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How do Corporate Taxes affect International Trade?

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Abstract

This paper investigates how corporate income taxes affect international trade, and identifies the underlying channel. Using data on 33 NACE sectors, for 34 EU and OECD economies, over the period 2005-2014, we find that corporate income taxes reduce exports and imports only when the stock of foreign direct investment (FDI) is high. The effect is present primarily in the service sector and in countries with low corporate taxes. We interpret these findings as evidence that multinational enterprises reduce their operations in countries that raise their corporate taxes. The effect has been found to be small on aggregate, implying that the expected increase in corporate taxes in the future, arising from the global minimum tax, is unlikely to hurt international trade.

Keywords: taxation, profits, international trade, exports, imports, FDI

JEL classification: F14, F23, H25

CONTENTS

TABLES AND FIGURES

1. Introduction

Corporate taxation is important for companies, as it affects their net profits, and through this, their business decisions, such as investment, production and employment. Recent decades have seen many countries use corporate income tax (CIT) as a tool to compete for mobile capital, in an effort to improve their economic performances (see, for instance, Deveraux et al., 2008). This has led to international tax competition, which has generated a downward trend in CIT rates globally. The growth effects of this trend have been ambiguous. As Gechert and Heimberger (2021) have found, one cannot reject the hypothesis of a zero effect of corporate taxes on growth.

Corporate taxes are not important only for companies. They are at least equally important for governments, as they constitute a major part of total public revenues. The decline in CIT rates in recent decades has reduced public revenues, which has left governments without sufficient resources for providing public goods (see, for instance, Stiglitz et al., 2021).

In parallel with this, recent decades have also seen a surge in profit-shifting activities by multinational companies. Having offices in many countries, these companies often try to move their profits from high-tax jurisdictions to low-tax territories, thereby reducing the amount of taxes they pay. Tørsløv et al. (2018) have estimated that each year around USD 200bn of public money are lost globally as a result of profit shifting by multinational companies.

These developments have concerned policy makers, and several global initiatives have emerged. The Base Erosion and Proft Shifting (BEPS) initiative of the OECD has tried to address these issues, by closing loopholes for profit shifting and by ensuring that as many jurisdictions as possible follow the same standards on profit taxation. But as Oxfam (2016) has argued, the BEPS package has been unable to prevent the race to the bottom, and may even have accelerated it, because many governments have lowered their CIT rates in order to offset the higher costs for companies caused by the BEPS measures.

Most recently, in October 2021, 136 jurisdictions signed the global minimum tax initiative, which aims to introduce a global minimum CIT of 15%, in an effort to halt the trend of lowering CIT rates globally and limit the tendency to shift profits to off-shore destinations. It is yet to be seen what the effects of the initiative will be, but the OECD estimates that it will generate USD 150bn in additional global tax revenues annually.

This paper contributes to the debates on these topics, by investigating how CIT affects exports and imports. The literature has identified several main channels through which CIT may affect international trade. The first is through aggregate demand – CIT affects companies' profits, and through this, their investment, production and employment, which in turn affect aggregate demand. As aggregate demand is a standard determinant of country's imports, higher CIT may lead to lower imports. The demand-driven impact on exports is less clear ex ante, and possibly depends also on the time horizon. Although the immediate impact is likely to be insignificant, some firms may turn more to external markets as

domestic demand declines, resulting in higher exports. However, in the longer term, lower investment amid higher CIT may lead to reduced production capacities, resulting in lower exports.

CIT can affect international trade also through the activities of cross-border investors, i.e. multinational enterprises (MNE). If a country raises its CIT, an MNE might try to reduce its tax base in that country, in order to prevent paying higher taxes. One way to do this is by shifting profits to a lower-tax jurisdiction, by using transfer pricing, i.e. by manipulating the prices of a company's intra-firm exports and imports (see Heckemeyer and Overesch, 2017, for a recent overview of the related literature, which suggests, inter alia, that transfer pricing and licensing, and not intercompany debt, are dominant profit-shifting channels). If a country increases its CIT rate, an MNE's affiliate in that country can increase the prices of its imports, or reduce the prices of its exports with a related entity from another country, thereby lowering its tax base in the country that has raised the tax (see Huizinga and Laeven, 2008). This would result in higher imports and lower exports, owing to a rise in the CIT.

MNEs can avoid paying higher taxes also in a more direct way, by shifting activity from a country with higher corporate taxes to another country with lower rates. As MNE presence is associated with higher exports and imports, higher CIT would then be associated with lower imports and exports in the country where the tax has been raised. Although this mechanism is similar to the profit-shifting mechanism that operates through transfer prices, it does not entail 'cooking the books', i.e. artificial representation of import and export prices. Furthermore, an important difference is that this mechanism leads to a decline in imports as a result of higher CIT, whereas the profit-shifting channel leads to an increase in imports because of higher CIT.

This paper aims to investigate how CIT affects international trade, and which of the three channels is likely to explain the relationship. To that end, we employ sectoral data from 34 EU and OECD economies, over the period 2005-2014. We first assess whether CIT affects imports and exports of these industries and countries, and then, whether this relationship depends on the presence of MNEs in the industry and country, i.e. the stock of foreign direct investment (FDI). If CIT is found to reduce exports and imports in general, we interpret this as an indication that the aggregate-demand channel is at play. If CIT is found to affect international trade only when FDI stocks are high, our interpretation is that the effect is due to MNEs. We then distinguish between the two MNE channels (the profit-shifting through transfer prices, and the activity-shifting), by observing the effect of CIT on imports when FDI stocks are high – if CIT is found to increase imports, we interpret this as evidence that the profit-shifting mechanism is at play; if CIT is found to lower imports, we read this as a consequence of the activity-shifting mechanism.

The rest of the paper is organised as follows. The next section gives an overview of the related literature and elaborates our contributions to it. Section 3 presents the methodology we apply, while Section 4 shows our results. Section 5 discusses the implications of our findings, and Section 6 presents our conclusions.

2. Related literature

There are numerous academic studies examining the relationship between corporate taxation and investment. As the (effective) CIT affects companies' after-tax profits, it is not surprising that CIT is largely found to be a significant investment determinant. A meta-analysis of the early empirical literature is provided by de Mooij and Ederveen (2003). Some of the other important contributions include Devereux and Griffith (1998), Buettner and Ruf (2007), and a more recent study by Herger et al. (2016). The majority of related studies are focused on the cross-border investment decisions of MNEs (see Devereux, 2007): whether to invest abroad, and if so, where to invest, and how much. The last decision in this context is where the MNE should declare the generated taxable corporate income. An important study by Bond and Xing (2015) finds that corporate taxation significantly affects overall domestic capital accumulation, most strongly for equipment investment, but also for total capital and investment in structures. As corporate taxation affects (domestic) investment and consequently aggregate demand, its changes are likely to have an impact on trade flows. This is a demand-driven CIT effect on trade, which has been previously analysed by Keen and Syed (2006) – a study presented in more detail below.

Apart from being an important investment-location determinant, CIT affects the behaviour of MNEs, which try to minimise their corporate tax bill by shifting profits to their affiliates in low-tax countries. A very popular profit-shifting method is transfer pricing, i.e. manipulation of prices in their intra-firm international trade transactions (see Heckemeyer and Overesch, 2017). If a country increases its CIT rate, an MNE's affiliate in that country can increase its import prices (i.e. reduce export prices) in international trade transactions with another affiliate of the same MNE located in the lower-CIT rate country. Using US international trade price data, Clausing (2003) estimated that intra-firm trade with a country with a 1% lower statutory CIT rate was associated with export (import) prices 1.8% lower (2% higher) than non-intra firm prices in trade with the same country. More recent evidence on lower intra-firm export prices in trade with affiliates located in low-tax jurisdictions is available from Davies et al. (2018) for French companies. Such profit-shifting practices have a direct effect on gross trade flows, and consequently on the value added that is embedded in these flows. The impact can be sizeable. A study by Bruner et al. (2018) shows that 'correcting' for the profit shifting of MNEs through trade for the US in 2014 increases the trade balance from -2.8% to -1.3% of GDP, with considerable effects on some other macroeconomic indicators. We label this a profit-shifting driven CIT effect on trade, and note that the existing macroeconomic empirical studies on CIT and trade do not differentiate between this partial effect and the demand-driven effect.

Possibly the first relevant macroeconomic empirical study of CIT and trade is the aforementioned contribution by Keen and Syed (2006), who analysed the consequences of a tax shift from CIT to a value-added tax (VAT) for the trade balance in a panel of OECD countries. The authors first present a simple two-period theoretical model, which predicts that an increase in the (de facto widely used) source-based CIT reduces domestic consumption and investment on impact – i.e. induces capital outflows – which initially increases the trade balance. In the second period, following the initial capital outflows, there is an increase in net income from abroad, which is related to a decline in the trade balance. Under the residence-based corporate tax, on the other hand, a CIT rate hike does not affect the

return on investment of non-resident investors. It does, however, reduce returns on residents' savings so that they initially increase their consumption, leading to a decline in the trade balance. In the second period this is reversed, as lower resident savings in the initial period result in lower income from abroad. Their empirical results – a positive and significant initial effect of corporate taxes on net exports, which converges to zero in the longer term – are consistent with the expected effects under source-based corporate taxation.

