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Debt financing and sharp currency depreciations: wholly versus partially-owned multinational affiliates

Shafik Hebous · Alfons J. Weichenrieder

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Abstract This paper provides empirical evidence on two potential costs of shared ownership of German affiliates abroad. First, in periods of currency crises, wholly-owned affiliates, in contrast to partially-owned affiliates, seem to circumvent financial constraints by accessing capital from their parent companies. In terms of differences in performance regarding sales of both types of firms, wholly-owned affiliates have a significantly better sales performance than partially-owned affiliates in periods of crises. This finding contributes to the evidence that FDI helps in mitigating the negative consequences of sharp currency depreciation, and stresses that this effect works especially through capital inflows to wholly-owned affiliates. Second, the debt financing of partially-owned affiliates is less sensitive to the tax rate suggesting that partially-owned affiliates rely less on international debt shifting than wholly-owned affiliates. This indicates that partially-owned affiliates are less flexible to exploit tax efficient strategies.

Keywords Foreign direct investment · Capital structure · Ownership structure · Currency crises · Corporate taxation

JEL Classification F230 · G320

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1 Introduction

This paper examines the debt financing behaviour of partially-owned and wholly-owned German affiliates abroad throughout periods of sharp currency depreciation (currency crises) in the host economies, and compares the differences between both types of affiliates in relying on international debt shifting.

There are two main findings. First, the results indicate that wholly-owned affiliates, in contrast to partially-owned affiliates, can circumvent financial constraints during periods of sharp currency depreciation by accessing capital from their parent companies and related parties. The ratio of loans granted from a German parent company to total assets of a wholly-owned affiliate increases by about 2% points during years of sharp currency depreciation in emerging markets. Meanwhile, this ratio is lower by about 2.5% points in the case of partially-owned affiliates during episodes of currency crises. Decomposing the partial ownership structure into minority and majority-owned affiliates shows that the negative effect on the loan ratio is more pronounced in the case of minority-owned affiliates. With regards to differences in sales of both types of firms, the evidence suggests that sales of partially-owned affiliates decline in periods of crises, while wholly-owned affiliates manage to keep their sales unaltered.

Second, the results suggest that wholly-owned affiliates rely more on debt shifting than partially-owned affiliates. Particularly, a 10% increase in the corporate tax rate in emerging markets increases the ratio of total debt to total asset of wholly-owned affiliates by about 27% points. However, for partially-owned and minority-owned affiliates, we cannot find evidence on debt shifting responses to higher tax rates. This is also true in the sample of affiliates operating in OECD countries suggesting that the ownership structure matters for tax planning and debt policy of affiliates not only in emerging markets but also in advanced economies.

These findings are linked to two branches in the literature: the literature on the costs of shared ownership and the literature on the effects of sharp depreciations and currency crises. Theoretical and empirical studies that address the costs of sharing the ownership of the affiliate emphasise aspects such as coordination costs and the cost of shared control rights and technology; Desai et al. (2004), Ramachandran (1993), and Grossman and Hart (1986). Furthermore, costs of shared ownership arise with regard to shifting taxable profit from high tax to low tax rate countries. For instance, Weichenrieder (2009) finds that a change in the tax rate has a larger impact on the profitability of wholly-owned than partially-owned German affiliates. Desai et al. (2004) find a similar effect for US affiliates.

In this context, our results point out to two new potential costs of shared ownership. The first finding indicates that accommodating the financial needs of multinational affiliates is easier when the parent enjoys full control over the affiliate. In periods of currency crises it is more difficult for partially-owned affiliates to access capital from parent companies than wholly-owned affiliates. The second finding on debt shifting experiences suggests that multinational firms engage in worldwide tax planning not only with respect to profit shifting but also with respect to debt policy. However, the reaction of partially-owned affiliates is not consistent

with international debt shifting. This result is a new evidence that partially-owned affiliates are less inclined to be shaped in a tax efficient way.¹

The effects of sharp depreciations and currency crises are examined in the literature by focusing on various aspects. A macroeconomic aspect includes for example studies that investigate the response of macroeconomic variables such as output and the current account to currency depreciations (Gupta et al. 2007). A microeconomic aspect concentrates on financial issues such as the foreign exchange exposure of the firm and corporate financial policies around periods of sharp depreciation (Bris and Koskinen 2002; Bris et al. 2004). There are recent attempts, to which this paper belongs, to use data at the firm level to provide microeconomic evidence on ideas that have macroeconomic interpretations. For example, Desai et al. (2008) compare the reaction of US affiliates with local firms to currency depreciations, and conclude that US affiliates, in contrast to local firms, expand their activities after sharp depreciations. This finding supports the idea that foreign direct investment (FDI) tends to mitigate the negative effect of a sharp depreciation or the severity of a currency crises. As an explanation for their finding, Desai et al. (2008) provide evidence for the hypothesis that foreign affiliates overcome financial constraints through internal capital markets with the parent companies. These results are connected to the rich literature on the positive effects of FDI on host economy firms through channels such as technology spillover as for example in Keller and Yeaple (2009).² Alvarez and Görg (2007) consider a distinct but related issue of employment response of multinational subsidiaries and local firms in a period of economic slowdown in Chile, and find no evidence on differential reactions between both types of firms.

