

The Effects of Indirect Taxes on the Industrial Composition of US Inward FDI

ABSTRACT

This study considers the effect of indirect taxes on inward foreign direct investment (FDI) in the US. It reports a measure similar to average effective indirect tax rates but in relation to gross operating surplus rather than the actual tax bases for a large sample of industries. The study then uses this measure of taxes to analyse the impact of indirect taxes on the industrial composition of inward FDI in the US. For consistency with other empirical studies of the determinants of FDI the models estimated specify tax as one of several possible determinants of inward direct investment. This analysis uses two different measures of inward FDI, which results in two samples which also vary according to the time periods and industries included. The key finding of the study is that, as expected, coefficients for our measure of indirect tax are both negative and statistically significant in explaining US inward investment by industry. That is, our results support the view that indirect taxes in the US have distorted the pattern of inward investment away from those industries with higher indirect taxes and towards those with lower indirect taxes.

Key words: indirect taxes, FDI determinants, industry, OLI theory
JEL Codes: F230, H250, F210.

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1. Introduction

The key objective of this paper is to examine the effects of indirect taxes on inward FDI in the US by industry. Most previous research on tax and FDI has focused on statutory rates of taxes on corporate income. Since these tend to vary little by industry or sector such studies tended to focus on aggregate FDI across a sample of a number of countries. More recent research has tended to focus on effective rather than statutory tax rates, permitting variation of the corporate tax burden on FDI by industry and region to be considered. The effects of indirect taxes are even more likely to vary between one industry and another. For example, taxes on energy or real estate can be expected to affect energy intensive or real estate intensive industries much more than others.

However, measurement of indirect taxes is more complex. In most cases there are numerous different taxes, levied on a variety of different tax bases. In consequence calculation of average effective rates in relation to the tax base is not the most satisfactory way to assess the impact of indirect taxes on FDI. Accordingly we do not use average effective tax rates in the normal way but calculate a similar measure in which the total expenditure on a number of indirect taxes is expressed as a proportion of gross operating surplus. In effect, this calculates the burden of a package of indirect taxes as an average effective profit tax “equivalent”.

In an ideal situation it would be possible to construct a sample comprising not just a time series for a sample of industries for a single country but for a number of countries. However, such a sample would impose very substantial data requirements, not least because of inconsistencies between the tax systems of different countries. Since there are many multi-country studies of tax and FDI but few focusing on different effects on different industries, this study focuses on a sample of industries for a single country – the US.

Section 2 provides a review of the relevant literature both from the point of view of researchers approaching these issues from a public finance perspective and from the point of view of those more concerned with the determinants of the location of inward FDI. Section 3 provides a description of the key characteristics of indirect taxes in the US and reports values of our measure of a package of indirect taxes in relation to gross operating surplus by industry. A further feature of this study is that it does not analyse the effects of indirect taxes on inward FDI in the US in isolation but as part of set of determinants founded in the (OLI) theory of FDI. Section 4 sets out the specification of the models to be estimated and identifies the key hypotheses to be tested. In section 5 we present an analysis of the determinants of US inward FDI according to one measure (sales by foreign affiliates as a proportion of industry sales) and, in section 6, according to a different measure – stocks of inward FDI. Finally conclusions are presented in section 7.

2. Review of Literature

There is a substantial literature on the effects of tax on the location of foreign direct investment (FDI). By far the bulk of the empirical work has come from the public finance tradition. However, some important research has also emerged from a tradition more concerned with empirical studies of the determinants of inward investment. Despite different origins and different emphases these two traditions are consistent with each other and the conceptual foundation of this paper draws on both.

Within the public finance tradition the most common empirical approach has been to study the impact of direct taxes on corporate income on the location of FDI in a multi-country sample. Generally these studies find a negative relationship between national taxes on corporate income and measures of aggregate FDI. Goodspeed et al (2011) provide a review of a number of these studies. De Mooij and Ederveen (2003) and (2008) also provide useful reviews of this empirical literature.

