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from OECD Multinationals”

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The Effects of Repatriation Taxes on FDI: Evidence from OECD Multinationals

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Abstract

This study empirically investigates whether the tax differentials between home and host countries differently affect multinationals' foreign investment and profit shifting decisions under contrasting international tax systems. In particular, we compare these differential tax effects between credit and exemption systems, using firm-level data on selected OECD countries. Based on the presented analysis, we find that tax differentials affect multinationals' foreign investment decisions to a larger degree under the exemption system than under the credit system when a home country's tax rate is larger than that in the host country. By contrast, our results show that the tax effects on profit shifting are similar under both these systems.

Keywords: Corporate taxation, International tax system, Multinational firms

JEL Classifications: H25, H87

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1 Introduction

International tax systems can be categorized into credit and exemption systems, with more countries having recently moved from the former to the latter. One reason for this global trend is that the M&As of domestic multinationals are more competitive in a third country under the exemption system. Specifically, if the domestic country adopts the exemption system while the competing country has the credit system, domestic multinationals are not obliged to pay any extra tax in the home country, whereas competing multinationals are taxed again at home. Therefore, the exemption system offers domestic multinationals competitive advantage in this regard¹.

However, under the exemption system, since differences in tax rates (tax differentials hereafter) between domestic and foreign countries are more important for firms' investment decisions, high tax countries may suffer capital outflow, which crowds out domestic capital. When a country transitions from the credit system to the exemption system, even if M&As do not crowd out domestic investment, non-M&As may do so². Therefore, for a comprehensive evaluation of the trend toward the transition to the exemption system, it is necessary to identify how the differential tax effects between domestic and foreign countries influence the entire foreign investment of multinationals. Based on the foregoing, this study investigates the differential tax effects on multinationals' foreign investment under these two international tax systems, using firm-level data for selected OECD countries. To our knowledge, this is the first study to clarify empirically how different tax regimes affect overall foreign investment decisions under these tax systems by using micro data.

A string of empirical studies has examined the effects of taxation on FDI³. Slemrod (1990) presents empirical analyses of FDI inflow into the United States, using Bureau of

¹ The exemption system is said to satisfy the national ownership neutrality criterion proposed by Desai and Hines (2003).

² M&As may also crowd out domestic investment because of the limits of managerial capacity. The essential thing is not the type of investment but whether foreign investment crowds out domestic investment, as Becker and Fuest (2010) point out.

³ Devereux (2007) reviews studies of the tax effect on both FDI and profit shifting.

Economic Analysis macro data from 1962 to 1987. He finds that the taxation regime in the host country negatively affects FDI, but obtains no evidence of the effects of the home country taxation system. Hines (1996) also uses Bureau of Economic Analysis data and shows that the tax system of the home country affects FDI to the United States as well as states' tax rates. Similarly, Gropp and Kostial (2000) examine several propositions on the effect of tax on FDI by using data on 25 OECD countries from 1988 to 1997 and find that home country taxation affects the level and tax sensitivity of FDI to foreign countries.

Benassy-Quere et al. (2005) investigate how tax differentials between home and host countries influence FDI, using bilateral data for OECD countries from 1984 to 2000. They observe differential tax effects on FDI, but obtain no clear evidence of any difference between credit and exemption systems. Smart (2011) estimates the elasticity of tax differentials on Canadian outward FDI under these two systems, using Canadian tax treaty information. He concludes that the shift from the credit system to the exemption system increases Canadian outward FDI by 79%. Feld et al. (2013) use micro data for cross-border M&A and find that the 2009 tax reforms that aimed to eliminate repatriation taxes in Japan and the United Kingdom have increased the number of outbound cross-border M&As by 31.9% for the former and 3.9% for the latter.

Despite this large body of research on how the taxation regime in the home country affects FDI, however, the results are mixed and most analyses are limited to national data. In another research context, Becker and Riedel (2012) examine the effect of both home and host country taxation systems on foreign investment by using European firm-level data. They investigate whether domestic taxation negatively affects foreign as well as domestic investment, contrary to the standard view of tax competition⁴. They also recognize that repatriation taxes influence foreign investment, but exclude credit system countries from the sample to extract the pure tax rate effects of home and host countries in several estimations. In this study, we expand Becker and Riedel's (2012) analysis in the opposite direction by investigating the effect of repatriation taxes on foreign investment.

⁴ Prior studies of this point include Feldstein (1995) and Desai et al. (2005, 2009).

The presented estimation results show significantly larger differential tax effects on foreign investment under the exemption system than under the credit system when a home country's tax rate is larger than that in the host country. While the impact found herein is marginally smaller than that revealed by previous studies that have used macro data, our results show that the transition from the credit system to the exemption system increases foreign investment by about 80%, which is almost the same impact as presented by Smart (2011).

Furthermore, by investigating the same effect on profit shifting, we find that tax differentials affect profit shifting almost equally under these two systems. These results suggest that profit shifting is already prevalent, even under the credit system, and does not alleviate the increase in the differential tax effects on foreign investment that arise from changing international tax regimes.