In conjunction with this literature, our results contribute to the evidence that FDI helps in mitigating the negative consequences of sharp currency depreciations. Moreover, the results put forth that the effect works especially through inflows of loans from parent companies and related parties to wholly-owned affiliates. This is an indication of a negative effect of restricting foreign ownership of the affiliates by the law of the host economy.

This paper proceeds as follows: In Sect. 2, we describe the data, identify episodes of sharp currency depreciation and provide descriptive statistics. We present our empirical results in Sect. 3 and conclude in Sect. 4.

2 Data, depreciation episodes and descriptive statistics

2.1 Data and depreciation episodes

This study employs the Deutsche Bundesbank MiDi data set on the German outbound FDI. This firm-level data set contains information on private, publicly

¹ While the focus in this paper is to compare differences between both types of affiliates, other studies examine the determinants of the ownership decision. For example, Raff et al. (2009) stress the role of firm productivity in the ownership decision and provide evidence from Japanese multinational firms. Kesternich and Schnitzer (2009) find that the ownership share depends negatively on political risks.

² See Smeets (2009) and Görg and Greenaway (2004) for a survey.

traded and government-owned German affiliates abroad. The foreign trade and payments regulation oblige all German firms investing abroad and satisfying the reporting requirements to report several key balance sheet items of their affiliates abroad. We concentrate on firms in manufacturing industries and exclude banks, financial and non-profit institutions. To correct for changes in the reporting requirements for German investors during the sample period, we drop all affiliates that are characterised by a total balance sheet of less than five million euro and discard affiliates that do not exist for at least three consecutive years.³ The final full sample spans from 1996 to 2006 and contains observations on 106,809 German affiliates in 55 countries (on average 9,710 affiliates per year).

Since a prime interest in this paper is the impact of currency crises on the debt behaviour of affiliates, a sample of emerging markets is required. Also, in examining the power of taxation in explaining the debt policy of affiliates, it is constructive to distinguish between those affiliates located in OECD countries and those in emerging markets. Therefore, we obtain two sub-samples by restricting the full sample to either include only emerging markets or only OECD countries. We identify emerging markets as those economies that are classified as middle income economies by the World Bank and for which we have information on German affiliates. Hence, the sample of emerging markets contains observations on 28,178 German affiliates in 31 countries (on average 2,562 affiliates per year) whereas the OECD sample contains observations on 87,099 German affiliates. Both sub-samples, like the full sample, span from 1996 to 2006.

Data on statutory corporate income tax rates have been taken from Mintz and Weichenrieder (2010), PricewaterhouseCoopers and KPMG. The source of macroeconomic variables is the International Financial Statistics of the International Monetary Fund. In computing the nominal exchange rates between the euro and the national currencies for the period before 1999, we employ the exchange rate of the ECU (European Currency Unit) vis-à-vis the Deutsche Mark. The real exchange rate between the euro and the currency of the host economy is obtained by deflating the nominal rate by the ratio of the German producer price index to the producer price index of the host economy.⁴

We identify real depreciation episodes (currency crises) in emerging markets as follows:

$$crisis_{n,t} = \begin{cases} 1 & \text{if } RER_{n,t} \geq RER_n^{average} + 2 \times STD(REER_n) \\ 0 & \text{else} \end{cases} \quad (1)$$

The subscripts n and t are a country and a time index, respectively. The depreciation dummy is equal to one if the change in the real exchange rate (RER) is greater than or equal to its country mean times double its standard deviation (STD) for the period 1990–2007. Otherwise, the depreciation dummy takes the value zero. This method is in line with the identification methods used in the literature on currency crises.⁵

³ See Lipponer (2008) for details on the reporting requirements and the MiDi data set.

⁴ The producer price index is not available for five countries. In these cases, we use the consumer price index.

⁵ See Laeven and Valencia (2008), Kaminsky et al. (1998), and Frankel and Rose (1996).

It captures well-known years of sharp currency depreciation such as 1998 in Russia, 1999 in Brazil and 2002 in Argentina. Table 6 in the appendix displays a list of the identified years of depreciation.