In another related study, Ivanova (2012) econometrically tested the impact of CIT on the (medium-term) current-account balance, and found that higher CIT rates are related to higher current-account balances, with a negative impact on investments being the primary channel of influence. More recently, Tkalec and Vukšić (2019) analysed the impact of CIT rates (statutory, average effective, and marginal effective rates) on balances of trade in goods and services and on current-account balances for 28 EU countries. By observing the systematic differences in the results for the two measures of external balances, they conclude that the differences may be explained by the partial profit-shifting effect of CIT on trade: a higher CIT rate increases both trade and current-account balances, but the impact on the current-account balance is of greater magnitude. As the profit-shifting partial effect of CIT on trade should have an opposite sign to that of the demand-driven effect (i.e. it should lead to a decline in the trade balance following a CIT hike), this partial effect reduces the overall impact on the trade balance. However, the current account contains other, non-trade-related items in addition to net exports, including the primary income account where the MNEs' earnings are recorded. Thus, if a portion of the earnings is shifted abroad, the primary income balance is affected positively. This should immediately offset the corresponding partial negative effect on net exports, resulting in a zero partial impact on the current-account balance through transfer pricing. The profits shifted abroad following a tax increase therefore reduce the magnitude of the CIT impact on the trade balance, but not the impact on the current-account balance, as they appear (with the opposite sign) in another current-account item. The authors emphasise that this result is in line with the findings of Bruner et al. (2018), who show that accounting for profit-shifting effects on trade for the US improves the country's trade balance (strongly), but leaves the current-account balance largely unchanged.

The main contribution of our paper is that we explicitly try to distinguish between the demand-driven effect of CIT on international trade, and the effect arising from MNEs shifting their profits or activity. Unlike some related contributions, which focus on external balances, we analyse exports and imports separately. This means that the demand effect potentially induced by less investment amid higher CIT is likely also to be associated with potentially lower production capacities, weighing on countries' exports. An additional contribution is that we do not use country-level data, but sectoral data, which yield more observations, provide greater variability, alleviate possible aggregation bias and thus result in more robust estimates. Finally, we try to account for the likely endogeneity in the relationship between international trade and corporate taxation, as exports and imports may also affect corporate taxes, by applying a two-stage least squares (2SLS) estimator, using past values of public debt as instruments for CIT.

3. Methodology

3.1. MODEL AND ECONOMETRIC TECHNIQUE

The model from which we start expresses exports and imports as a function of the corporate income tax, plus a set of controls:

$$exports_{s,c,t} = \alpha_1 + \alpha_2 * CIT_{s,c,t} + \alpha_3 * controls_{s,c,t} + x_s + y_c + z_t + \varepsilon_{s,c,t} \quad (1)$$

$$imports_{s,c,t} = \beta_1 + \beta_2 * CIT_{s,c,t} + \beta_3 * controls_{s,c,t} + x_s + y_c + z_t + \eta_{s,c,t} \quad (2)$$

where *s* is an index that denotes the sectors, *c* is an index for the countries, *t* is an index for the years, x_s indicates the sector fixed effects, y_c the country fixed effects, z_t the time fixed effects, ε and η are error terms, and *α's* and *β's* are coefficients to be estimated.

This model is then augmented, in order to see which of the possible mechanisms for CIT affecting imports and exports is at play. Specifically, we assess the following three channels:

- *Demand channel* – arising from the possibly negative effect of CIT on aggregate demand, which may in turn lead to lower imports and, eventually, also exports. If it is present, it would be seen by a general negative effect of CIT on imports and exports.
- *Profit-shifting of MNEs channel* – arising from MNEs shifting their profits to lower-tax jurisdictions owing to higher CIT, through transfer pricing. It would be seen by CIT reducing exports and increasing imports when the presence of MNEs is bigger.
- *Activity-shifting of MNEs channel* – arising from MNEs shifting their activity (not just profits) to lower-tax jurisdictions, by reducing activity in the higher-tax jurisdiction and increasing activity in lower-tax locations. It would be seen by CIT reducing both exports and imports when the MNE presence is bigger.

To assess which of these is likely to be present, we amend the above model by including a variable measuring the presence of MNEs. Specifically, we measure the presence of MNEs through the stocks of FDI in the respective industries and countries – if the FDI stocks are higher, this means that there are more MNEs operating in that industry and country. We thus add an interaction term of the CIT and the FDI stocks to equations (1) and (2):

$$exports_{s,c,t} = \alpha_1 + \alpha_2 * CIT_{s,c,t} + \alpha_3 * CIT_{s,c,t} * FDI\_stock_{s,c,t} + \alpha_4 * controls_{s,c,t} + x_s + y_c + z_t + \varepsilon_{s,c,t} \quad (3)$$

$$imports_{s,c,t} = \beta_1 + \beta_2 * CIT_{s,c,t} + \beta_3 * CIT_{s,c,t} * FDI\_stock_{s,c,t} + \beta_4 * controls_{s,c,t} + x_s + y_c + z_t + \eta_{s,c,t} \quad (4)$$

If the coefficients on CIT (α_2 and β_2) turn out to be significant and negative, this is an indication that the *demand* channel is at force, i.e. that higher CIT is reducing exports and imports in general, owing to the

reduced aggregate demand. Even if only β_2 is found to be significantly negative, we could consider this as evidence for the demand channel, as the CIT effect on exports is less clear.

If α_2 and β_2 are insignificant, but the coefficients on the cross-product between CIT and FDI stocks (α_3 and β_3) are significant, this is an indication that the underlying channel for CIT affecting international trade is through the multinational enterprises shifting their profits or activity. If the coefficient on the cross-product in the exports regression (α_3) turns out to be significant and negative, and the coefficient on the cross-product in the imports regression (β_3) appears significant and positive, this is an indication that the *profit-shifting* channel is at force, i.e. that MNEs are reporting lower exports and higher imports as a consequence of higher CIT, in an effort to shift profits to other territories. If, on the other hand, both α_3 and β_3 turn out to be significant and negative, this implies that the *activity-shifting* mechanism is at play, i.e. that MNEs move activity from the country with higher CIT to lower-tax countries, in order to minimise the taxes they pay.

The above models might be plagued by endogeneity issues, arising both from reverse causality and omitted variables. As an example of the former, low exports may induce countries to lower their taxes, in an attempt to attract export-oriented investment and boost their exports. As for the latter, there are many factors that may affect both trade and taxes, not all of which can be taken into account (many of them are also unobservable). To address this issue, we apply a 2SLS estimator, using the second lag of taxes and the second lag of public debt as instruments for the current values of taxes. These are not directly affected by current trade developments because they predate them. They may be still correlated with them if there are omitted variables that are correlated with both taxes and trade. To address this, we include as control variables standard variables from the literature, and also fixed effects for countries, years and industries. In this way, arguably, the omitted variable bias is reduced significantly and should not affect our results.

We assess the appropriateness of our instruments on the grounds of the Kleibergen-Paap underidentification test (the null hypothesis is that the model is underidentified, so a p-value below 0.05 indicates that the model is identified), and on the grounds of the Hansen J test (the null hypothesis is that the instruments are uncorrelated with the error term, so a p-value above 0.05 indicates that the instruments are valid). Standard errors robust to both arbitrary heteroskedasticity and arbitrary autocorrelation are reported.

3.2. DATA AND VARIABLES

We use three definitions for the corporate income taxes – the statutory corporate income tax rate, the effective average corporate income tax rate, and the effective marginal corporate income tax rate. The *statutory* corporate income tax rate is the standard top statutory corporate income tax rate levied on domestic businesses, from the Tax Foundation. The *effective average* CIT rate is the effective average tax rate (EATR) of the OECD, and it is calculated as the average tax contribution a firm makes on an investment project earning above-zero economic profits. The *effective marginal* CIT rate is the effective marginal tax rate (EMTR) of the OECD, which measures the extent to which taxation increases the pre-tax rate of return required by investors to break even. All CIT variables are on a country level. Table 1 presents the correlation coefficients between the three CIT variables. The effective average rate and the effective marginal rate are very highly correlated (82%). The effective average rate is also highly

correlated with the statutory CIT rate (69%). The effective marginal rate and the statutory rate are somewhat less correlated (49%).

Table 1 / Correlation between the CIT variables

	CIT statutory	CIT effective average	CIT effective marginal
CIT statutory	1.000		
CIT effective average	0.6895	1.000	
CIT effective marginal	0.4901	0.8198	1.000

For the exports and imports, we use two definitions. The first expresses the nominal exports and imports as a percentage of the nominal GDP, the second is the natural logarithms of the nominal exports and imports in US dollars. Both variables are sectoral, and the underlying data are from the OECD database.

FDI stocks are sectoral, expressed as logarithms of the nominal US dollars, from the UNCTAD database.

The control variables included in the specification are the standard determinants of trade from the literature, as in Adarov et al. (2021): nominal effective exchange rate, foreign and domestic demand, other taxes, net wages, unemployment rate, general government budget balance, and dummies for euro adoption and for EU membership.

All control variables are included with a lag to alleviate potential endogeneity; the exception is foreign demand, which is clearly exogenous. All control variables are on an aggregate national level, as there are no data for them on a sectoral level. The exceptions are the FDI stocks and nominal net wages, which are available on a sectoral level. Table 2 presents the variable names, variable definitions and data sources for all the variables.

The analysis includes 34 countries that are members of the OECD and the EU and covers 33 NACE sectors over a 10-year period (2005-2014). The time period is determined by the availability of consistent sectoral data on exports, imports and FDI. The countries that are included are: Australia, Austria, Belgium, Bulgaria, Canada, Switzerland, Cyprus, Czechia, Germany, Denmark, Spain, Estonia, Finland, France, the UK, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Sweden, Turkey, and the US. The sectors that are included are shown in Table A1 in the Appendix.

The descriptive statistics for the variables – the number of observations, the mean, the standard deviation, the minimum value, the 25th percentile, the median, the 75th percentile and the maximum value – are presented in Table A2 in the Appendix.

The average for the statutory CIT rate is 23%, ranging between 10% and 39%. The effective average tax rate is notably lower than the statutory one – its average is 18%, its minimum is 0%, while its maximum is 35%. The effective marginal tax rate is lower still – its average is 11%, its minimum is negative (-10%), while its maximum is 34%.

Significant variation is present in the exports and imports data. Some industries have exports and imports of 0% of the GDP of the respective country, while some have exports and imports that exceed the GDP of their country. Notable examples, in countries such as Ireland, Luxembourg and Malta, are IT and other information services; chemical and pharmaceutical products; financial and insurance activities; and professional, scientific and technical activities/administrative and support service activities.

The majority of the observations are from the EU (93%), while around one half (48%) are in countries that have adopted the euro as their currency.