Finally, we also show that the differential tax effects on foreign investment are larger under the exemption system only for the manufacturing sector, whereas the same effects on profit shifting are larger under the exemption system only for non-manufacturing firms. Although these results are not necessarily easy to interpret, they seem to suggest that tax differentials are relatively less important for the investment locations of non-manufacturing firms, which have sufficient capability to shift profits in order to offset the differential tax effects on investment.

The rest of the paper is structured as follows. Section 2 explains how foreign profits are taxed under the credit and exemption systems and why the latter attracts more foreign investment. Section 3 describes the characteristics of the firm-level data used for our estimation. Section 4 discusses the estimation strategy and model specifications. Section 5 presents the empirical results for the differential tax effects on the foreign investment and profit shifting decisions of multinationals. Section 6 concludes.

2 International tax systems

2.1 Worldwide and territorial tax principles

International tax principles can be classified into those based on worldwide tax (the residence principle) and those based on territorial tax (the source principle). According to the worldwide tax principle, all incomes posted by multinationals are taxable regardless of their location. To avoid double taxation, countries normally use the foreign tax credit system in which foreign tax is credited against domestic tax. By contrast, the territorial tax principle requires no extra domestic tax on foreign profits (i.e., the exemption system).

Under the unrestricted credit system, foreign taxes do not hinder the outward FDI of multinationals because they do not affect these firms' overall tax payments in the domestic and foreign countries owing to full crediting. The first-order condition shows that the after-tax marginal profits from domestic investment should be equal to those from foreign investment. Under the credit system, this condition is represented by the following equation:

$$(1 - t_H)f'_H = (1 - t_F)f'_F - (t_H - t_F)f'_F = (1 - t_H)f'_F \quad \text{if } t_H \geq t_F, \quad (1)$$

where t_i ($i = H, F$) is the tax rate and f'_i ($i = H, F$) denotes marginal profits. From Equation (1), we have $f'_H = f'_F$. In other words, firms allocate their capital between domestic and foreign countries as if there were no tax and thus capital is efficiently allocated from a global perspective. This property is called capital export neutrality (CEN).

By contrast, the first-order conditions under the exemption system require that

$$(1 - t_H)f'_H = (1 - t_F)f'_F. \quad (2)$$

In general, since t_H is not equal to t_F , CEN is not satisfied under the exemption system. However, because all profits posted in the same location are taxed equally, the exemption

system satisfies capital import neutrality. Further, since there is no adjustment in domestic tax systems under the exemption system, tax differentials affect firms' investment location decisions.

In fact, the credit system does not necessarily satisfy CEN for two reasons. First, foreign tax credit usually has a ceiling based on the domestic tax system and is thus not refundable when foreign tax exceeds domestic tax. If a home country offers a refundable foreign tax credit and therefore the host country's high tax rate does not prevent the inflow of the home country's FDI, the host country's government would have an incentive to raise the tax rate as high as possible. As a result, tax revenues would shift from the home country to the host country. This is called the "fiscal transfer," which governments usually prevent by limiting foreign tax credit up to the level of domestic tax. Hence, when foreign taxes are larger than domestic ones, the credit system is effectively the same as the exemption system. From the perspective of the differential tax effects on foreign investment, the credit and exemption systems should thus be equivalent. From the above discussion, we have two propositions on the differential tax effects on foreign investment.

Proposition 1: When the host country's tax rate is lower than the home country's tax rate, the tax differentials between the domestic and foreign countries affect foreign investment only under the exemption system.

Proposition 2: When the host country's tax rate is higher than the home country's tax rate, the tax effects on foreign investment are the same under both the credit system and the exemption system.

Second, only repatriated income is taxed as foreign income. Following the pure worldwide tax principle, the foreign incomes of domestic multinationals should be taxed on an accrual basis. However, this system of taxation does not work unless all governments around the world exchange information about subsidiaries' incomes in their jurisdictions.

Therefore, governments can only tax repatriated incomes from foreign subsidiaries and this shortcoming allows multinationals to defer tax on foreign incomes, thereby permitting them to reinvest overseas instead of sending subsidiaries' incomes home. To the extent of tax deferral, the credit system thus comes close to the exemption system. Hartman (1985) argues that repatriation taxes do not affect the foreign investment decision if this investment is financed only by retained earnings.

Proposition 3: To the extent that tax deferrals are made, the differential tax effects on foreign investment become similar under the credit and exemption systems.

By putting Propositions 1 to 3 together, we have Proposition 4, namely that tax effects differ under these two international tax systems.

Proposition 4: The differential tax effects on foreign investment are larger under the exemption system than under the credit system.

These differential tax effects also influence the profit shifting of multinationals. Because such firms can shift profits to the lowest country within a group by using techniques such as transfer pricing, profit shifting is interpreted as another measure to shift the tax base between domestic and foreign countries. Profit shifting thus changes the global tax base allocation in a different way from foreign investment. Therefore, when an international tax system changes, profit shifting may alleviate the differential tax effect on capital reallocation because the tax incentive for investing in a low tax country is lessened by the capability of profit shifting.

Proposition 5: Tax differentials affect multinationals' profit shifting, which may alleviate the differential tax effects on foreign investment.

Moreover, tax differentials are considered to affect profit shifting to a larger degree under the exemption system than under the credit system for the same reason as they affect foreign investment.