2.2 Descriptive statistics

The degree of ownership of an affiliate is computed in the MiDi data set based upon the actual share of the parent firm in nominal capital of the affiliate. If this share is 100%, we consider the affiliate to be wholly-owned. Otherwise, the affiliate is considered to be partially-owned. In our regression analysis, we make a further distinction among partially-owned affiliates between minority-owned, characterised by a participation share of less than 50%, and majority-owned, characterised by a participation share of greater than 50% but less than 100%.

Table 1 displays the number of affiliates and summary statistics of variables used in our econometric analysis. Considering the sample of all countries, 75% of the affiliates are wholly-owned while 25% are partially-owned. In the sample of emerging markets, about 64.5% of the affiliates are wholly-owned while 35.5% are partially-owned. In OECD countries partially-owned affiliates constitute about 22% of total affiliates. Further, Table 1 reveals that with respect to the ratio of total debt or sales there are no substantial differences between both types of affiliates or between affiliates across countries.⁶ However, the ratio of loans from parent companies tends to be lower for partially-owned affiliates than for wholly-owned affiliates. The average statutory corporate tax rates faced by both types of firms are almost identical.

German multinational firms are increasingly relying on establishing wholly-owned affiliates to carry out their operations abroad rather than partially-owned affiliates. Considering the entire sample, panel (a) of Fig. 1 shows that the percentage of wholly-owned affiliates has increased from 70% in 1996 to about 80% in 2006.⁷ This pattern is consistent with that reported in Desai et al. (2004) for US firms. Panels (b) and (c) of Fig. 1 demonstrate that this pattern is observed in emerging markets and in OECD countries. The percentage of partially-owned affiliates has decreased from about 46% in 1996 to 30% in 2006 in emerging markets (panel b) and from 25% in 1996 to 18% in 2006 in OECD countries (panel c).

Figure 2 illustrates the pattern of wholly versus partially-owned affiliates across sectors. One important message from Fig. 2 is that we do not observe a pattern of clustering of partially-owned affiliates only in one sector and wholly-owned affiliates only in another sector. In the sample including all countries, the percentage of partially-owned affiliates is between 22 and 30% in all sectors. One exception is the wholesale trade sector. In emerging markets the percentage of partially-owned

⁶ We correct for outliers by excluding affiliates characterised by a total debt ratio above the 98th percentile. These are observations with extreme values of negative equity.

⁷ Since the key point to be made is the access of affiliates to loans from their parent companies in Germany, we consider affiliates that are owned by two or more German parents as wholly-owned affiliates.

Table 1 Descriptive statistics, 1996–2006

	Wholly-owned affiliates					
	All countries		Emerging markets		OECD countries	
	Mean	STD	Mean	STD	Mean	STD
Number of affiliates	80106		18161		67937	
Percent	75%		64.5%		78%	
Total debt ratio	0.53	0.29	0.52	0.29	0.53	0.29
Debt from parent ratio	0.13	0.21	0.14	0.21	0.13	0.21
Log of sales	8.90	3.54	9.24	2.81	8.90	3.54
Log of employment	4.5	1.47	4.8	1.41	4.5	1.61
Corporate tax rate	0.33	0.06	0.28	0.06	0.34	0.06
	Partially-owned affiliates					
	All countries		Emerging markets		OECD countries	
	Mean	STD	Mean	STD	Mean	STD
Number of affiliates	26703		10017		19162	
Percent	25%		35.5%		22%	
Total debt ratio	0.51	0.29	0.49	0.28	0.52	0.29
Debt from parent ratio	0.06	0.14	0.06	0.14	0.05	0.14
Log of sales	8.83	3.42	9.22	2.72	8.65	3.69
Log of employment	4.7	1.59	5.2	1.41	4.4	1.61
Corporate tax rate	0.32	0.06	0.30	0.06	0.35	0.06

Source MiDi data set

affiliates across sectors is between 37 and 48% (panel b) whereas it is lower in OECD countries (panel c).

3 Empirical results

3.1 Financing multinational affiliates during periods of sharp currency depreciations

Sharp currency depreciations affect firms in many ways. A depreciation of the currency of the host economy makes the products of exporting firms more competitive in the international markets supporting exports.⁸ Hence, exporting firms, whether domestic or multinational, may seek to obtain additional debt finance for expansion. Meanwhile, importing firms may not be able to fully pass through the

⁸ Forbes (2002) compares the performance of firms in economies that did not experience depreciation episodes with those located in economies that did experience depreciations without distinguishing between multinational and domestic firms. The results suggest that particularly firms with foreign sales exposure outperform those with low foreign sales exposure.