Table 2 / Variables and data sources

Variable name	Variable definition	Level of aggregation	Source
X_GDP	Nominal exports as a share of nominal GDP	Sectoral	OECD and authors' calculations
M_GDP	Nominal imports as a share of nominal GDP	Sectoral	OECD and authors' calculations
lx	Log of nominal exports (in USD)	Sectoral	OECD
lm	Log of nominal imports (in USD)	Sectoral	OECD
CIT_stat	Top statutory corporate income tax rate	National	Tax Foundation
CIT_EATR	Effective average corporate income tax rate	National	OECD
CIT_EMTR	Effective marginal corporate income tax rate	National	OECD
lfdi_stock	Log of foreign direct investment inward stock, USD	Sectoral	UNCTAD
lneer	Log of the nominal effective exchange rate index, calculated on 171 trading partners (increase=appreciation)	National	Bruegel
lfor_dem	Log of foreign effective demand. Constructed as weighted average of GDP of 10 biggest export partners	National	Comtrade and World Bank
ldom_gdp	Log of nominal GDP in the country, current USD	National	World Bank WDI
Lwage	Log of net annual income after taxes in USD	Sectoral	WIOD
other_taxes	All other taxes except CIT (% of GDP)	National	UNU-Wider
Euro	Euro area membership dummy	National	Constructed by authors
EU	EU membership dummy	National	Constructed by authors
GG_bal	General government budget balance, % of GDP	National	IMF WEO
Unem	Unemployment, total (% of total labour force) (national estimate)	National	ILO

4. Results

4.1. MAIN RESULTS

We start with a specification that includes the CIT only (equations 1 and 2 from Section 3.1), in order to see whether exports and imports are affected by the corporate income taxes. Table 3 presents the results for the exports, Table 4 the results for the imports. Three different specifications are shown for each of them, based on different definitions of the CIT rate (effective average, effective marginal and statutory). It can be seen that the CIT variables are always statistically insignificant, implying no relationship between the CIT and exports and imports.

We then proceed with the specifications that include the interactions between the CIT and the shifting potential (i.e. the FDI stocks). Table 5 presents the results for the exports (equation 3 from Section 3.1), Table 6 the results for the imports (equation 4 from Section 3.1). In each of them, CIT alone is always insignificant, just as previously. Moreover, the coefficients on the cross-product of the CIT with the FDI stocks are statistically significant at 1% in the specifications for the average and marginal CIT rates, both for exports and imports. This implies that the effect of CIT on exports and imports depends on the stock of FDI. The coefficients are negative, implying that as the FDI stock grows, increases in CIT will cause a greater decline in exports and imports (or vice versa).

It is also worth noting that the cross-product of the statutory CIT rate and the FDI stock is insignificant, both for exports and imports, differently from the other two CIT variables. This is not surprising, as the statutory rates are of lesser importance than the effective rates, owing to tax exemptions and deductions that reduce the tax base.

The statistics for the instruments' tests suggest that the instruments are fine. The p-value in the underidentification test is below 0.05, suggesting that the models are identified, and the p-value of the Hansen test is above 0.05, indicating that the instruments are valid.

The control variables are mostly insignificant, except for the stock of FDI, which is significant and positive, meaning that exports and imports are higher in industries and countries that have higher FDI stocks. The insignificance of the control variables can be explained by the numerous time, country and industry fixed effects.

The effect of the CIT on the exports is such that, in an industry that has an average stock of FDI (6.85 in log terms), an increase in the effective average CIT rate by 10 pp (from 20% to 30%, for instance) is associated with a decline in exports of 3.6 pp of GDP (0.0523*6.85*0.1=0.036). This is close to the average value of the sectoral exports (see Table A2 in the Appendix), meaning that the magnitude of the effect is moderate. When the stock of FDI is towards the highest values in the sample (12 in log terms), the same increase in CIT reduces the exports by 6.3 pp of GDP. When the stock of FDI is towards the lowest values in the sample (1 in log terms), the effect on exports declines to just 0.5 pp. The effects on imports are similar, as the coefficient on the cross-product of CIT and FDI is similar in those regressions. The same is true for the effect of the effective marginal CIT rate.

Table 3 / Results for exports and CIT, without the shifting potential

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**0.709**		
	(2.146)		
CIT_EMTR		**0.0187**	
		(1.274)	
CIT_stat			**0.706**
			(1.818)
L.lneer171	0.108	0.0996	0.133
	(0.0775)	(0.0754)	(0.110)
lfor_dem	0.00889	0.00524	0.00699
	(0.0230)	(0.0645)	(0.0209)
EU	-0.00615	-0.00777	-0.00587
	(0.00963)	(0.00945)	(0.00956)
Euro	0.000375	0.00568	-0.00252
	(0.0213)	(0.0240)	(0.0254)
L.GG_bal	-0.00427	-0.00384	-0.00355
	(0.00625)	(0.00597)	(0.00572)
L.unem	-0.276	-0.227	-0.313
	(0.187)	(0.166)	(0.241)
L.lwage2	0.00883	0.00863	0.00838
	(0.00568)	(0.00560)	(0.00598)
L.lfdi_stock_sec	0.00887***	0.00885***	0.00880***
	(0.00164)	(0.00168)	(0.00163)
L.lgdp_nom	-0.201*	-0.195*	-0.234
	(0.111)	(0.108)	(0.158)
L.oth_taxes	-0.288	-0.355	-0.406
	(0.529)	(0.624)	(0.541)
Constant	5.051*	5.263	6.017
	(2.739)	(3.643)	(3.688)
Observations	4,149	4,149	4,149
R-squared	0.566	0.567	0.566
Underidentification test p-value	0	0	0
Hansen J test	0.728	0.689	0.815

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 4 / Results for imports and CIT, without the shifting potential

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**0.982**		
	(1.710)		
CIT_EMTR		**0.437**	
		(1.019)	
CIT_stat			**0.894**
			(1.453)
L.lneer171	0.0644	0.0561	0.0945
	(0.0594)	(0.0560)	(0.0897)
lfor_dem	0.00615	0.0221	0.00320
	(0.0209)	(0.0538)	(0.0190)
EU	-0.00517	-0.00561	-0.00502
	(0.00790)	(0.00775)	(0.00786)
euro	-0.00762	-0.00629	-0.0106
	(0.0173)	(0.0194)	(0.0207)
L.GG_bal	-0.00119	-0.000907	-0.000217
	(0.00442)	(0.00422)	(0.00412)
L.unem	-0.139	-0.122	-0.179
	(0.144)	(0.131)	(0.189)
L.lwage2	0.000298	0.000340	-0.000296
	(0.00326)	(0.00332)	(0.00329)
L.lfdi_stock_sec	0.00349***	0.00355***	0.00341***
	(0.00113)	(0.00114)	(0.00114)
L.lgdp_nom	-0.101	-0.0881	-0.142
	(0.0856)	(0.0796)	(0.130)
L.oth_taxes	-0.150	-0.0920	-0.308
	(0.371)	(0.432)	(0.422)
Constant	2.274	1.704	3.527
	(2.063)	(2.639)	(3.041)
Observations	4,149	4,149	4,149
R-squared	0.435	0.431	0.434
Underidentification test p-value	0	0	0
Hansen J test	0.796	0.729	0.760

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 5 / Results for exports and CIT, with the shifting potential

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**1.234**		
	(1.125)		
CIT_EATR_FDI	**-0.0523*** **		
	(0.0141)		
CIT_EMTR		**1.422**	
		(2.544)	
CIT_EMTR_FDI		**-0.0458*** **	
		(0.0166)	
CIT_stat			**0.614**
			(0.768)
CIT_stat_FDI			**0.00445**
			(0.0254)
L.lneer171	0.131	0.112	0.159
	(0.105)	(0.110)	(0.105)
lfor_dem	0.00724	0.0405	0.00534
	(0.0274)	(0.0755)	(0.0285)
euro	-0.00276	-0.0116	-0.00269
	(0.0133)	(0.0449)	(0.0126)
L.GG_bal	-0.00469	-0.00464	-0.00412
	(0.00803)	(0.00813)	(0.00751)
L.unem	-0.196	-0.147	-0.265
	(0.204)	(0.300)	(0.269)
L.lwage2	0.00477	0.00624	0.00655
	(0.00689)	(0.00688)	(0.00682)
L.lfdi_stock_sec	0.0163***	0.0130***	0.00789
	(0.00393)	(0.00341)	(0.00685)
L.lgdp_nom	-0.232	-0.201	-0.272*
	(0.153)	(0.159)	(0.160)
L.oth_taxes	-0.304	-0.101	-0.469
	(0.897)	(1.049)	(0.810)
Constant	5.937	4.142	7.201*
	(4.012)	(5.577)	(4.119)
Observations	2,823	2,823	2,823
R-squared	0.601	0.583	0.601
Underidentification test p-value	0	0	0
Hansen J test	0.714	0.926	0.728

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 6 / Results for imports and CIT, with the shifting potential

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**0.545**		
	(0.804)		
CIT_EATR_FDI	**-0.0600*** **		
	(0.0141)		
CIT_EMTR		**-0.195**	
		(1.728)	
CIT_EMTR_FDI		**-0.0469*** **	
		(0.0134)	
CIT_stat			**0.279**
			(0.585)
CIT_stat_FDI			**-0.0258**
			(0.585)
L.lneer171	0.0371	0.0344	0.0435
	(0.0806)	(0.0828)	(0.0837)
lfor_dem	0.00435	-0.0135	-0.000960
	(0.0239)	(0.0546)	(0.0259)
euro	0.000159	0.0109	0.000631
	(0.00968)	(0.0286)	(0.00933)
L.GG_bal	-0.000900	-0.000938	-0.000729
	(0.00571)	(0.00577)	(0.00534)
L.unem	-0.0639	-0.0988	-0.0760
	(0.160)	(0.206)	(0.205)
L.lwage2	-0.00556	-0.00428	-0.00359
	(0.00388)	(0.00377)	(0.00372)
L.lfdi_stock_sec	0.0133***	0.00872***	0.0101**
	(0.00312)	(0.00240)	(0.00496)
L.lgdp_nom	-0.0598	-0.0732	-0.0690
	(0.120)	(0.122)	(0.128)
L.oth_taxes	-0.00886	-0.225	-0.0786
	(0.613)	(0.751)	(0.554)
Constant	1.499	2.645	1.905
	(3.208)	(4.121)	(3.417)
Observations	2,823	2,823	2,823
R-squared	0.475	0.461	0.469
Underidentification test p-value	0	0	0
Hansen J test	0.727	0.711	0.705

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

To get a better understanding of the magnitude of the effect and the importance of the stock of FDI, we next illustrate the effect of the average effective CIT rate on exports and imports, throughout the whole range of values for the FDI stocks in our sample. Figure 1 presents this for the exports, Figure 2 for the imports. The effects range from 0, in the industries in which there are no FDI, to 0.7-0.8, in the industries which are dominated by FDI. The exports and imports effects are very similar, though the import effect is slightly stronger.