Proposition 6: Tax differentials affect multinationals' profit shifting to a larger degree under the exemption system than under the credit system.

In addition, other institutional factors may affect the differential tax effects on multinationals' foreign activities in each credit system country, including the range of taxes against which foreign tax credit can be used and the periods of carry-forward of excess credit⁵. Nevertheless, we disregard these miscellaneous institutional factors in the analysis presented herein in order to simplify the analysis.

3 Data

Our main data source is the ORBIS database provided by Bureau van Dijk. We use the firm-level financial statements of parents and subsidiaries for OECD countries from 2003 to 2010. By using ownership information, we identify each capital relationship between a parent firm and its subsidiaries within OECD countries. We use only subsidiaries that are directly owned by the parent companies with at least 90% shares in the final year of the sample, in line with the approach taken by Becker and Riedel (2012).

Our panel dataset contains 7,248 parent firms and 11,630 subsidiaries for 2010. We exclude from the sample those countries that acceded to the OECD in 2010 (Chile, Slovenia, Israel, and Estonia), countries that have few samples (Canada, New Zealand), financial firms, firms whose operating revenues are below \$100,000, and consolidated financial statements.

The country distribution is presented in **Table 1**. Since the ORBIS database places

⁵ When foreign tax credit is larger than domestic tax, the difference between the two is called "excess credit."

disproportionate weight on European countries, more than 90% of the samples are concentrated in EU countries, especially France, Germany, Sweden, Italy, Belgium, Austria, and the United Kingdom. However, our sample still includes some important countries outside Europe such as Australia, Japan, South Korea, and the United States. Further, regarding macro data on tax rates and the control variables, all variables are obtained from OECD data (National Accounts, Main Economic Indicators, or Tax Database).

Table 1: Country Distribution

Number of Firms (2003)			Number of Firms (2010)		
country	Subsidiary	Parent	country	Subsidiary	Parent
Australia	0	21	Australia	33	26
Austria	11	272	Austria	347	421
Belguim	460	402	Belguim	491	485
Czech Republic	669	52	Czech Republic	937	100
Denmark	0	265	Denmark	163	345
Finland	400	117	Finland	438	165
France	1094	852	France	1173	1023
Dermany	300	777	Dermany	1345	1041
Greece	64	9	Greece	81	16
Hungary	187	9	Hungary	257	14
Iceland	4	4	Iceland	3	6
Ireland	53	47	Ireland	66	58
Italy	738	464	Italy	1013	636
Japan	5	233	Japan	8	330
Korea	71	17	Korea	87	53
Luxembourg	43	69	Luxembourg	83	114
Mexico	4	2	Mexico	6	1
Netherlands	172	151	Netherlands	197	197
Norway	156	78	Norway	502	124
Poland	514	21	Poland	857	42
Portugal	259	48	Portugal	520	59
Slovakia	128	25	Slovakia	216	52
Spain	1161	433	Spain	1188	692
Sweden	225	502	Sweden	253	781
Switzerland	0	3	Switzerland	0	7
Turkey	3	9	Turkey	19	22
United Kingdom	1210	284	United Kingdom	1347	403
United States	0	25	United States	0	35
Sum	7931	5191	Sum	11630	7248

To assess the effects of the two international tax systems examined in the present study, we must identify the treatment for repatriation taxes between any two countries. We derive information on each country's international tax system from PwC (2013), the IBFD database, and other publications from accounting firms. We focus only on the international tax systems with regard to repatriated dividends (i.e., we disregard capital gains and other capital incomes).

Not all nations necessarily have the same tax treatment for repatriated dividends,

because each host country has bilateral tax treaties with particular countries or its own domestic laws that determine the country-specific special tax treatments for repatriated dividends. The international tax systems between any two OECD countries are presented in **Table 2**, where C denotes the credit system and E refers to the exemption system.

Table 2: International Tax Systems for OECD Countries

Year 2003

Parent	Subsidiary	AU	AT	BE	CZ	DK	FI	FR	DE	GR	HU	IS	IE	IT	JP	KR	LU	MX	NL	NO	PL	PT	SK	ES	SE	CH	TR	GB	US
		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
AU		E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
AT		E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
BE		E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
CZ		E	E	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	E	E	C	E
DK		E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
FI		E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
FR		E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
DE		E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
GR		C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
HU		C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
IS		E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
IE		C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
IT		C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
JP		C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C	C
KR		C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C	C	C	C	C	C	C	C	C	C	C	C
LU		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E	E	E
MX		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		E	E	E	E	E	E	E	E	E	E	E
NL		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E	E	E	E	E	E
NO		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		E	E	E	E	E	E	E	E	E
PL		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		E	E	E	E	E	E	E	E
PT		C	E	E	E	E	E	E	E	E	E	C	E	E	E	C	E	E	E	E	E		E	E	E	C	C	E	C
SK		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		E	E	C	C	C	C
ES		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E	E
SE		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E	E
CH		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E		E	E	E
TR		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C	C
GB		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C		C
US		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	