There have also been a number of more recent developments which have had the effect of increasing the sophistication of this approach. A number of early studies used statutory (listed) rates of tax. Devereux and Griffith (2003) emphasised the importance of using average tax rates and proposed a measure of forward looking average effective tax rates. Zodrow (2010) also highlighted the problems of using statutory tax rates. More recent studies, such as that of Djankov et al (2010), have continued to consider the effects of taxes on corporate income on aggregate inward FDI in a multi-country sample but using effective rather than statutory tax rates. Egger et al (2009) examine outward FDI from OECD countries and found a negative association with bilateral effective tax rates. Bellak and Leibrecht (2009) use a gravity model and effective tax rates to estimate the impact of taxes and other variables on FDI in a multi-country sample. This study is in this tradition in that it uses tax rates which are much more closely related to average effective rates than statutory rates.

There are also a number of variations on the core tax and FDI theme. An (2011) finds that reductions in the preferential treatment of foreign enterprises in China to have affected investment patterns. Buettner and Ruf (2007) find a significant effect of tax incentives on German multinationals. Dreßler and Overesch (2011) find that the treatment of losses in the calculation of profit taxes affects investment by German multinationals. Klemm and Parys (2012), using a multi-country sample, find tax incentives to be ineffective in attracting inward investment. Weyzig (2012) finds tax treaties to be a key determinant of FDI in the Netherlands.

Although the emphasis has remained on corporate taxes the literature has been extended in a very few instances to include indirect taxes. The link between indirect taxes and the location of FDI has been little explored but interest in such taxes is not wholly new. For example, Guisinger (1989) proposed a measure combining several taxes with import tariffs. More recently, Desai et al (2004) found indirect taxes to be of considerable importance in the location of FDI by US multinationals. Buettner and Wamser (2009)

also found a significant effect of indirect taxes on the locational choices of German multinationals.

Another under-explored theme in the existing literature is the possibility that the behaviour of FDI with respect to taxes may vary by industry or by sector. Stowhase (2005) finds important differences between EU sectors in their sensitivity to corporate income tax (tax elasticities). There are good reasons to suppose that indirect taxes are also likely to be of particular relevance when the industrial composition of inward FDI is of interest. For example, high taxes on labour in one particular location might well be expected to distort the pattern of inward FDI away from labour intensive activities in that location. The proper identification of the impact of indirect taxes on FDI would ideally involve a multi-country and multi-industry sample. With currently available data this is, for all practical purposes impossible. Since such evidence as exists on the effects of indirect taxes is focused on aggregate FDI in multi-country samples, this paper chooses to complement such work by considering a multi-industry sample in a single location (US).

Single country studies of taxes and FDI are also part of the established literature, usually examining the effects of taxes on the allocation of FDI between different regions of the same country. For example, Billington (1999) considers the effects of a variety of influences, including tax on inward FDI in different regions of the UK. Bobonis and Shatz (2007) find that, amongst other influences, tax policies of US states influence the regional pattern of FDI within the US. Wijeweera et al (2007) consider the effects on US outward and inward investment in terms of the difference between domestic and foreign rates of corporate tax.

The other tradition which has led to research of relevance to tax and FDI is the empirical literature on the determinants of inward FDI. Blonigen (2005) provides a review of earlier studies and Blonigen (2011) a review of two broad approaches – the gravity model and more recent models emphasising factor endowments. A further approach, of which Wang (2010) is a recent example, looks at aggregate inward FDI as an essentially macro-economic phenomenon determined by a series of macro-economic variables such as inflation and exchange rates. Dimitropoulou et al (2013) provide an empirical examination of the determinants of inward FDI in the different regions of the UK from the perspective of economic geography.

A number of studies of the determinants of the location of inward FDI also consider the effects of government policies rather than taxes specifically. Loree and Guisinger (1995) consider the effects of government policies, including effective tax rates, on US inward investment. Lim (2005) examines the relationship between policy incentives and the industrial structure of FDI. Love (2008) examines the determinants of FDI on a sectoral basis with particular emphasis on sourcing or exploiting technology. Moosa (2009) provides an empirical analysis of inward investment in MENA countries using a set of determinants linked to the OLI theory associated with Dunning (1998) and (2000) in particular. Chidlow et al (2009) provide a similar analysis of OLI related determinants in a study of inward FDI in Poland. This study, like a number of those concerned with the

determinants of inward FDI, is explicitly based on OLI theory. In this respect it shares much in common with Stowhase (2005), who both considers sectoral variations in the effects of tax on inward FDI and uses OLI theory as a theoretical foundation.