Figure 1 / Partial effect of the average effective CIT rate on exports

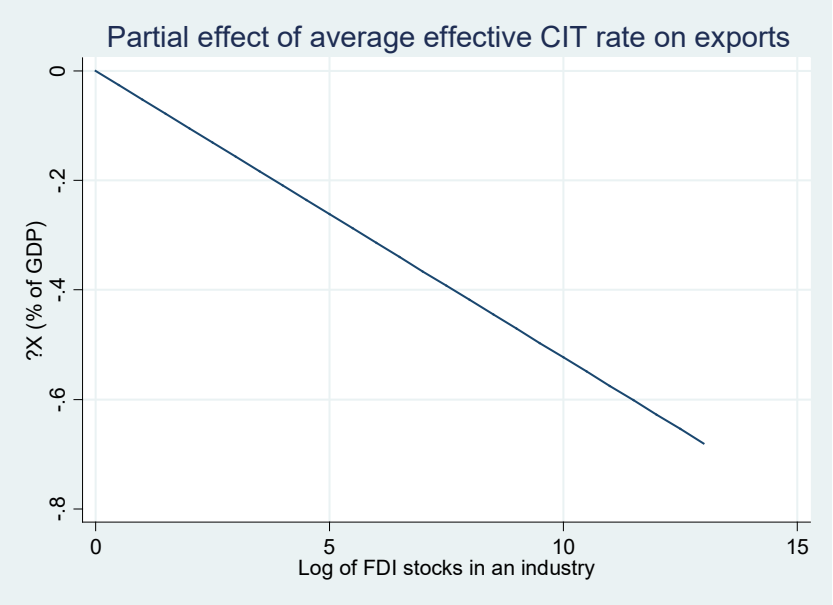
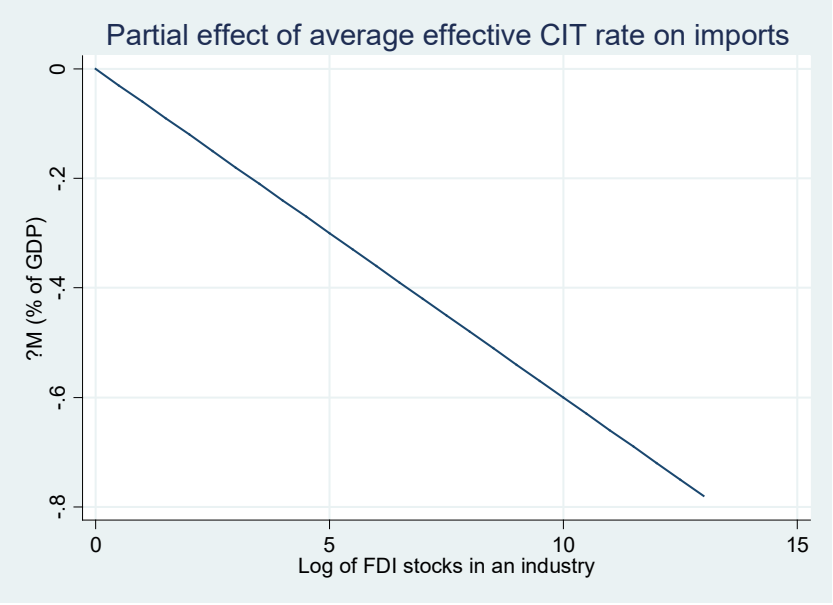


Figure 2 / Partial effect of the average effective CIT rate on imports



4.2. ROBUSTNESS

We next carry out several robustness checks. We check whether the results remain stable when the time period is shortened, when the control variables are excluded and when the variables are defined in another way,

First, we investigate the stability of the results when the sample is reduced to shorter time periods. Tables 7 and 8 show the results for the exports, the former for the period before 2011, the latter for the period after 2010. One can see that the previous results hold for the two sub-periods, the only difference is that in the second sub-period, the effects seem to be slightly stronger. Tables 9 and 10 show the same for the imports, and the same pattern can be observed here – the coefficient on the cross-product is negative and significant in both the sub-periods, being slightly stronger in the second half of the sample. Thus, the results are not driven by a particular time period, but one could say that they have become stronger in more recent years.

Then, we check whether the results remain the same when the control variables are excluded. Table 11 shows these results for the exports, Table 12 for the imports. Evidently, there are no changes when the control variables are excluded, both for the exports and the imports, implying that the results are not affected in any way by the control variables that are included in the regressions. As mentioned previously, this is not unexpected, given the time, country and industry fixed effects.

Finally, we explore what happens when exports and imports are defined as logarithms, instead of as percentages of GDP. These results are shown in Tables 13 and 14. For the exports, one can see that the results are qualitatively the same as before – the sole CIT variable is always insignificant, while its cross-product with the FDI is negative. The only difference with respect to the previous results is that the cross-product is statistically insignificant when the CIT is defined as the effective marginal rate. For the imports, the results are even more in line with the previous results – the cross product is negative and significant both when CIT is defined as an average and as a marginal rate.

Table 7 / Exports results for the period before 2011

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**2.017**		
	(3.349)		
CIT_EATR_FDI	**-0.0419****		
	(0.0181)		
CIT_EMTR		**3.786**	
		(3.827)	
CIT_EMTR_FDI		**-0.0402****	
		(0.0161)	
CIT_stat			**1.798**
			(1.285)
CIT_stat_FDI			**0.0162**
			(0.0389)
L.lneer171	0.182	0.102	0.320
	(0.152)	(0.0827)	(0.253)
lfor_dem	0.109*	0.231	0.103
	(0.0576)	(0.223)	(0.0831)
euro	-0.0129	-0.0388	-0.0307
	(0.0335)	(0.0462)	(0.0271)
L.GG_bal	-0.00500	-0.00376*	-0.00244
	(0.00392)	(0.00194)	(0.00163)
L.unem	-0.288*	-0.0463	-0.527
	(0.160)	(0.128)	(0.373)
L.lwage2	0.0136	0.0155	0.0160
	(0.0132)	(0.0125)	(0.0122)
L.lfdi_stock_sec	0.0142***	0.0118***	0.00486
	(0.00484)	(0.00375)	(0.0101)
L.lgdp_nom	-0.273	-0.125*	-0.415
	(0.190)	(0.0740)	(0.311)
L.oth_taxes	-0.462	-0.0449	-0.773
	(0.535)	(0.201)	(0.738)
Constant	3.701	-4.159	7.534
	(4.874)	(6.401)	(5.830)
Observations	1,686	1,686	1,686
R-squared	0.618	0.592	0.612
Underidentification test p-value	0.000627	3.18e-09	0
Hansen J test	0.367	0.516	0.492

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 8 / Exports results for the period after 2010

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**1.045**		
	(0.920)		
CIT_EATR_FDI	**-0.0643****		
	(0.0316)		
CIT_EMTR		**0.345**	
		(0.777)	
CIT_EMTR_FDI		**-0.0513***	
		(0.0291)	
CIT_stat			**-3.758**
			(39.42)
CIT_stat_FDI			**0.0156**
			(0.0472)
L.lneer171	0.168	0.0581	0.229
	(0.374)	(0.591)	(2.050)
lfor_dem	-0.0384	-0.0406	-0.0363
	(0.0798)	(0.0903)	(0.156)
L.GG_bal	0.00172	0.00198	0.00338
	(0.0199)	(0.0198)	(0.0347)
L.unem	-0.0774	-0.00168	-0.216
	(0.431)	(0.523)	(1.469)
L.lwage2	-0.00633	-0.00566	-0.00410
	(0.00753)	(0.00747)	(0.00701)
L.lfdi_stock_sec	0.0202**	0.0152**	0.00721
	(0.00879)	(0.00714)	(0.0130)
L.lgdp_nom	-0.140	-0.0127	-0.125
	(0.280)	(0.619)	(1.105)
L.oth_taxes	-0.224	-0.183	-0.416
	(2.659)	(2.862)	(4.586)
Constant	4.085	1.243	4.299
	(8.627)	(14.14)	(34.75)
Observations	1,137	1,137	1,137
R-squared	0.596	0.595	0.593
Underidentification test p-value	0	0.00346	0.0720
Hansen J test	0.933	0.729	0.991

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 9 / Imports results for the period before 2011