AU:Australia, AT:Austria, BE:Belguim, CZ:Czech Republic, DK:Denmark, FI:Finland, FR:France, DE:Germany, GR:Greece, HU:Hungary, IS:Iceland, IE:Ireland, IT:Italy, JP:Japan, KR:Korea, LU:Luxembourg, MX:Mexico, NL:Netherlands, NO: Norway, PL:Poland, PT:Portugal, SK:Slovakia, ES:Spain, SE:Sweden, CH:Swizerland,TR:Turkey, GB: United Kingdom, US: United States

Year 2010

	Subsidiary	AU	AT	BE	CZ	DK	FI	FR	DE	GR	HU	IS	IE	IT	JP	KR	LU	MX	NL	NO	PL	PT	SK	ES	SE	CH	TR	GB	US
Parent																													
AU		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
AT		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
BE		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
CZ		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
DK		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
FI		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
FR		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
DE		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
GR		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
HU		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
IS		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
IE		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
IT		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
JP		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
KR		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
LU		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
MX		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
NL		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
NO		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
PL		C	E	E	E	E	E	E	E	E	E	E	E	E	C	E	E	E	E	E	E	E	E	E	E	E	C	E	C
PT		C	E	E	E	E	E	E	E	E	E	E	E	E	C	E	C	E	E	E	E	E	E	E	E	E	C	E	C
SK		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
ES		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
SE		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
CH		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
TR		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
GB		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
US		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

AU:Australia, AT:Austria, BE:Belguim, CZ:Czech Republic, DK:Denmark, FI:Finland, FR:France, DE:Germany, GR:Greece, HU:Hungary, IS:Iceland, IE:Ireland, IT:Italy, JP:Japan, KR:Korea, LU:Luxembourg, MX:Mexico, NL:Netherlands, NO: Norway, PL:Poland, PT:Portugal, SK:Slovakia, ES:Spain, SE:Sweden, CH:Swizerland,TR:Turkey, GB: United Kingdom, US: United States

In 2003, about half of OECD countries applied the credit system to repatriated dividends, but the majority has since moved to the exemption system. In particular, many EU members have changed their international tax treatments from the credit system to the exemption system for repatriated dividends from other European countries, while the United Kingdom and Japan introduced the exemption system for repatriated dividends from all countries in 2009. As of 2010, OECD countries that operated under the credit system were limited to only the United States, Mexico, South Korea, Ireland, and Greece⁶.

4 Estimation Strategy

According to the two international tax systems introduced thus far and their relative tax rates, we can derive the four differential tax effects described in **Table 3**. “Negative tax differentials” occur if the host country tax rate (t_i) is lower than the home country tax rate (t_h), while “positive tax differentials” occur if this relationship is the opposite. Under negative tax differentials, the tax effects on foreign investment should differ under the credit and exemption systems (points (A) and (C) in Table 3). We interpret that Proposition 4 is supported if the differential tax effects in points (A) and (C) are different.

By contrast, under positive tax differentials, since there is no tax in the home country, the credit system is equivalent to the exemption system. Therefore, the tax effects in points (B) and (D) should be the same. Moreover, these effects should also be equal to point (C). However, prior research including Benassy-Quere et al. (2005) empirically shows that firms’ behaviors depend on the sign of the tax differentials. Therefore, by considering these asymmetric differential tax effects, we focus on the comparison of points (A) and (C).

⁶ Greece currently operates the exemption system for repatriated incomes from EU countries.

Table 3: Effects of Tax Differentials on Foreign Investment

	$t_h > t_i$ (Negative tax differentials)	$t_h \leq t_i$ (Positive tax differentials)
Credit system	(A)	(B)
Exemption system	(C)	(D)

We assume a capital stock adjustment model with quadratic adjustment costs. By taking the linear approximations of the first-order conditions, we find that the specification has two lagged dependent variables, as often used in the literature on investment functions:

$$\begin{aligned}
 \log K_{it} = & \beta_1 \log K_{it-1} + \beta_2 \log K_{it-2} + \beta_3 EXEMP_{it} \times NEG_{hit} \times taxdiff_{hit} + \beta_4 EXEMP_{it} \\
 & \times POS_{hit} \times taxdiff_{hit} + \beta_5 CREDIT_{it} \times NEG_{hit} \times taxdiff_{hit} + \beta_6 CREDIT_{it} \\
 & \times POS_{hit} \times taxdiff_{hit} + \beta_7 X_{it} + \eta_i + \lambda_t + \varepsilon_{it}, \quad (3)
 \end{aligned}$$

where the subscripts i and h show the host country (subsidiaries) and home country (parents), respectively, K_i represents the capital stock of subsidiaries, $taxdiff_{hi}$ denotes the tax differentials in statutory tax rates between the home and host countries (host country's tax rate – home country's tax rate), $EXEMP_i$, $CREDIT_i$, NEG_{hi} , and POS_{hi} are dummy variables, X_i denotes a vector of the control variables, η_i is a firm fixed effect, λ is a year dummy, and ε_i is an error term.