3. US Indirect Taxes by Industry

In this section (Table 1) we present estimates by industry of the importance of indirect taxes in relation to gross operating surplus. In many respects these are similar to average effective tax rates in that they measure the actual expenditure by US businesses on a range of different taxes, net of subsidies. However, they are not average effective rates in a strict sense as these net taxes are measured in relation to gross operating surplus not in relation to their tax base. By definition, the tax base for these indirect taxes would normally be different. These measures are intended to be, in effect, a profit tax equivalent – to assess the effect of a package of indirect taxes on profits. This measure (t_j) is calculated for industry j as:

$$t_j = (T_j/GOS_j).100 \quad (1)$$

where T_j are total taxes, net of subsidies, for industry j (production and imports) and where GOS_j is the gross operating surplus for industry j . Data for both were taken from the *Annual Input-Output Accounts* data (published on-line by the Bureau of Economic Analysis, US Department of Commerce). It should also be noted that this measure of indirect taxes is net of subsidies and can be negative in the rare circumstances where payments received exceed taxes paid. Of the sample of industries covered in Table 1 this occurs in only two cases – farms and railway transportation.

The taxes included in these calculations comprise Federal excise taxes and customs duties, state and local sales taxes, property taxes (including residential real estate taxes where applicable), motor vehicle licenses, severance taxes and other taxes on business production. Subsidies are the monetary grants paid by the government to private business or to other government enterprises. (“A Guide to NIPAs” <http://www.bea.gov/national/pdf/nipaguid.pdf>)

The taxes excluded from these calculations are taxes on corporate income, whether paid to the United States Internal Revenue Service, State governments or governments of other countries. Thus some state-level taxes are included (sales taxes) whereas state corporation taxes, which are not levied by all states of the US, are excluded. Also excluded are the federal payroll taxes borne by the employer: OASDI tax (old age, survivors and disability insurance), Medicare and unemployment tax. The state-level unemployment tax levied by some states is excluded as well. Although these taxes are deductible against profits chargeable to corporation tax, they can represent a considerable burden in labour intensive industries, typically amounting to some 7.7% of gross payroll.

It is clear that for at least some of the taxes included in this calculation that the incidence of taxation may not fall wholly on the firm or even fall on the firm at all. For example, it is clearly possible that either all or part of the burden of sales taxes will be transferred to

consumers. Likewise it is possible that firms might pass on the burden of other taxes to their workers in the form of lower wages. The concern of this study is with whether indirect taxes have affected the pattern of inward FDI by industry in the US. Issues of the incidence of taxation are, therefore, only of indirect concern. Should our analysis find that indirect taxes have little effect on inward FDI it may be reasonable to question whether or not firms bear any of the burden of indirect taxes. Conversely, a finding that indirect taxes do have a significant effect on the pattern of inward FDI by industry would suggest that at least some of the incidence of the tax falls upon firms.

The results presented in Table 1 suggest considerable variation between one industry and another in the effects of indirect taxes relative to gross operating surplus. A number of industries exhibit rates of indirect taxes which are persistently 30% of gross operating surplus or greater. For example, accommodation services consistently exhibits rates in excess of 40%. Other industries, such as publishing or construction, persistently exhibit rates of 4% or less. With this variation in the importance of indirect taxes to industry earnings there are at least plausible grounds to suppose that the allocation of inward investment to one industry rather than another might have been affected.

To minimise the effects of short run fluctuations in gross operating surplus, which might distort the ratio, our results are reported as averages over four year periods (three years for 2009-2011). It is noticeable that the measure increases substantially for many (but not all) industries for the period 2009-2011. This does not reflect major shifts in taxation but most probably reflects the impact of the macro-economic downturn on gross operating surpluses.