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**2.252**		
	(4.243)		
CIT_EATR_FDI	**-0.0498*** **		
	(0.0185)		
CIT_EMTR		**1.158**	
		(2.798)	
CIT_EMTR_FDI		**-0.0426** **	
		(0.0171)	
CIT_stat			**0.770**
			(1.054)
CIT_stat_FDI			**-0.0157**
			(0.0321)
L.lneer171	0.0574	0.0356	0.106
	(0.128)	(0.0807)	(0.201)
lfor_dem	0.0503	0.0627	0.0303
	(0.0619)	(0.162)	(0.0632)
euro	-0.0148	-0.00711	-0.00857
	(0.0421)	(0.0347)	(0.0227)
L.GG_bal	-0.00183	-0.00211	-0.00141
	(0.00300)	(0.00240)	(0.00199)
L.unem	-0.150	-0.0601	-0.207
	(0.210)	(0.144)	(0.319)
L.lwage2	-0.00603	-0.00341	-0.00335
	(0.00733)	(0.00651)	(0.00635)
L.lfdi_stock_sec	0.0116***	0.00832***	0.00783
	(0.00391)	(0.00284)	(0.00689)
L.lgdp_nom	-0.0961	-0.0554	-0.141
	(0.161)	(0.0834)	(0.242)
L.oth_taxes	-0.0325	0.0481	-0.164
	(0.426)	(0.187)	(0.561)
Constant	0.621	-0.459	2.717
	(4.209)	(4.691)	(4.876)
Observations	1,686	1,686	1,686
R-squared	0.483	0.483	0.482
Underidentification test p-value	0.000627	3.18e-09	0
Hansen J test	0.783	0.951	0.936

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 10 / Imports results for the period after 2010

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**1.089**		
	(0.918)		
CIT_EATR_FDI	**-0.0802****		
	(0.0348)		
CIT_EMTR		**0.722**	
		(0.684)	
CIT_EMTR_FDI		**-0.0658****	
		(0.0320)	
CIT_stat			**7.239**
			(26.54)
CIT_stat_FDI			**-0.0372**
			(0.0540)
L.lneer171	0.0561	0.0769	-0.321
	(0.258)	(0.444)	(1.384)
lfor_dem	-0.0118	0.0210	0.0136
	(0.0610)	(0.0776)	(0.109)
L.GG_bal	-0.00348	-0.00337	-0.00591
	(0.0134)	(0.0134)	(0.0233)
L.unem	-0.0344	-0.154	0.285
	(0.310)	(0.463)	(1.009)
L.lwage2	-0.00675	-0.00607	-0.00453
	(0.00555)	(0.00555)	(0.00540)
L.lfdi_stock_sec	0.0176**	0.0117**	0.0136
	(0.00799)	(0.00589)	(0.0119)
L.lgdp_nom	-0.0205	-0.0709	0.202
	(0.206)	(0.481)	(0.751)
L.oth_taxes	0.506	0.410	0.815
	(1.798)	(1.946)	(3.092)
Constant	0.379	0.899	-6.174
	(6.283)	(10.61)	(23.57)
Observations	1,137	1,137	1,137
R-squared	0.464	0.459	0.429
Underidentification test p-value	0	0.00346	0.0720
Hansen J test	0.806	0.574	0.708

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 11 / Exports results without control variables

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	-0.218		
	(1.006)		
CIT_EATR_FDI	-0.0442***		
	(0.0159)		
CIT_EMTR		5.523	
		(5.911)	
CIT_EMTR_FDI		-0.0486**	
		(0.0238)	
CIT_stat			-0.417
			(0.776)
CIT_stat_FDI			0.00799
			(0.0317)
Constant	0.0947	-1.255	0.0781
	(0.348)	(1.317)	(0.294)
Observations	2,931	2,931	2,931
R-squared	0.594	0.163	0.593
Underidentification test p-value	0	1.29e-06	0
Hansen J test	0.299	0.342	0.307

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 12 / Imports results without control variables

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	0.403		
	(0.802)		
CIT_EATR_FDI	-0.0502***		
	(0.0166)		
CIT_EMTR		0.407	
		(4.268)	
CIT_EMTR_FDI		-0.0429**	
		(0.0168)	
CIT_stat			0.237
			(0.595)
CIT_stat_FDI			-0.0228
			(0.0298)
Constant	-0.0751	-0.0674	-0.0872
	(0.267)	(0.959)	(0.217)
Observations	2,931	2,931	2,931
R-squared	0.473	0.471	0.468
Underidentification test p-value	0	1.29e-06	0
Hansen J test	0.921	0.925	0.944

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 13 / Exports results for exports defined as logarithms

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**-2.971**		
	(8.495)		
CIT_EATR_FDI	**-0.379*** **		
	(0.144)		
CIT_EMTR		**3.460**	
		(6.007)	
CIT_EMTR_FDI		**-0.226**	
		(0.143)	
CIT_stat_FDI			**0.362***
			(0.219)
CIT_stat			-3.433
			(5.051)
L.lneer171	-0.221	-0.192	-0.214
	(0.492)	(0.474)	(0.579)
lfor_dem	0.0553	0.0981	0.0477
	(0.270)	(0.339)	(0.270)
euro	0.120	0.0547	0.0991
	(0.143)	(0.154)	(0.139)
L.GG_bal	0.00634	0.00733	0.00712
	(0.0117)	(0.0117)	(0.0122)
L.unem	0.790	1.010	0.940
	(0.932)	(1.007)	(1.045)
L.lwage2	0.446***	0.457***	0.466***
	(0.123)	(0.123)	(0.124)
L.lfdi_stock_sec	0.456***	0.422***	0.328***
	(0.0285)	(0.0232)	(0.0478)
L.lgdp_nom	-0.406	-0.429	-0.423
	(0.452)	(0.449)	(0.586)
L.oth_taxes	-1.877	-0.970	-1.968
	(2.397)	(2.882)	(2.304)
Constant	14.70	11.52	14.14
	(14.38)	(17.92)	(16.43)
Observations	2,812	2,812	2,812
R-squared	0.855	0.855	0.857
Underidentification test p-value	0	0	0
Hansen J test	0.884	0.104	0.680

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 14 / Imports results for imports defined as logarithms

VARIABLES	(1) CIT average rates	(2) CIT marginal rates	(3) CIT statutory rates
CIT_EATR	**-1.247**		
	(5.408)		
CIT_EATR_FDI	**-0.384*** **		
	(0.0958)		
CIT_EMTR		**0.398**	
		(4.312)	
CIT_EMTR_FDI		**-0.307*** **	
		(0.0935)	
CIT_stat_FDI			**0.000948**
			(0.139)
CIT_stat			-1.232
			(3.295)
L.lneer171	-0.179	-0.157	-0.198
	(0.304)	(0.289)	(0.362)
lfor_dem	0.376**	0.310	0.347*
	(0.173)	(0.225)	(0.182)
euro	0.130	0.136	0.121
	(0.0847)	(0.0982)	(0.0822)
L.GG_bal	0.00853	0.00886	0.00861
	(0.00813)	(0.00825)	(0.00845)
L.unem	-1.300**	-1.329**	-1.145*
	(0.561)	(0.625)	(0.651)
L.lwage2	-0.0835*	-0.0751*	-0.0678
	(0.0451)	(0.0445)	(0.0439)
L.lfdi_stock_sec	0.130***	0.101***	0.0749***
	(0.0190)	(0.0146)	(0.0284)
L.lgdp_nom	0.0530	-0.0375	0.0786
	(0.284)	(0.273)	(0.380)
L.oth_taxes	-0.446	-0.799	-0.476
	(1.584)	(1.895)	(1.508)
Constant	-0.691	3.013	-1.448
	(8.914)	(11.24)	(10.74)
Observations	2,823	2,823	2,823
R-squared	0.937	0.937	0.937
Underidentification test p-value	0	0	0
Hansen J test	0.436	0.107	0.322

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

4.3. RESULTS FOR DIFFERENT INDUSTRIES AND COUNTRIES

We next investigate whether the results differ for different industries and countries. First, we do the estimations for different NACE sectors, then for countries with high and low FDI, then for countries with high and low CIT. To conserve space, we present the results only for the effective average CIT rate.

Table 15 shows the results for exports for the primary, manufacturing and service sectors, while Table 16 shows the same for the imports. Looking at the exports, an interesting observation emerges – the cross-product is significant only for services, with a coefficient that is similar to the previously obtained one. For manufacturing, the coefficient is negative as before, and with a similar magnitude, though insignificant. For the primary sector, the coefficient is insignificant and positive. We read these findings as an indication that the negative effect of CIT on exports is driven by the service sector, which might not come as a surprise, as service activities are easier to move between countries.

Table 15 / Results for exports by different industries

VARIABLES	(1) Primary sector	(2) Manufacturing	(3) Services
CIT_EATR	**0.475**	**2.362**	**0.730**
	(0.598)	**(1.939)**	**(0.910)**
CIT_EATR_FDI	**0.112**	**-0.0399**	**-0.0599*** **
	(0.0723)	**(0.0380)**	**(0.0191)**
L.lneer171	0.00953	0.247	0.101
	(0.0328)	(0.216)	(0.104)
lfor_dem	-0.00814	0.00500	0.00530
	(0.0205)	(0.0438)	(0.0366)
euro	-0.0141	-0.0162	0.00110
	(0.0107)	(0.0216)	(0.0116)
L.GG_bal	0.00134	-0.00467	-0.00481
	(0.00114)	(0.0127)	(0.00573)
L.unem	0.0373	-0.200	-0.243
	(0.0649)	(0.451)	(0.204)
L.lwage2	0.000727	0.0187	-0.00555
	(0.00527)	(0.0170)	(0.00791)
L.lfdi_stock_sec	-0.0134	0.00862	0.0203***
	(0.0135)	(0.00890)	(0.00571)
L.old_age	0.518	-0.00930	-1.372
	(0.651)	(0.857)	(1.524)
L.lgdp_nom	-0.00550	-0.417	-0.117
	(0.0278)	(0.316)	(0.141)
L.oth_taxes	-0.154	-0.914	0.158
	(0.153)	(1.211)	(0.487)
Constant	-0.128	9.973	3.067
	(0.883)	(7.176)	(3.996)
Observations	231	1,136	1,456
R-squared	0.106	0.498	0.762
Underidentification test p-value	0.278	0	0
Hansen J test	0.806	0.460	0.547

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Turning to the imports results by industries (Table 16), the negative coefficient of the cross-product is present in all the three sectors, but is significant only for manufacturing and services. Furthermore, the magnitude of the coefficient in the manufacturing case is around five times smaller than previously, while the magnitude in the services case is roughly the same as before. Thus, we interpret these findings again as an indication that the negative effect of CIT on imports is driven by the service sector.