Given the asymmetric differential tax effects, we follow the approach presented by Benassy-Quere et al. (2005) by using the interaction terms of the international tax system dummies (credit or exemption) and tax differential dummies (positive or negative). $EXEMP_i$ is the exemption system dummy ($EXEMP_i = 1$ if the home country adopts the exemption system and $EXEMP_i = 0$ otherwise), while $CREDIT_i$ is the credit system dummy ($CREDIT_i = 1$ if the home country adopts a credit system and $CREDIT_i = 0$ otherwise). Further, NEG_{hit} is the negative dummy ($NEG_{hit} = 1$ if the tax differentials are

negative and $NEG_{hit} = 0$ otherwise) and POS_{hit} is the positive dummy ($POS_{hit} = 1$ if the tax differentials are positive and $POS_{hit} = 0$ otherwise).

For the tax variables, we focus on statutory tax rates. In theory, marginal effective tax rates affect marginal investment decisions. Therefore, considering that our foreign investment data include FDI and the marginal investment of existing subsidiaries, both statutory tax rates and marginal effective tax rates should be used in the analyses. However, since suitable and comprehensive data on marginal effective tax rates are unavailable, we focus only on the results for statutory tax rates⁷. For the control variables, we use GDP, GDP per capita, and the unemployment rates in the home and host countries, following Becker and Riedel (2012).

Since Equation (3) includes the lags of the dependent variable, we must address endogeneity problems in our dynamic panel estimation. We use the instrumental variable approach introduced by Anderson and Hsiao (1982) and subsequently developed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991) to address the endogeneity issues. For the instrumental variables for the first lag of the dependent variable, the second and third lags are used in all foreign investment equations.

We mainly check whether coefficients β_3 and β_5 significantly differ. Since Equation (3) is first-differenced in the estimation, we cannot identify the effects of the international taxation dummies (EXEMP, CREDIT) if both international tax systems and tax differentials are unchanged. Therefore, the coefficients β_3 and β_5 in Equation (3) reflect the change in either international tax systems or tax differentials.

We also estimate a similar equation to investigate whether these international tax systems affect the differential tax effects on the profit shifting of multinationals (Proposition 5). We regress firm profits on tax differentials, while the linear capital stock term in Equation (4) is derived from stock adjustment models on the assumption of a well-behaved production function and perfectly competitive market:

⁷ We tried using the marginal effective tax rates of Spengel et al. (2012), which are calculated based on certain assumptions on interest and inflation rates, but we did not find any significant results.

$$\begin{aligned}
\log \Pi_{it} = & \alpha_1 \log K_{it} + \alpha_2 EXEMP_{it} \times NEG_{hit} \times taxdiff_{hit} + \alpha_3 EXEMP_{it} \times POS_{hit} \times taxdiff_{hit} \\
& + \alpha_4 CREDIT_{it} \times NEG_{hit} \times taxdiff_{hit} + \alpha_5 CREDIT_{it} \times POS_{hit} \times taxdiff_{hit} \\
& + \alpha_6 X_{it} + \eta_i + \lambda_t + \varepsilon_{it}, \quad (4)
\end{aligned}$$

where Π_i represents firm profits. Since the explanatory variable K_i is endogenous, we use lagged K_i as the instrumental variable. We then check whether α_2 and α_4 are different in the same way as in the foreign investment case (Proposition 6). The descriptive statistics are summarized in **Table 4**.

Table 4: Descriptive Statistics

Variable	Unit	Mean	Std.dev	Min.	Max.	Obs.
Parent:						
Statutory corporate tax rate	Percent	30.7	4.8	12.5	40.8	47,433
Capital stock	Millions US\$	238	1,536	0	45,900	44,447
Pre-tax Profit	Millions US\$	131	740	-15,200	18,500	43,674
GDP per capita	1000s const. US\$	37.2	9.6	7.2	87.6	47,433
Population	Millions	44.7	36.9	0.3	310.0	47,433
Unemployment rate	Percent	7.6	3.0	2.2	20.0	47,433
Subsidiary:						
Statutory corporate tax rate	Percent	28.4	5.3	12.5	40.8	47,433
Capital stock	Millions US\$	12	95	0	7,486	47,433
Pre-tax Profit	Millions US\$	5	80	-716	7,716	45,195
GDP per capita	1000s const. US\$	31.1	13.2	7.2	87.6	47,433
Population	Millions	39.8	26.4	0.3	128.0	47,433
Unemployment rate	Percent	8.0	3.2	2.2	20.0	47,433

5 Empirical Results

5.1 Results for foreign investment

5.1.1 Benchmark estimation

Table 5 shows the benchmark results for the differential tax effects on foreign investment. We find a statistically significant differential tax effect on foreign investment if a home country adopts the exemption system and tax differentials are negative, while the differential tax effects under the credit system are not significant (β_3 and β_5 in Column (2) of **Table 5**)⁸. These results support Proposition 4. The semi-elasticity of the tax differentials

⁸ We also carried out a statistical test on the difference between β_3 and β_5 and found a significant difference

on the foreign investment of subsidiaries is -0.84 , which is lower than that in Benassy-Quere (2005) based on OECD macro data. However, our results show that the differential tax effects on foreign investment increase by about 80% when the credit system changes to the exemption system, which is consistent with the results of Smart (2011).