TABLE 1: TAXES ON PRODUCTION AND IMPORTS RELATIVE TO GROSS OPERATING SURPLUS, selected US industries				
Industry	Annual average for period:			
	1998-2001	2002-2005	2006-2008	2009-2011
Farms	-18.51%	-10.97%	-5.79%	-3.11%
Forestry, fishing, and related activities	7.84%	8.59%	11.94%	10.78%
Oil and gas extraction	30.76%	22.62%	22.31%	28.14%
Mining, except oil and gas	24.79%	25.74%	23.84%	16.45%
Support activities for mining	24.80%	13.32%	6.52%	9.30%
Utilities	34.21%	42.74%	40.59%	37.67%
Construction	3.31%	3.47%	3.92%	4.82%
Wood products	9.23%	10.07%	21.89%	17.40%
Nonmetallic mineral products	5.85%	7.47%	10.76%	17.35%
Primary metals	21.11%	17.21%	9.43%	24.99%
Fabricated metal products	5.73%	7.75%	7.14%	9.80%
Machinery	7.70%	11.58%	8.74%	7.74%
Computer and electronic products	4.31%	29.57%	8.30%	5.93%
Electrical equipment, appliances, and components	6.26%	8.00%	6.05%	1.13%
Motor vehicles, bodies and trailers, and parts	5.67%	6.33%	39.33%	7.41%
Other transportation equipment	8.76%	12.81%	8.72%	8.22%
Furniture and related products	3.23%	4.20%	4.43%	5.76%
Miscellaneous manufacturing	4.42%	4.19%	3.66%	3.78%
Food and beverage and tobacco products	22.67%	26.56%	29.34%	33.38%
Textile mills and textile product mills	10.25%	17.22%	11.90%	10.88%
Apparel and leather and allied products	5.81%	7.37%	10.22%	10.70%
Paper products	7.02%	9.03%	8.10%	7.78%
Printing and related support activities	15.72%	21.43%	23.22%	23.27%
Petroleum and coal products	5.07%	3.35%	2.16%	3.44%
Chemical products	5.64%	5.47%	5.07%	4.59%
Plastics and rubber products	6.30%	7.50%	8.55%	6.47%
Rail transportation	-3.28%	-7.99%	-3.30%	-6.04%
Water transportation	22.35%	12.28%	10.57%	9.02%
Truck transportation	6.50%	6.04%	6.33%	7.73%
Transit and ground passenger transportation	10.73%	11.28%	11.85%	16.49%
Pipeline transportation	25.38%	27.24%	31.74%	29.80%
Other transportation and support activities	18.26%	14.55%	14.06%	14.75%
Warehousing and storage	6.74%	7.93%	7.28%	6.65%
Publishing industries (includes software)	5.43%	3.05%	3.49%	5.72%
Motion picture and sound recording industries	10.65%	9.33%	10.07%	11.47%
Broadcasting (except internet) and telecommunications	25.95%	23.71%	18.52%	14.92%
Federal Reserve banks, credit intermediation, and related activities	4.82%	4.34%	5.20%	5.13%
Insurance carriers and related activities	13.53%	16.59%	14.50%	14.10%
Funds, trusts, and other financial vehicles	22.08%	15.07%	15.15%	40.57%
Real estate	13.61%	14.02%	14.26%	14.65%
Rental and leasing services and lessors of intangible assets	8.96%	10.97%	10.64%	9.69%
Legal services	17.37%	27.16%	23.10%	12.20%
Computer systems design and related services	9.63%	22.95%	21.16%	16.02%
Miscellaneous professional, scientific, and technical services	3.77%	3.54%	3.44%	3.63%
Management of companies and enterprises	29.83%	30.94%	34.43%	30.71%
Administrative and support services	8.42%	7.56%	7.79%	7.41%
Waste management and remediation services	18.20%	14.92%	18.56%	16.29%
Educational services	55.89%	68.93%	63.43%	51.81%
Ambulatory health care services	7.22%	7.58%	7.87%	6.83%
Hospitals and nursing and residential care facilities	45.11%	50.96%	60.83%	45.05%
Social assistance	7.18%	6.64%	7.01%	7.96%
Performing arts, spectator sports, museums, and related activities	19.66%	17.52%	19.89%	19.59%
Amusements, gambling, and recreation industries	38.18%	67.44%	76.90%	71.22%
Accommodation	48.26%	45.52%	49.31%	75.34%
Food services and drinking places	53.70%	49.16%	55.70%	47.64%
Other services, except government	13.58%	17.23%	18.36%	18.83%
Source: <i>Annual Input-Output Accounts Data</i> , Bureau of Economic Analysis, US Department of Commerce				