Table 16 / Results for imports by different industries

VARIABLES	(1) Primary sector	(2) Manufacturing	(3) Services
CIT_EATR	**0.387**	**0.205**	**0.555**
	(0.630)	**(0.210)**	**(1.158)**
CIT_EATR_FDI	**-0.0717**	**-0.0102*** **	**-0.0596*** **
	(0.0450)	**(0.00382)**	**(0.0213)**
L.lneer171	0.00592	0.0113	0.144
	(0.0296)	(0.0181)	(0.160)
lfor_dem	-0.0104	0.00137	0.00226
	(0.0212)	(0.00547)	(0.0420)
euro	0.00285	-0.00236	0.000934
	(0.0127)	(0.00312)	(0.0147)
L.GG_bal	-0.000682	0.00152	-0.00426
	(0.000955)	(0.00102)	(0.00830)
L.unem	0.0869	0.0270	-0.264
	(0.0992)	(0.0383)	(0.319)
L.lwage2	-0.00477	-5.17e-05	-0.0101
	(0.00568)	(0.00179)	(0.00994)
L.lfdi_stock_sec	0.0123	0.00352***	0.0141**
	(0.00834)	(0.000770)	(0.00602)
L.old_age	0.207	0.0600	-1.496
	(0.566)	(0.146)	(1.549)
L.lgdp_nom	-0.00970	-0.0279	-0.176
	(0.0263)	(0.0236)	(0.229)
L.oth_taxes	0.105	-0.0899	-0.0922
	(0.220)	(0.106)	(0.748)
Constant	0.554	0.652	5.023
	(0.975)	(0.549)	(6.516)
Observations	231	1,136	1,456
R-squared	0.583	0.838	0.588
Underidentification test p-value	0.278	0	0
Hansen J test	0.660	0.943	0.977

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Next, we do the estimations for countries which have high stocks of FDI and countries which have low stocks of FDI. For this, we calculate the average stock of sectoral FDI for each of the countries, and divide the countries into two groups, depending on whether they fall below or above the median value for FDI stocks. Countries which have low FDI are: Greece, the US, Italy, Turkey, Germany, France,

Slovenia, Lithuania, Latvia, Romania, Spain, Norway, the UK, Austria, Poland, Finland and Croatia. Table 17 shows the results for the exports, Table 18 for the imports. In both cases, the same thing can be observed – the coefficient on the cross product of the CIT with the FDI is much bigger in the sample of countries which have a high stock of FDI than in the countries with a low stock of FDI. In the exports case, the coefficient is 11 times bigger in the countries with high FDI, while in the imports case, it is 16 times bigger.

Table 17 / Results for exports for countries with high and low stocks of inward FDI

	(1)	(2)
VARIABLES	**Low FDI stock**	**High FDI stock**
CIT_EATR	**0.163**	**-1.154**
	(0.180)	**(2.915)**
CIT_EATR_FDI	**-0.00827*** **	**-0.0904*** **
	(0.00221)	**(0.0313)**
L.lneer171	-0.00558	0.256
	(0.00772)	(0.341)
lfor_dem	-0.00476	-0.0663
	(0.00851)	(0.0845)
euro		5.67e-05
		(0.0152)
L.GG_bal	-6.01e-05	-0.00453
	(0.000296)	(0.0115)
L.unem	0.0182	0.526
	(0.0188)	(0.793)
L.lwage2	0.00428***	0.0105
	(0.00145)	(0.0201)
L.lfdi_stock_sec	0.00519***	0.0259***
	(0.000476)	(0.00780)
L.lgdp_nom	-0.00736	-0.489
	(0.00788)	(0.399)
L.oth_taxes	0.0353	-1.520
	(0.0597)	(1.892)
Constant	0.252	14.74
	(0.360)	(10.74)
Observations	1,613	1,210
R-squared	0.549	0.615
Underidentification test p-value	5.71e-11	0
Hansen J test	0.745	0.646

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 18 / Results for imports for countries with high and low stocks of inward FDI

VARIABLES	(1) Low FDI stock	(2) High FDI stock
CIT_EATR	**0.0333**	**0.388**
	(0.136)	**(2.028)**
CIT_EATR_FDI	**-0.00717*** **	**-0.117*** **
	(0.00133)	**(0.0286)**
L.lneer171	-0.000308	0.0807
	(0.00541)	(0.243)
lfor_dem	0.00163	-0.00399
	(0.00736)	(0.0599)
euro		-0.00114
		(0.0137)
L.GG_bal	-5.73e-05	-0.000830
	(0.000266)	(0.00798)
L.unem	-0.00387	0.0761
	(0.0177)	(0.502)
L.lwage2	-0.00256***	-0.0213*
	(0.000910)	(0.0112)
L.lfdi_stock_sec	0.00164***	0.0251***
	(0.000274)	(0.00561)
L.lgdp_nom	-0.00203	-0.125
	(0.00598)	(0.303)
L.oth_taxes	0.0180	-0.282
	(0.0513)	(1.295)
Constant	0.0319	3.419
	(0.305)	(8.321)
Observations	1,613	1,210
R-squared	0.671	0.502
Underidentification test p-value	5.71e-11	0
Hansen J test	0.949	0.783

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Finally, we run the estimations for countries with high CIT and countries with low CIT. We take the effective average CIT rates, calculate the average for each of the countries in the observed sample, and then divide the countries into high and low CIT groups, depending on whether their average CIT is below the median or above it. Specifically, countries with low CIT are Cyprus, Lithuania, Latvia, Malta, Bulgaria, Ireland, Romania, Slovakia, Poland, Croatia, Turkey, Czechia, Switzerland, Slovenia, Hungary, Greece and the Netherlands. Table 19 displays the results for the exports, Table 20 for the imports. For the exports, the coefficient on the cross product is negative and significant in the sample of countries with low CIT, while it is, surprisingly, positive in the group of countries with high CIT. For the imports, the coefficients on the cross-product are insignificant in both the sub-groups, probably owing to the smaller number of observations, but in the low-CIT group, the coefficient is much bigger (in absolute terms), and close to the magnitude from the baseline estimation. Thus, we conclude that the overall finding about the negative effect of CIT on trade when FDI is high is driven by the low-CIT countries.

Table 19 / Results for exports for countries with low and high effective average CIT

VARIABLES	(1) Low effective average CIT	(2) High effective average CIT
CIT_EATR	**-1.114**	**-0.0133**
	(2.232)	**(0.687)**
CIT_EATR_FDI	**-0.0503***	**0.0340***
	(0.0262)	**(0.0182)**
L.lneer171	0.103	-0.0997
	(0.0899)	(0.125)
lfor_dem	-0.0977	-0.0249
	(0.0608)	(0.0334)
euro	-0.0332	-0.000806
	(0.0318)	(0.00882)
L.GG_bal	-0.00607	0.000919
	(0.0117)	(0.00145)
L.unem	-0.478	0.122
	(0.597)	(0.185)
L.lwage2	-0.000828	0.00627**
	(0.0123)	(0.00290)
L.lfdi_stock_sec	0.0207***	-0.00240
	(0.00494)	(0.00369)
L.lgdp_nom	-0.546*	0.0803
	(0.292)	(0.116)
L.oth_taxes	-1.703	0.156
	(1.622)	(0.231)
Observations	1,333	1,490
R-squared	0.577	0.823
Underidentification test p-value	0	0.000292
Hansen J test	0.974	0.911

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

Table 20 / Results for imports for countries with low and high effective average CIT

VARIABLES	(1) Low effective average CIT	(2) High effective average CIT
CIT_EATR	**-0.339**	**0.486**
	(1.284)	**(0.565)**
CIT_EATR_FDI	**-0.0363**	**-0.00817**
	(0.0320)	**(0.0129)**
L.lneer171	0.0419	-0.114
	(0.0775)	(0.112)
lfor_dem	-0.0377	-0.0313
	(0.0630)	(0.0306)
euro	-0.0106	-0.00112
	(0.0229)	(0.00696)
L.GG_bal	-0.00119	0.00131
	(0.00710)	(0.00126)
L.unem	-0.128	0.135
	(0.409)	(0.160)
L.lwage2	-0.0194**	0.00223
	(0.00899)	(0.00246)
L.lfdi_stock_sec	0.0115**	0.00229
	(0.00466)	(0.00265)
L.lgdp_nom	-0.158	0.0978
	(0.269)	(0.104)
L.oth_taxes	-0.550	0.205
	(0.971)	(0.209)
Observations	1,333	1,490
R-squared	0.395	0.824
Underidentification test p-value	0	6.15e-05
Hansen J test	0.598	0.548

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

4.4. RESULTS FOR THE DOMESTIC VALUE ADDED

As can be seen in Figures 1 and 2, the effect of CIT turns out to be bigger (in absolute terms) for imports than for exports. This may imply that there is a type of import-substitution effect, i.e. that the decline in imports stemming from to a higher CIT is compensated by an increase in the domestic value added in exports (DVAX). To evaluate this possibility, we next investigate how the CIT affects the DVAX. We do the same regressions as above, replacing the dependent variable with the DVAX. We use three measures of DVAX – the natural logarithm of DVAX (lDVAX), the DVAX as a share of GDP (DVAX_GDP), and the DVAX as a share of exports (DVAX_X). Table 21 shows these results. It can be seen that CIT is insignificant for the logarithm of the DVAX, which means that corporate taxation does not affect the absolute amount of domestic value added in exports. The same holds for DVAX as a share of GDP. On the other hand, for DVAX as a share of exports, the interaction term between the CIT and the FDI is found to be significant and positive, implying that the domestic value added *share* of exports

increases when CIT increases. However, as the *absolute amount* of the domestic value added in exports is found to remain unchanged, this happens simply because of the decline in imports. Thus, one cannot say that higher CIT leads to higher domestic value added in exports, but only that higher CIT increases the domestic share in exports, owing to the decline in the imports content of exports.