Table 5: Benchmark Results for Foreign Investment

Dependent variable: Subsidiaries' capital stock	(1)	(2)	(3)	(4)
L. Capital Stock, Subs	0.385*** (6.07)	0.414*** (6.72)	0.387*** (6.11)	0.414*** (6.73)
L2. Capital Stock, Subs	-0.024*** (-2.99)	-0.025*** (-3.11)	-0.024*** (-2.99)	-0.025*** (-3.11)
Taxdiff * Credit * Negative (β_3)	-0.408 (-1.43)	-0.462 (-1.58)		
Taxdiff * Credit * Positive (β_4)	-0.089 (-0.19)	-0.129 (-0.27)		
Taxdiff * Exemp * Negative (β_5)	-0.750*** (-3.56)	-0.840*** (-3.89)		
Taxdiff * Exemp * Positive (β_6)	-0.460 (-1.43)	-0.460 (-1.40)		
Taxrate Host * Credit			-1.160*** (-3.78)	-1.207*** (-3.89)
Taxrate Home * Credit			-0.507* (-1.71)	-0.478 (-1.58)
Taxrate Host * Exemp			-1.575*** (-6.24)	-1.621*** (-6.35)
Taxrate Home * Exemp			-0.078 (-0.36)	-0.035 (-0.16)
GDP p.c., Subs		0.946*** (5.18)		0.941*** (5.16)
GDP p.c., Par		0.713*** (2.87)		0.648*** (2.61)
Population, Subs		1.644** (2.36)		1.766*** (2.56)
Population, Par		0.613 (0.98)		1.054* (1.67)
Unemployment, Subs		-0.517** (-1.97)		-0.590** (-2.25)
Unemployment, Par		-0.564* (-1.87)		-0.591** (-1.96)
Sargan–Hansen test	12.84	13.77	12.85	13.84
P-value	0.117	0.087	0.116	0.086
Arellano–Bond test AR(2)	0.380	0.449	0.371	0.447
P-value	0.704	0.653	0.711	0.654
N	47433	47433	47433	47433

1) Parentheses contain t-statistics robust to heteroscedasticity.

2) *** indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

In the case of positive tax differentials, the tax effects under both the credit and the

between them.

exemption systems are different and not statistically significant. The asymmetry of differential tax effects can also be observed.

Next, we estimate equations that use the home and host countries' tax rates as explanatory variables separately instead of tax differentials in order to compare our results with those of Becker and Riedel (2012). Unlike Becker and Riedel's results, the home country tax effects on foreign investment are not statistically significant at least at the 5% significant level and only the host country's tax rates significantly affect the foreign investment of multinationals (Columns (3) and (4) in **Table 5**). These results may justify our assumption based on standard tax competition models in which each country competes for capital by reducing its tax rates. However, we also observe the negative signs of the coefficients of home country taxation on foreign investment and these lead to low semi-elasticities of tax differentials on foreign investment.

5.1.2 Robustness checks

To check the robustness of these results, we change our sample in two ways. First, small firms are excluded from the sample since they may act differently to larger firms because of their restraints in terms of operating resources and financial arrangements. The medium-sized and large firms that remain in the estimation are then defined by two criteria, namely operating revenue (\$10 million) and number of employees (200).

Under the exemption system with negative tax differentials, we find statistically significant differential tax effects, which are -0.864 and -1.065 , respectively for each sample according to the two criteria (β_5 in Columns (2) and (4) of **Table 6**). Moreover, the magnitudes are almost the same or even a little larger than the benchmark ones.

However, unlike the benchmark, the effects of the credit system are also significant (β_3 in Columns (2) and (4) of **Table 6**). This finding may suggest that the credit system is effectively identical to the exemption system for larger firms because of the feasibility of tax deferrals. In general, because larger firms do not face liquidity constraints, they can allocate capital depending on the prevailing domestic and foreign tax rates. In the case of

medium-sized and large firms, the shift from the credit system to the exemption system thus increases foreign investment by 25–39%.

Table 6: Investment Results for Medium-sized and Large Firms

Dependent variable: Subsidiaries' capital stock	(1)	(2)	(3)	(4)
	Operating revenue	Operating revenue	Number of employees	Number of employees
L. Capital Stock, Subs	0.321*** (3.88)	0.360*** (4.48)	0.321** (2.44)	0.367*** (2.84)
L2. Capital Stock, Subs	-0.023** (-2.52)	-0.025*** (-2.71)	-0.028** (-2.08)	-0.032** (-2.34)
Taxdiff * Credit * Negative (β_3)	-0.578* (-1.94)	-0.618** (-2.01)	-0.778** (-2.40)	-0.847** (-2.52)
Taxdiff * Credit * Positive (β_4)	0.168 (0.30)	0.191 (0.34)	0.203 (0.28)	0.262 (0.35)
Taxdiff * Exemp * Negative (β_5)	-0.784*** (-3.43)	-0.864*** (-3.70)	-0.955*** (-3.39)	-1.065*** (-3.72)
Taxdiff * Exemp * Positive (β_6)	-0.373 (-1.04)	-0.369 (-1.00)	0.024 (0.06)	0.080 (0.18)
GDP p.c., Subs		0.991*** (4.76)		0.950*** (3.55)
GDP p.c., Par		0.545* (1.96)		0.318 (0.93)
Population, Subs		0.828 (1.06)		0.531 (0.54)
Population, Par		1.353* (1.78)		0.541 (0.56)
Unemployment, Subs		-0.282 (-0.97)		-0.564 (-1.41)
Unemployment, Par		-0.941*** (-2.62)		-0.557 (-1.14)
Sargan–Hansen test	17.21	18.33	9.124	9.876
P-value	0.028	0.018	0.331	0.273
Arellano–Bond test AR(2)	0.357	0.444	-0.047	0.085
P-value	0.721	0.657	0.962	0.932
N	37309	37309	19754	19754

1) Parentheses contain t-statistics robust to heteroscedasticity.