3. Model Specification and Hypotheses

As discussed earlier the approach of this paper is to seek to assess the effect of indirect taxes on the industrial composition of inward investment activity in the US. This is embedded with a specification owing much to OLI theory and empirical models of the determinants of inward FDI. To do this we use two different dependent variables, with the consequence that we also use two different but overlapping samples. The core specification, using our first dependent variable (*asout*) is a standard fixed effects specification:

$$asout_{jt} = X_{jt}\beta + \delta_j + \eta_t + u_{jt} \quad (2)$$

where X comprises observations of the independent variables, δ_j are unobserved (fixed) industry effects, η_t unobserved (fixed) time effects and u_{jt} a disturbance term.

The variables are defined as follows:

- *asout_{jt}* - the share of sales by non-bank foreign affiliates in the total output of industry j at time t . Data on sales of non-bank affiliates were taken from the *Direct Investment and MNCs* database and data on industry output from the *Annual Input-Output Accounts* data. Both are published on-line by the Bureau of Economic Analysis, US Department of Commerce.
- *mfp_{jt}* – the multi-factor productivity index for industry j at time t . These data were taken from the multi-factor productivity data published on-line by the US Bureau of Labor Statistics. The variable is intended to capture efficiency seeking behaviour by foreign investors.
- *tax_{jt}* – indirect tax payments (net of subsidies) as a percentage of gross operating surplus for industry j at time t . This variable was described in the preceding section.
- *cons_{jt}* – apparent consumption (output plus imports less exports) for industry j at time t . These data were calculated from the US *Annual Input-Output Accounts*. The variable seeks to capture market seeking behaviour by foreign investors.
- *comp_{jt}* – the computer intensity of industry j at time t , defined as the share of computer services and equipment in output (from the *Annual Input-Output Accounts*). As an indicator of technological use it seeks to capture strategic asset seeking inward FDI.
- *nri_{jt}* – natural resource intensity, defined as the share of natural resources in industry output, also taken from the Input-Output data. This variable is intended to measure resource seeking behaviour by foreign investors.
- *skill_{jt}* - the share of managerial and professional workers in the total industry payroll of industry j at time t . These data were taken from the *Occupational Employment Statistics* database published by the US Bureau of Labor Statistics. The variable seeks to measure the skill intensity of industry j and, hence, related strategic asset seeking in inward FDI.

- exs_{jt} and $impen_{jt}$ – are the export to sales and import penetration ratios (imports as a share of total demand) for industry j at time t , again calculated from the input-output data. These variables capture the effects of international trade on inward FDI.

Our analysis also used a second dependent variable – fdi_{jt} . This was defined as:

- fdi_{jt} – stocks of inward US FDI for industry j at time t (measured at historic cost). These data were also drawn from the *Direct Investment and MNCs* database, published by the Bureau of Economic Analysis.

The second relationship estimated simply replaces the dependent variable $asout_{jt}$ with fdi_{jt} such that:

$$fdi_{jt} = X_{jt} \cdot \beta + \delta_j + \eta_t + u_{jt} \quad (3)$$

Irrespective of the choice of dependent variable our core hypothesis is the same. The central hypothesis of this paper is that there is a negative and statistically significant relationship between indirect taxes (measured in relation to gross operating surplus) and inward FDI in a particular industry. That is, we hypothesise that indirect taxes have affected the composition of US inward FDI in a way that has distorted the pattern of investment away from higher taxed industries and towards lower taxed ones. We note that it is possible that the incidence of the taxes involved may be such that a part of the burden of indirect taxes falls on consumers in higher prices or is passed onto workers in lower wages. We interpret any evidence of a statistically significant effect of indirect taxes to also imply that some of the tax burden must also have fallen upon firms. Issues of incidence are, thus, embodied in this hypothesis.

