this assertion.

Discussion

Our results are neither surprising for the following reasons not incompatible with a potential effect of corporate tax wedges on the real economy and in particular international trade. First, recent research has shown that the variation in statutory corporate income tax rates in OECD countries is much larger than the variation in average effective tax rates (Gravelle, 2011; Markle and Shackelford, 2007; Devereux et al., 2009). This suggests that, if not through real economic effects, companies have other ways to smooth their effective tax payments in reaction to corporate income tax wedges, such as income shifting, transfer pricing, or other accounting strategies (Grubert and Altshuler, XXXX). Second, research has fount that outbound FDI and domestic production are not substitutes, but complements (Desai et al., 2008). Therefore, although corporate tax wedges affect the real economy. Third, when effective marginal tax rates are taken into account—which we do by correcting statutory tax rates with depreciation allowance—the results suggest that [TBU]. Fourth, corporate tax wedges may not affect trade flows but may still affect the structure of trade. For example, it is has been suggested as part of the debate over corporate tax reform in the U.S. that the persistent high corporate tax rate offsets US comparative advantage in capital intensive goods. Further research should investigate the effect of corporate and indirect taxes on the composition of trade. Fifth, [OTHER SUGGESTIONS?]

Finally, previous research suggests that FDI and international trade are at least complement (Eaton and Tamura, 19964) or and that FDI induces trade (Yamayaki, 1991; Fontagne and Pajot, 1997). If FDI explains trade and if corporate tax wedges significantly affect FDI as the literature also suggests, the correct methodology may be to use a two-step model where trade is indirectly explained by taxes through FDI.

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Appendix Table A1 - Central government statutory corporate income tax rates and decline by time period, selected years*

Country	1981	1990	2005	2011	1981-2011	1990-2011	2005-2011
Australia	46	39	34	30	-16	-9	-4
Austria	55	30	34	25	-30	-5	-9
Belgium	48	41	40.2	34	-14	-7	-6.2
Canada 1/	37.8	28.8	29.1	22.1	-15.7	-6.7	-7
Denmark	40	40	32	28	-12	-12	-4
Finland	43	25	29	26	-17	1	-3
France 2/	50	42	37.8	35	-15.1	-7.1	-2.8
Germany 3/	56,0	50,0	42.2	26.4	n/a	n/a	-15.8
Greece	45	46	40	32	-13	14	-8
Hungary	n.a.	40	18	16	n/a	-24	-2
Iceland	n.a.	n.a.	30	18	n/a	n/a	-12
Ireland	45	43	24	12.5	-32.5	-30.5	-11.5
Italy 1/	40	52.2	37	33	-7	-19.2	-4
Japan	42	37.5	30	30	-12	-7.5	0
Luxembourg 4/	40	34	31.2	22.9	-17.1	-11.1	-8.3
Mexico	42	36	35	30	-12	-6	-5
Netherlands	48	35	35	31.5	-16.5	-3.5	-3.5
New Zealand	45	33	33	33	-12	0	0
Norway	29.8	29.8	28	23.8	-6.1	-6.1	-4.3
Portugal	47	36.5	32	25	-22	-11.5	-7
Spain	33	35	35	35	2	0	0
Sweden	40	40	28	28	-12	-12	0
Switzerland	9.8	9.8	8.5	8.5	-1.3	-1.3	0
Turkey	n.a.	n.a.	33	30	n/a	n/a	-3
United Kingdom	52	34	30	30	-22	-4	0
United States	46	34	35	35	-11	1	0

Source: OECD Tax Database.

1/ Top regional rate

2/ Including regional rate

3/ Including surcharge and top regional rate

4/ Not including surcharge in 1981 and 1990.

Table 1 - Tax Differential Results

	4 Year Cross Sectional Panel	8 Year Cross Sectional Panel	12 Year Cross Sectional Panel
Corporate Tax Differential > 10	-.02 (.03)	.02 (.05)	-.00 (.06)
Corporate Tax Differential <-10	.01 (.04)	-.05 (.05)	-.04 (.06)
Corporate Tax Differential > 20	.00 (.05)	.01 (.08)	-.03 (.10)
Corporate Tax Differential <-20	-.02 (.05)	-.07 (.09)	.03 (.10)
VAT Differential > 5	-.04 (.04)	-.02 (.06)	-.09 (.07)
VAT Differential <-5	-.01 (.04)	-.03 (.06)	-.01 (.07)
VAT Differential > 10	-.02 (.06)	-.02 (.08)	.03 (.11)
VAT Differential <-10	.01 (.06)	-.06 (.09)	.05 (.12)
R-Squared	.97	.97	.97

Standard errors are in parentheses

Table 2 – Joint Corporate and Value Added Tax Burden Results

	4 Year Cross Sectional Panel	12 Year Cross Sectional Panel
Joint Corporate and Value Added Tax Burden Importer	-.00 (.45)	-.26 (.54)
Joint Corporate and Value Added Tax Burden Exporter	-.17 (.43)	-.44 (.54)
Observations	3,539	1,403
R-Squared	.97	.98

Standard errors are in parentheses