2) *** indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

3) Firms are included if they meet the criteria: \$10 million in operating revenue for (1) and (2), and 200 employees for (3) and (4).

The second robustness check is to estimate the results for the manufacturing and non-manufacturing sectors separately in order to reduce the heterogeneity of our sample (Table 7). Indeed, since the manufacturing sector often creates more jobs and places stronger positive externalities on the whole economy, knowing which of these sectors responds to tax differentials in credit or exemption systems may be of interest.

Under the exemption system with negative tax differentials, we find statistically significant differential tax effects in both the manufacturing and the non-manufacturing

sectors (β_5 in Columns (2) and (4) of **Table 7**). However, under the credit system, while the differential tax effects are smaller and not significant for manufacturing, those for non-manufacturing significantly have the same impact as under the exemption system (β_3 in Columns (2) and (4) of **Table 7**). This finding means that the transition from the credit system to the exemption system does not influence foreign investment in the non-manufacturing sector.

Table 7: Investment Results by Sector

Dependent variable: Subsidiaries' capital stock	(1)	(2)	(3)	(4)
	Manufacturing	Manufacturing	Non-Manufacturing	Non-Manufacturing
L. Capital Stock, Subs	0.116 (0.82)	0.178 (1.32)	0.472** (7.26)	0.482*** (7.54)
L2. Capital Stock, Subs	-0.020* (-1.64)	-0.025** (-1.99)	-0.026*** (-2.64)	-0.027*** (-2.68)
Taxdiff * Credit * Negative (β_3)	-0.257 (-0.74)	-0.313 (-0.89)	-0.764* (-1.67)	-0.819* (-1.77)
Taxdiff * Credit * Positive (β_4)	-0.504 (-0.76)	-0.386 (-0.57)	-0.208 (-0.33)	-0.379 (-0.59)
Taxdiff * Exemp * Negative (β_5)	-0.507* (-1.72)	-0.642** (-2.18)	-0.761** (-2.47)	-0.840*** (-2.66)
Taxdiff * Exemp * Positive (β_6)	-0.233 (-0.55)	-0.142 (-0.34)	-0.939** (-1.96)	-0.997** (-2.05)
GDP p.c, Subs		1.185*** (4.22)		0.969*** (3.96)
GDP p.c, Par		0.433 (1.20)		0.892** (2.53)
Population, Subs		0.084 (0.07)		2.315** (2.43)
Population, Par		0.985 (0.92)		0.048 (0.06)
Unemployment, Subs		-0.269 (-0.73)		-0.672* (-1.74)
Unemployment, Par		-0.507 (-0.98)		-0.432 (-1.07)
Sargan–Hansen test	7.392	8.025	12.83	13.32
P-value	0.494	0.431	0.117	0.101
Arellano–Bond test AR(2)	0.761	0.867	-0.497	-0.487
P-value	0.446	0.856	0.619	0.626
N	20527	20527	26487	26487

1) Parentheses contain t-statistics robust to heteroscedasticity.

2) *** indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

5.2 Results for profit shifting

Regarding profit shifting, for the benchmark, we find statistically significant results for the differential tax effects under both systems when tax differentials are negative (α_2 and α_4

in Column (2) of **Table 8**), which supports Proposition 5. The magnitudes of this effect are larger than those for foreign investment and similar under both systems. This result confirms the need to consider the impact of tax differentials on profit shifting as well as on foreign investment.

The result that the two systems have almost equal differential tax effects may reflect the fact that profit shifting activities are prevalent regardless of the prevailing tax system, which defies Proposition 6. This finding suggests that the differential tax effects on foreign investment presented in **Table 5** are partly offset by profit shifting under both systems, whereas the increase in the differential tax effects on foreign investment owing to the transition from the credit system to the exemption system is not offset by profit shifting.

Table 8: Results for Profit Shifting

Dependent variable: Subsidiaries' pre-tax profits	(1)	(2)	(3)	(4)
	Benchmark	Benchmark	Medium-sized and large firms	Medium-sized and large firms
Capital Stock, Subs	0.587*** (4.32)	0.537*** (4.39)	0.567*** (3.25)	0.515*** (3.28)
Taxdiff * Credit * Negative (α_2)	-1.302** (-2.41)	-1.331** (-2.48)	-0.956* (-1.66)	-0.952* (-1.66)
Taxdiff * Credit * Positive (α_3)	-0.563 (-0.59)	-0.644 (-0.68)	-0.646 (-0.59)	-0.630 (-0.58)
Taxdiff * Exemp * Negative (α_4)	-1.148*** (-3.44)	-1.218*** (-3.70)	-0.726** (-1.97)	-0.760** (-2.09)
Taxdiff * Exemp * Positive (α_5)	-0.106 (-0.23)	-0.152 (-0.33)	-0.483 (-0.92)	-0.467 (-0.90)
GDP p.c., Subs		0.014 (1.41)		0.012 (1.02)
GDP p.c., Par		-0.010 (-0.47)		-0.003 (-0.14)
Population, Subs		-0.0007 (-0.17)		0.005 (1.21)
Population, Par		-0.007* (-1.75)		-0.009* (-1.83)
Unemployment, Subs		-0.299* (-1.75)		-0.371* (-1.87)
Unemployment, Par		0.092 (0.48)		0.039 (0.18)
<i>N</i>	44817	44867	33562	33562

1) Parentheses contain t-statistics robust to heteroscedasticity.