The model specified does not see indirect taxation affecting inward FDI decisions in isolation but as part of a wider process. Some previous studies such as Bellak and Leibrecht (2009) have modelled the effects of taxation within a gravity model of FDI. In keeping with a number of the empirical studies of the determinants of inward FDI, for example that by Chidlow et al (2009), the model in this study is based on OLI theory as expressed by Dunning (1998, 2000) and others. OLI theory specifies a range of key motives for the choice of a location for inward FDI. Not all of these will necessarily be of consequence in any particular set of circumstances but, if they are, we should expect to observe the following effects :

- *market seeking motives* – a statistically significant and positive relationship between consumption and inward FDI.
- *efficiency seeking motives* – a statistically significant and positive relationship between inward FDI and multi-factor productivity.
- *resource seeking motives* – a positive and significant relationship between natural resource intensity and inward FDI.
- *strategic asset seeking motives* – a statistically significant and positive relationship with (a) computer intensity and (b) skilled labour intensity.

- *trade openness effects* – a positive and statistically significant relationship between both export to sales ratios and import penetration and inward FDI.

The following sections seek to test these hypotheses using both measures of inward FDI.

4. Regression Analysis Using Sales by Affiliates Data

Table 2 presents regression estimates using the proportion of industry output accounted for by sales of non-bank foreign affiliates in the US as the dependent variable. The data are for the period 1999-2006 since data on sales of affiliates for later years were only available on a different basis. Details of the sample of 48 industries used are provided in Appendix 1. The specified equation was estimated using three different estimators – a pooled (OLS) estimator, a panel (double) fixed effects model and a GMM (Arellano-Bond) estimator. The choice of 3 different estimators was intended partly to assess the robustness of key findings and partly to allow a choice of different assumption with respect to the underlying model.

For the purposes of this paper the most important finding is that all three models produce estimates of the coefficient for indirect taxes and subsidies as a percentage of gross operating surplus which are both negative and statistically significant at 95% confidence levels or better. That is, they find a statistically significant effect of the diversion of US inward FDI activity away from those industries with higher burdens of indirect taxation. Although statistically significant the magnitude of these coefficients is such that it is unlikely that indirect tax effects have dominated the composition of FDI activity by industry. The effects of tax do, therefore, need to be considered within a wider set of determinants.

Another variable found to have a statistically significant effect (at 95% confidence or better) on the industrial composition of US inward FDI is the indicator of skill intensity. This coefficient is positive, as expected, in the fixed effects and GMM model but negative in the pooled OLS model. Computer intensity was found to be both positive and statistically significant in both the pooled OLS and panel fixed effects models but not with the GMM estimator.