Table 21 / Results for the domestic value added in exports

	(1)	(2)	(3)
VARIABLES	**IDVAX**	**DVAX_GDP**	**DVAX_X**
CIT_EATR	**4.635**	**-0.512**	**-0.433**
	(8.873)	**(0.735)**	**(0.686)**
CIT_EATR_FDI	**-0.228**	**-0.00383**	**0.0775*** **
	(0.174)	**(0.0103)**	**(0.0212)**
L.lneer171	0.605	0.0888	-0.0176
	(0.654)	(0.0977)	(0.0693)
lfor_dem	0.200	0.00277	-0.0636
	(0.323)	(0.0169)	(0.0395)
euro	-0.193	-0.00701	-0.0124
	(0.148)	(0.0136)	(0.0129)
L.GG_bal	0.0212*	0.00346	-0.000603
	(0.0120)	(0.00591)	(0.00157)
L.unem	0.542	-0.0999	-0.00903
	(1.238)	(0.172)	(0.128)
L.lwage2	0.582***	0.00518	0.0228
	(0.114)	(0.00318)	(0.0142)
L.lfdi_stock_sec	0.432***	0.00339	-0.0214***
	(0.0321)	(0.00289)	(0.00436)
L.lgdp_nom	-0.706	-0.0895	0.0534
	(0.563)	(0.130)	(0.0769)
L.oth_taxes	-4.135	-0.534	-0.377
	(2.889)	(0.584)	(0.300)
Constant	10.20	2.146	1.355
	(17.42)	(3.560)	(2.281)
Observations	2,129	2,139	2,129
R-squared	0.877	0.622	0.814
Underidentification test p-value	0	0	0
Hansen J test	0.782	0.594	0.961

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
All regressions include industry, country and year fixed effects.
L. stands for the first lag of the variable.

5. Discussion and policy implications

There are several important messages to take away from the findings presented so far. The first is that CIT seems to affect international trade only when the stock of FDI is high, which would imply that the underlying effect is through the operations of MNEs, and not through the aggregate demand channel. As higher CIT is found to lower both imports and exports when the stock of FDI is high, it seems that the mechanism at play is the activity-shifting channel, i.e. that MNEs decide to shift activity from countries with higher corporate taxes to those where taxes are lower. This is different from the profit-shifting channel, which works through transfer prices, which would be at play if CIT was found to increase imports and reduce exports.

This would in turn imply that governments have limited space for increasing their corporate taxes, as this would lead to outflows of mobile capital from the country, which, in a way, confirms that international tax competition leads to a race to the bottom. Still, our results also imply that this effect is likely to be present only in some cases, i.e. only when the stocks of FDI are high, in countries which have low corporate taxes, and in the service sector. In other cases, the effect is found to be negligible, if present at all, implying that governments can still resort to raising CIT rates as a means for raising revenues in these cases, without fearing that this will push investors out of their countries.

Furthermore, the effect of CIT on trade seems to be rather small in the analysed sample. For example, the biggest decline in the effective average CIT rate in the sample is observed in Canada, where the rate has declined by approximately 9 pp (from 33% in 2005 to 24% in 2014). Taking an industry with a high stock of FDI (i.e. at the 90th percentile of the distribution), this decline in CIT means that imports and exports in that industry have increased by approximately 4.6 pp of GDP. This is four times smaller than the standard deviation of the exports, and three times smaller than the standard deviation of the imports (see Table A2 in the Appendix), implying that the contribution of CIT to the increase in the exports and imports in the observed period is not very large.

Finally, most of the analysed countries have seen a decline in their corporate taxes in the observed period, as can be seen in Figures 3-5, which show the dynamics of the three CIT variables considered in this paper – the effective average rate, the effective marginal rate and the statutory rate. This means that the global downward trend in CIT during this period has in general contributed to higher exports and imports. Still, as the effect of CIT on international trade has been found to be rather small, the contribution of the declining CIT rates during the past decades on exports and imports is likely to be limited. This in turn implies that a possible increase in CIT rates in the forthcoming period, owing to adoption of the global minimum tax, is unlikely to have a significantly adverse impact on international trade.