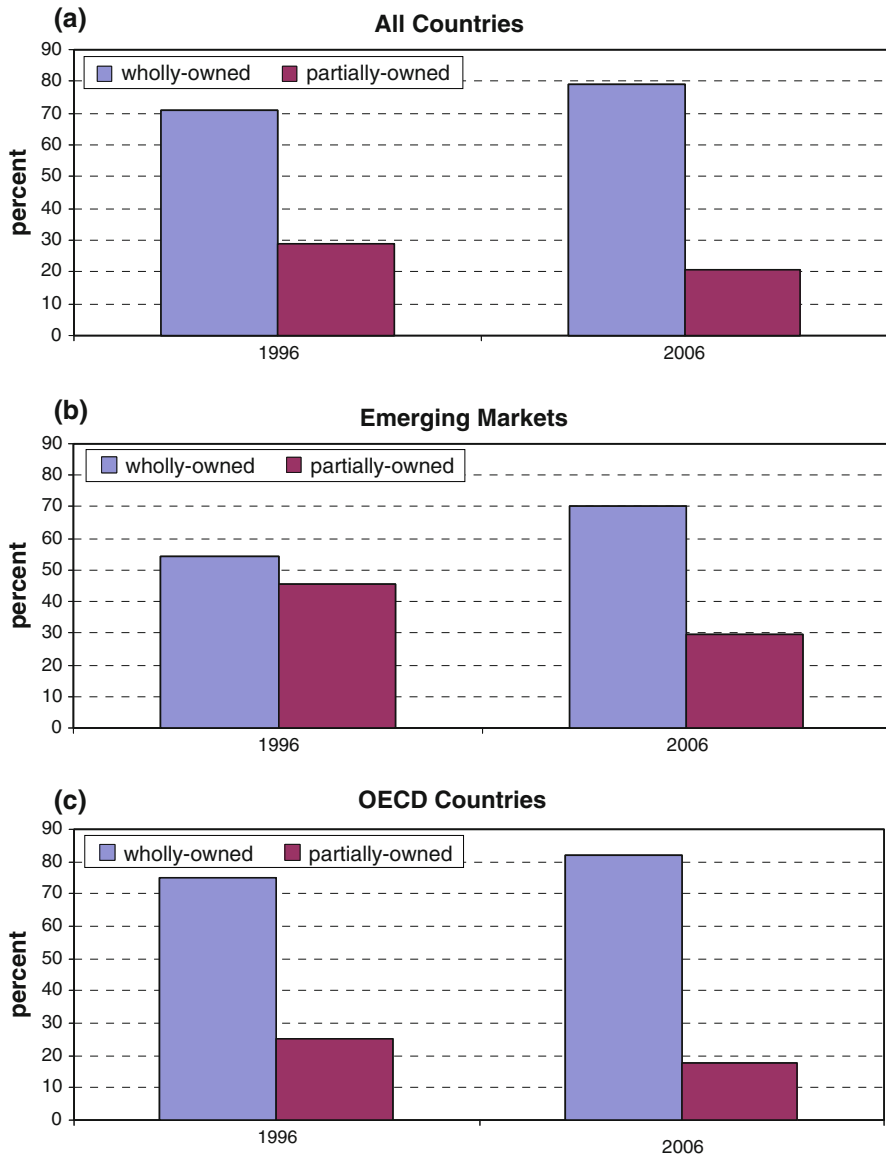


Fig. 1 Percent of wholly-owned and partially-owned German affiliates

decrease in the value of the domestic currency to domestic prices leading to financial unease and a need for funds.⁹ At the same time, many sharp depreciations, or currency crises, are associated with domestic credit crunches and banking crises causing difficulties in accessing capital from the host market. This “twin crisis”

⁹ See Campa and Goldberg (2005) for empirical evidence and Goldberg and Knetter (1997) for a literature survey on incomplete exchange rate pass-through.