TABLE 2 : REGRESSION ANALYSIS OF FOREIGN AFFILIATE SALES (RELATIVE TO INDUSTRY OUTPUT), 1999-2006					
Variable (dependent variable: affiliate sales as a proportion of industry output)		Pooled model (OLS)	Panel model (double fixed effects)	GMM (Arellano-Bond)	
Description	Label	Coefficient/ s.e. (robust)	Coefficient/ s.e. (robust)	Coefficient/ std error (robust)	
Affiliate sales/output, lagged one year	asout1			0.35708*	
				(0.2408918)	
Affiliate sales/output, lagged two years	asout2			-0.0765648	
				(0.0892244)	
Multi-factor productivity index	mfpi	0.00000851	0.0001136	-0.000543	
		(0.0008151)	(0.0004657)	(0.0006441)	
Indirect taxes/gross operating surplus	tax	-0.02012**	-0.00399**	-0.00678***	
		(0.0083523)	(0.0015814)	(0.0026929)	
Consumption	cons	1.39E-08	-0.0000001*	-0.0000001*	
		(0.00000001)	(0.00000005)	(0.00000007)	
Computer intensity	comp	0.42107**	1.5288***	0.9302547	
		(0.2048168)	(0.3511547)	(0.7880494)	
Natural resource intensity	nri	0.36928***	0.0223062	-0.1024634	
		(0.0767853)	(0.4651725)	(0.2634577)	
Skill intensity	skill	-0.04986**	0.1663***	0.23519**	
		(0.0227616)	(0.053841)	(0.1055828)	
Export to sales ratio	exs	0.29109***	0.2614319	0.126174	
		(0.1011846)	(0.261843)	(0.2622279)	
Import penetration	impen	0.09224*	-0.20190*	0.0297707	
		(0.0497848)	(0.1099818)	(0.2468939)	
Intercept	c	0.0844896	-0.0177045		
		(0.0799768)	(0.123125)		
Total number of observations: 384 (48 industries, 8 years)					
Diagnostics					
R-squared		0.2208	0.9338	A-B AR(1):	-1.82
Adjusted R squared		0.2042	0.9211	A-B AR(2):	-0.63
F statistic		13.93	199.43	Wald (13):	48.53
F: degrees of freedom		8,375	62,321	Sargan (8):	52.87
White test for heteroskedasticity		166.25	384	Hansen(8):	14.08
White degrees of freedom (Chi squared)		44	383		
Breusch-Pagan/Cook-Weisberg (Chi sq, 1)		50.49	251.99		
Akaike information criterion		-594.0056	-1433.03		
SWILK tesdt for normality (Z)		7.697	9.162		
Mean VIF		1.39	24.43		
Durbin Watson		0.124693	0.938128		
Notes:					
1. robust standard errors are in parentheses					
2. *** indicates statistically significant at 99% confidence, ** at 95% and * at 90%					
3. A-B is the Arellano-Bond test					
4. Sargan is the Sargan test for over-identified restrictions					
5. Hansen is the Hansen test for over-identified restrictions					

5. Regression Analysis Using Stocks of Inward FDI

Table 3 presents regression estimates using FDI stocks as the dependent variable. All independent variables are the same as for the analysis using sales of affiliates. The use of FDI stocks also required a change in the sample, with fewer industries (38) but a longer time series of 12 years (1999-2010).

The focus of the paper is on the relationship between indirect taxes and inward FDI by industry. As before this implies that the estimated coefficient for the indirect tax variable is of particular interest. With FDI stocks the relevant coefficient is negative and statistically significant (at 95% confidence levels) in the both the pooled (OLS) model and with the double fixed effects panel estimator. With the GMM estimator the estimated coefficient is again negative but not statically significant at any reasonable confidence level. These results support our core hypothesis that indirect taxes have affected the pattern of US inward FDI by industry, in a manner which diverts inward FDI from more highly taxed industries to less highly taxed ones.

The regression results presented in Table 3 provide only more ambiguous support for other determinants of inward FDI arising from (OLI) theory. With both the pooled (OLS) and panel estimators the coefficient for consumption is positive and statistically significant at 99%, but not with the GMM estimator. The OLS and panel results, thus, provide evidence in support of the hypothesis of market seeking behaviour. Both skill intensity and export to sales ratios were found to be statistically significant at 99% confidence with the pooled OLS estimator but not with the panel and GMM estimators. The other “control” variables – multi-factor productivity, computer intensity, natural resource intensity and import penetration – did not produce statistically significant results with any of the three estimators.

With respect to tax, our core hypothesis, the results are consistent between both dependent variables – sales of affiliates (in relation to output) and stocks of inward FDI. However, for other independent variables there is much less consistency between the two different samples. Given the differences between the dependent variables and the resulting differences in sample proportions this is not wholly surprising. Given the role of these – to provide a series of theoretically consistent control variables - the lack of consistency between the two is not particularly damaging to the dominant interest of this study, the role of indirect taxes.

Beugelsdijk et al (2010) have argued that stocks of FDI are biased measures which over-estimate the true intensity of the activity of foreign affiliates in some circumstances and under-estimate it in others. Given these concerns with the use of FDI stocks we would place greater emphasis on our findings from the analysis which used sales of affiliates as the dependent variable than these, using inward FDI stocks.