Figure 3 / Effective average CIT rates in the analysed sample

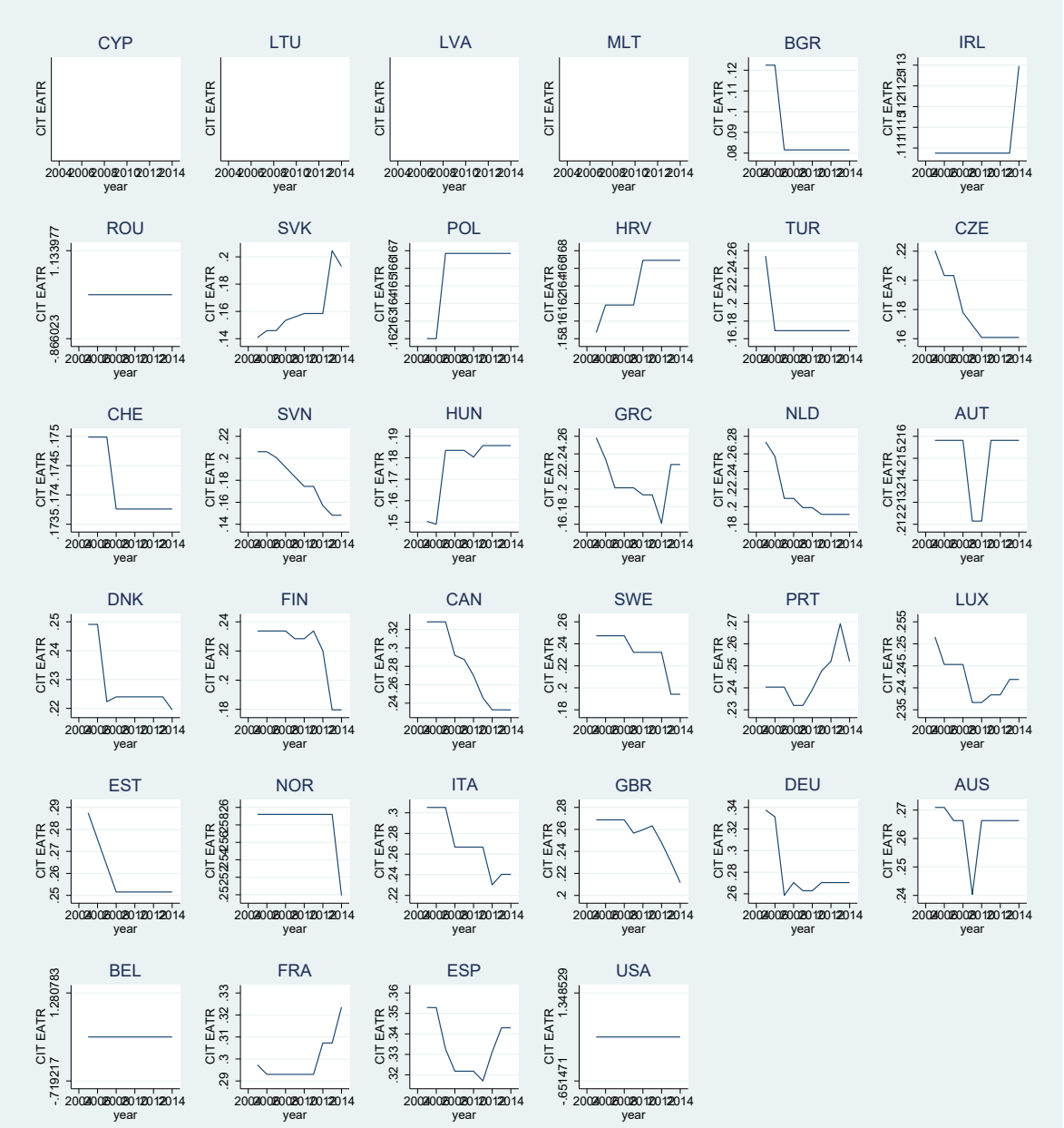


Figure 4 / Effective marginal CIT rates in the analysed sample

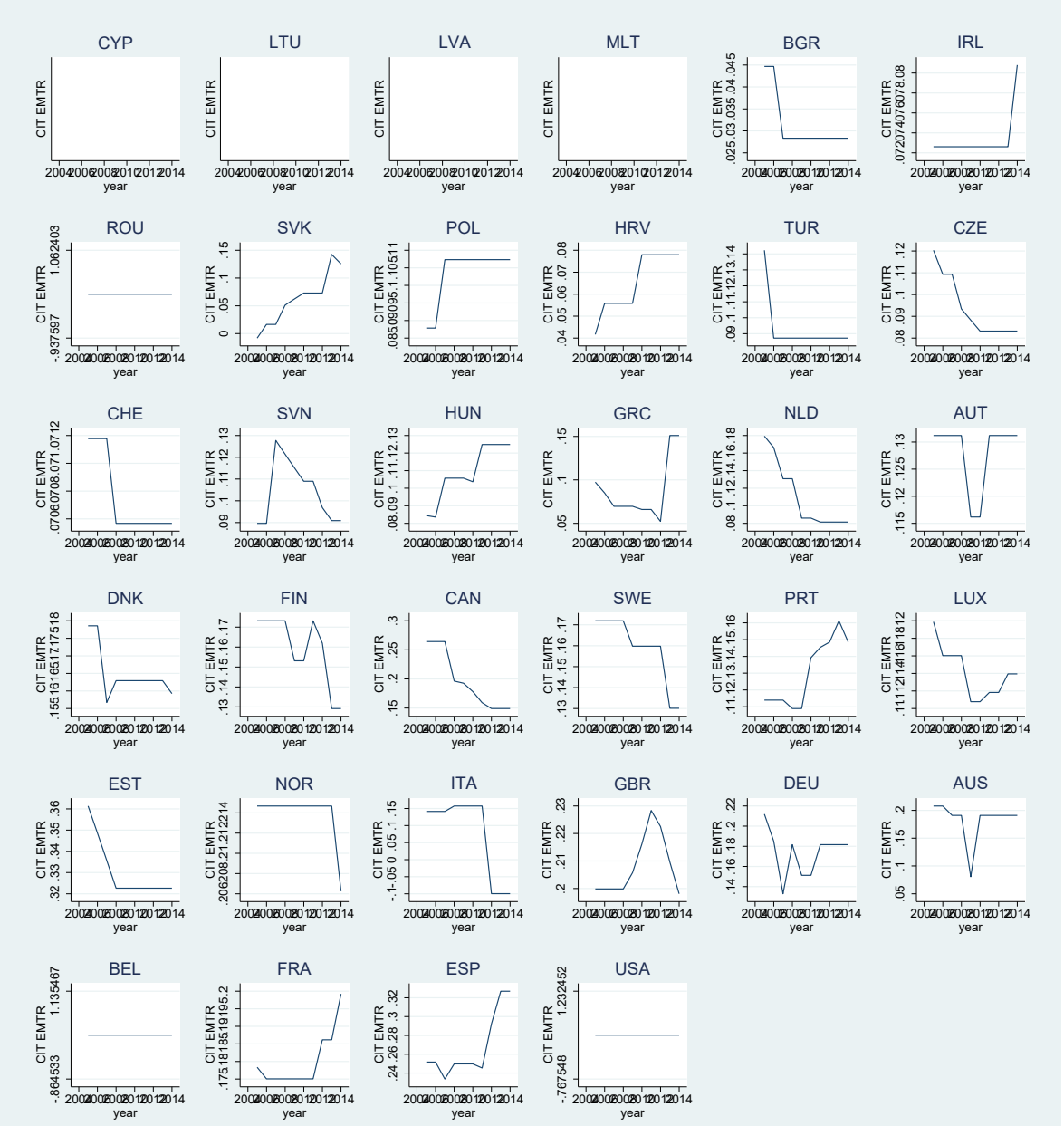
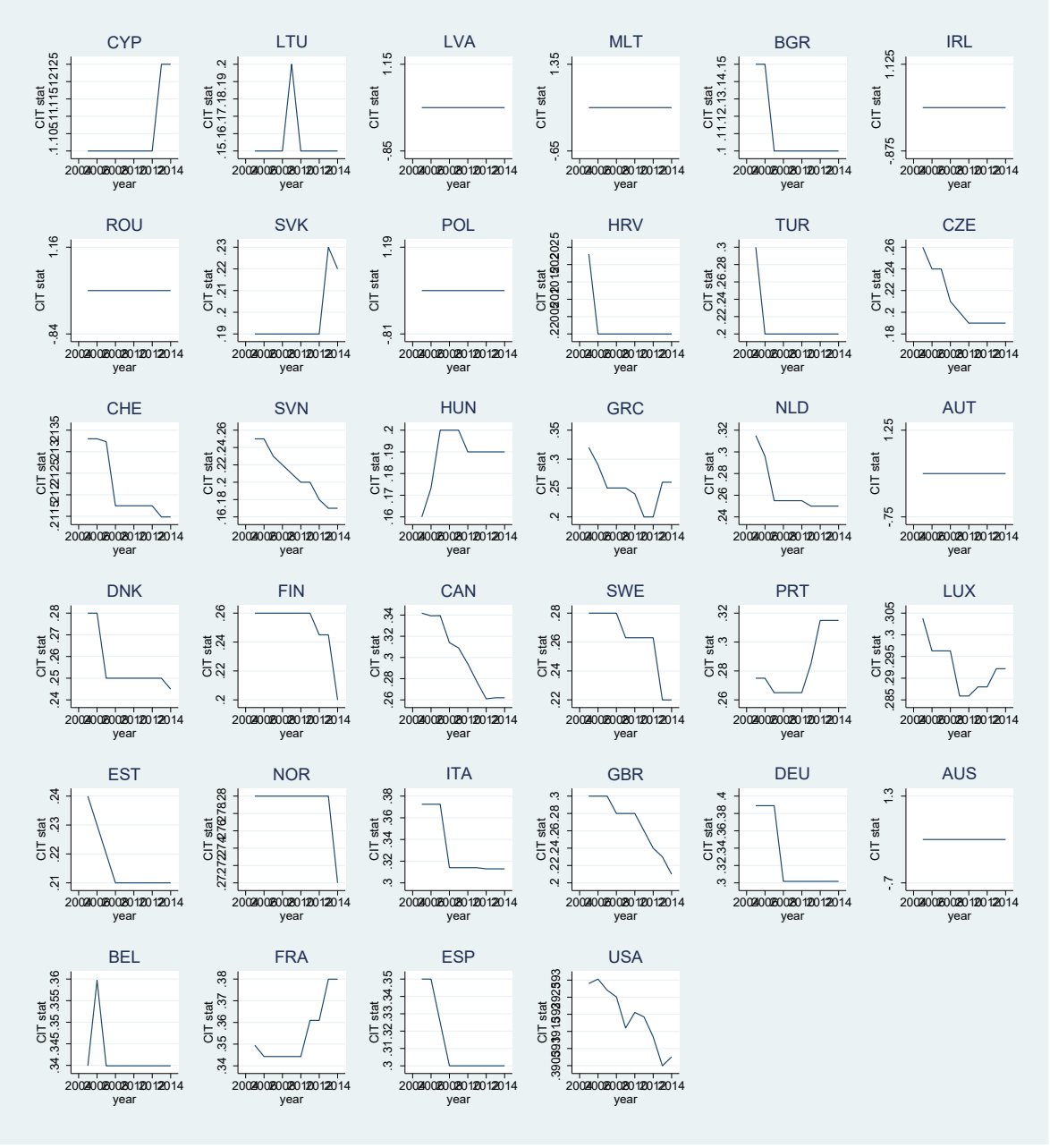


Figure 5 / Top statutory CIT rates in the analysed sample



6. Conclusion

In this paper, we have investigated the link between corporate taxes and international trade, focusing specifically on the role of MNEs. More precisely, we have assessed whether corporate taxes affect exports and imports, and through which underlying channel. We have found that corporate taxes reduce exports and imports only when the stock of FDI is high, primarily in countries where corporate taxes are low, and primarily in the service sector. We have interpreted these findings as evidence that MNEs decide to reduce their operations in low-tax countries that raise their corporate taxes. In other words, we read this as an indication that CIT affects international trade through the activity-shifting mechanism of MNEs, not through profit-shifting via transfer pricing, and not through lowering aggregate demand.

This finding could also be interpreted as a confirmation of the hypothesis that international tax competition leads to a race to the bottom – if countries raise their corporate taxes, this pushes away certain foreign companies. However, the effect is present only under certain conditions – for countries with high stocks of FDI and low corporate taxes, and only in services. Moreover, it has been found to be rather small, and the contribution of a decline in corporate taxes to increases in exports and imports in past decades has been limited. Thus, initiatives for raising corporate taxes in the future, such as the recent adoption of the global minimum tax, are unlikely to have a harmful impact on international trade.

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Appendix

Table A1 / Sectors included in the analysis

Paper products and printing
Other social and personal services
Agriculture, hunting, forestry and fishing [A]
Mining and quarrying [B]
Food products, beverages and tobacco [CA]
Textiles, wearing apparel, leather and related products [CB]
Wood and products of wood and cork, except furniture
Coke and refined petroleum products [CD]
Chemical and pharmaceutical products
Rubber and plastics products
Other non-metallic mineral products
Basic metals
Fabricated metal products, except machinery and equipment
Computer, electronic and optical products [CI]
Electrical equipment [CJ]
Machinery and equipment n.e.c. [CK]
Motor vehicles, trailers and semi-trailers
Other transport equipment
Furniture; other manufacturing; repair and installation of machinery and equipment [CM]
Electricity, gas and water supply; sewerage, waste management and remediation activities [D-E]
Construction [F]
Wholesale and retail trade, repair of motor vehicles and motorcycles [G]
Transportation and storage [H]
Accommodation and food service activities [I]
Publishing, audiovisual and broadcasting activities [JA]
Telecommunications [JB]
IT and other information services [JC]
Financial and insurance activities [K]
Real estate activities [L]
Professional, scientific and technical activities; administrative and support service activities [M-N]
Public administration and defence; compulsory social security [O]
Education [P]
Human health and social work activities [Q]

Table A2 / Descriptive statistics of the variables

variable	No. obs.	Mean	St. dev.	Min.	p25	p50	p75	Max.
CIT_stat	2,823	0.23	0.07	0.10	0.19	0.24	0.28	0.39
CIT_EATR	2,823	0.18	0.09	0.00	0.13	0.20	0.26	0.35
CIT_EMTR	2,823	0.11	0.08	-0.10	0.06	0.11	0.16	0.34
X_GDP	2,823	0.03	0.18	0.00	0.00	0.01	0.02	4.33
M_GDP	2,823	0.03	0.12	0.00	0.00	0.01	0.02	2.26
DVAX_sh	2,812	0.75	0.15	0.11	0.67	0.78	0.86	0.98
lfdi_stock	2,823	6.85	2.44	0.00	5.33	7.09	8.57	13.12
lneer171	2,823	4.60	0.08	4.31	4.60	4.61	4.63	4.78
lfor_dem	2,823	28.17	0.45	27.08	27.90	28.16	28.42	30.28
lgdp_nom	2,823	26.20	1.72	22.79	24.67	26.23	27.53	30.30
oth_taxes	2,823	0.32	0.06	0.17	0.27	0.30	0.37	0.43
EU	2,823	0.93	0.25	0.00	1.00	1.00	1.00	1.00
Euro	2,823	0.48	0.50	0.00	0.00	0.00	1.00	1.00
lwage2	2,823	10.35	0.82	5.64	9.75	10.44	11.03	13.26
old_age	2,823	0.25	0.04	0.11	0.23	0.25	0.27	0.32
GG_bal	2,823	-3.48	3.96	-32.03	-5.25	-3.24	-1.50	17.12
unem	2,823	0.09	0.04	0.02	0.06	0.08	0.11	0.24

IMPRESSUM

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