2) *** indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

3) First-differencing approach.

The results for medium-sized and large firms have the same characteristics as the benchmark (α_2 and α_4 in Column (4) of **Table 8**), although the magnitudes of the differential tax effects are somewhat lower. The differential tax effects are larger under the credit system than under the exemption system, but this distinction may arise from the differences between the sample countries that employ credit or exemption systems.

By sector, there is a difference in the tax effects between manufacturing and non-manufacturing firms on profit shifting as well as on foreign investment (α_2 and α_4 in Columns (2) and (4) of **Table 9**). However, the impacts on profit shifting in each sector are different from those of foreign investment. While the differential tax effects on profit shifting are significant under both the credit and the exemption systems for manufacturing as with the benchmark, only the exemption system has significant effects for non-manufacturing.

Table 9: Profit Shifting Results by Sector

Dependent variable: Subsidiaries' pre-tax profits	(1)	(2)	(3)	(4)
	Manufacturing	Manufacturing	Non-Manufacturing	Non-Manufacturing
Capital Stock, Subs	0.652 (1.55)	0.554* (1.77)	0.523*** (4.03)	0.491*** (4.01)
Taxdiff * Credit * Negative (α_2)	-1.335* (-1.73)	-1.447* (-1.94)	-0.751 (-0.96)	-0.743 (-0.95)
Taxdiff * Credit * Positive (α_3)	1.271 (0.81)	1.213 (0.84)	-1.889 (-1.38)	-2.021 (-1.47)
Taxdiff * Exemp * Negative (α_4)	-0.834 (-1.53)	-0.918* (-1.83)	-1.328*** (-2.95)	-1.376*** (-3.07)
Taxdiff * Exemp * Positive (α_5)	0.574 (0.80)	0.513 (0.76)	-0.580 (-0.90)	-0.620 (-0.97)
GDP p.c., Subs		0.007 (0.32)		0.017 (1.44)
GDP p.c., Par		-0.033 (-0.99)		-0.001 (-0.04)
Population, Subs		0.004 (0.65)		-0.002 (-0.45)
Population, Par		-0.008 (-1.27)		-0.006 (-1.12)
Unemployment, Subs		-0.499* (-1.88)		-0.197 (-0.88)
Unemployment, Par		-0.436 (-1.46)		0.398 (1.50)
N	19376	19376	25036	25036

1) Parentheses contain t-statistics robust to heteroscedasticity.

2) *** indicates statistical significance at the 1% level, ** indicates statistical significance at the 5% level, and * indicates statistical significance at the 10% level.

3) First-differencing approach.

By combining the results of profit shifting with those of foreign investment, we can thus infer that only non-manufacturing firms have sufficient capability to shift profits in order to offset the increase in the differential tax effects caused by the transition from the credit system to the exemption system.

5 Conclusions

In this study, we examined whether the tax effects on foreign investment and profit shifting differ under the credit and exemption taxation systems. Based on the presented empirical analyses using OECD data on selected countries, we found that the differential tax effects on foreign investment are statistically significant under the exemption system when tax differentials are negative. The results presented herein also suggest that a shift from the credit system to the exemption system increases foreign investment by about 80% for the whole sample and by about 25–39% for medium-sized and large firms.

The tax effect on profit shifting is different from that on foreign investment in that the magnitude is larger even though the effects on profit shifting seem to be the same under both systems. This result suggests that multinationals currently make use of tax planning under both systems and that profit shifting mitigates the differential tax effects on foreign investment. However, profit shifting may not offset the increase in the differential tax effects caused by the transition from the credit system to the exemption system.

By sector, we found interesting results. In the manufacturing sector, the shift from the credit system to the exemption system increases foreign investment, while it does not affect profit shifting. On the contrary, the change in international tax system encourages non-manufacturing firms to shift profits more in foreign countries but not to increase their foreign investment. These results suggest that non-manufacturing firms have sufficient capability to shift profits compared with manufacturing firms in order to offset the increase in the differential tax effects on foreign investment owing to the change in international tax system.

Our analyses have data limitations. Only statutory tax rates are utilized for the

calculation of tax differentials in the analysis. Effective tax rates should also be used because tax base is another factor that affects firms' decisions on foreign investment. Further, our data on foreign investment of subsidiaries include new cross-border investment by parents, incremental capital investment, and M&As by existing subsidiaries. However, because each investment may differently react to tax differentials, further research by using more detailed data on tax rates and foreign investment is necessary.

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