TABLE 3 : REGRESSION ANALYSIS OF STOCKS OF US INWARD FDI, 1999-2010					
Variable (dependent variable: stocks of inward FDI)		Pooled model (OLS)	Panel model (double fixed effects)	GMM (Arellano-Bond)	
Description	Label	Coefficient/ s.e. (robust)	Coefficient/ s.e. (robust)	Coefficient/ std error (robust)	
Inward FDI stock, lagged one year	fdil1			0.1540068 (0.2996721)	
Inward FDI stock, lagged two years	fdil2			-0.0725399 (0.1253146)	
Multi-factor productivity index	mfpi	168.4191 (143.1557)	80.90113 (86.90243)	190.261 (140.1267)	
Indirect taxes/gross operating surplus	tax	-11417.54** (4733.398)	-4934.843** (2366.944)	-1720.745 (4955.722)	
Consumption	cons	0.035188*** (0.0051551)	.0351016*** (0.0117344)	-17877.54 (0.0347537)	
Computer intensity	comp	-30111.93 (59062.97)	161783.7 (110738.5)	-17877.54 (132045.5)	
Natural resource intensity	nri	1991.657 (10157.83)	-34580.74 (25388.72)	-3022.092 (15874.06)	
Skill intensity	skill	33200.74*** (7205.4)	1117.01 (6000.109)	-6395.416 (4044.035)	
Export to sales ratio	exs	75126.95*** (24583.79)	77700.49 (58376.93)	161473.8** (72642.17)	
Import penetration	impen	-5190.056 (7264.389)	-29046.66 (28264.17)	53227.62 (69608.78)	
Intercept	c	-14919.6 (14014.36)	-11354.54 (10732.29)		
Total number of observations: 456 (38 industries, 12 years)					
Diagnostics					
R-squared		0.2365	0.9117	A-B AR(1):	-0.91
Adjusted R squared		0.2229	0.8993	A-B AR(2):	-2.07
F statistic		14.85	81.31	Wald (9):	37.23
F: degrees of freedom		8, 447	56,399	Sargan (16):	117.16
White test for heteroskedasticity		219.7	456	Hansen(16):	23.54
White degrees of freedom (Chi squared)		44	455		
Breusch-Pagan/Cook-Weisberg (Chi sq, 1)		157.24	211.42		
Akaike information criterion		10703.2	9815.38		
SWILK tesdt for normality (Z)		8.908	7.433		
Mean VIF		1.37	11.89		
Durbin Watson		0.138253	0.956048		
Notes:					
1. robust standard errors are in parentheses					
2. *** indicates statistically significant at 99% confidence, ** at 95% and * at 90%					
3. A-B is the Arellano-Bond test					
4. Sargan is the Sargan test for over-identified restrictions					
5. Hansen is the Hansen test for over-identified restrictions					

6. Conclusions

The central concern of this paper is with the effects of indirect taxes on the industrial composition of inward direct investment in the US. The measure of indirect taxes (in relation to gross operating surplus) presented in section 3 shows that the total value of indirect taxes are sufficiently large that the (ex ante) possibility that these taxes might have substantially affected profit incentives cannot be ignored. The variation between one industry and another also confirms that the possibility that profit incentives for one industry relative to another cannot be disregarded without further analysis.

The key finding of this study is that the coefficient estimates for the effects of inward FDI are universally negative and, with one exception, statistically significant. This provides evidence to support a distortionary effect on the pattern of US inward FDI by industry resulting from the impact on relative profit incentives arising from indirect taxes. Some of the indirect taxes included in our measure are sales and excise taxes, for which one might expect the tax burden to be passed onto the consumer. As we examine a package of indirect taxes it is impossible to identify the effects of any individual tax. Nonetheless, our finding of a statistically significant relationship with FDI suggests that at least some of the incidence of the package of indirect taxes must have fallen upon firms.

With respect to estimated tax coefficients our findings are consistent with two very distinct dependent variables and, hence, with two different samples. In this sense our key findings are robust. However, our model did not examine the relationship between indirect tax and FDI in isolation but as part of a wider set of determinants. Results for the other “control” variables are not, typically, consistent between the two samples but this could reasonably be expected. For example, the sensitivity of share of foreign affiliates in industry sales to market size is inherently less likely to be sensitive to market size than the stock of inward FDI.

Our core finding is to support the results of the very few previous studies concerning indirect taxes and FDI – that indirect taxes should not be ignored in understanding the location of inward direct investment.

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