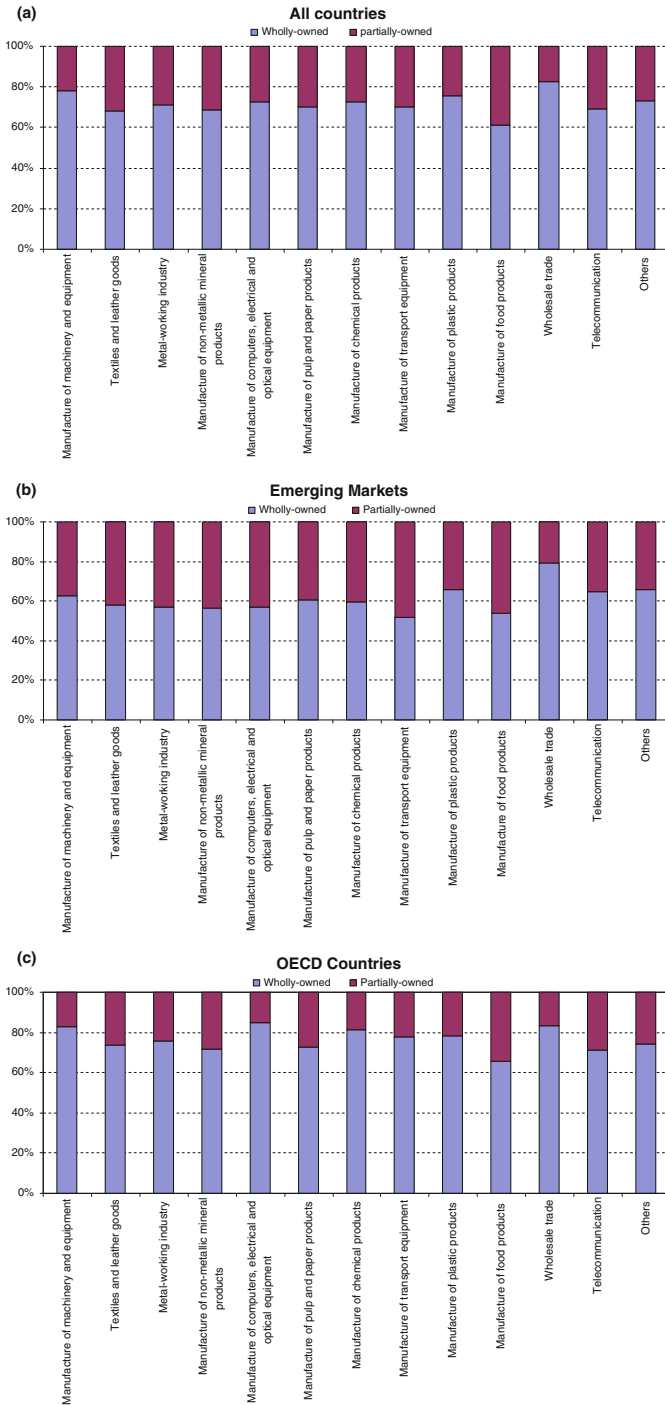


Fig. 2 The share of wholly-owned and partially-owned German affiliates by industry

phenomenon is stressed by Kaminsky and Reinhart (1999). Also, currency depreciation increases the nominal value of debt dominated in foreign currency, which raises financial leverage and limits the ability to obtain loans. The role of this balance sheet effect is considered, for example, by Krugman (1999) and Bernanke and Gertler (1989).¹⁰

Thus, firms' access to capital from the host economy can be limited during periods of sharp currency depreciation. Desai et al. (2008) emphasise that multinational firms circumvent such financial constraints by receiving capital from their parent companies. The question we ask here is: do all multinational affiliates benefit from such an effect? The answer turned out to be no; only wholly-owned affiliates do. During periods of currency crises, partially-owned German affiliates do not seem to receive extra loans from their parent companies. Theoretically, in the context of international tax planning Schindler and Schjelderup (2008) show that partially-owned affiliates are less effective in using intra-company loans to implement a tax efficient strategy than wholly-owned affiliates. The reason is that the benefits are shared with all owners even though some co-owners did not contribute to the funding of the plan. The same reasoning applies to periods of crises.

Empirically, we employ the following baseline specification:

$$\begin{aligned} debt_{k,n,t} = & \alpha + \beta_1(crisis_{n,t} \times partially_k) + \beta_2(tax_{n,t} \times partially_k) \\ & + \Gamma \mathbf{z}_{k,n,t} + \eta_{n,t} + \varepsilon_{k,t} \end{aligned} \quad (2)$$

where the subscript k denotes each firm, n is a subscript for each country, and t is a subscript for each year. The dependent variable, $debt$, is either the ratio of debt from parent companies and related parties in Germany to total asset or the total-debt ratio of the affiliate. The dummy $crisis$ is equal to one if the host economy experiences a sharp real currency depreciation (currency crisis) in that year as identified in Eq. 1 in Sect. 2.1. The dummy $partially$ is equal to one if the affiliate is partially owned and zero otherwise. The variable tax is the statutory corporate income tax rate of the host economy. The vector $\mathbf{z}_{k,n,t}$ is a vector of additional controls with associated vector of the coefficients in Γ . The set of country-year fixed effects ($\eta_{n,t}$) control for all unobserved country-year specific macroeconomic factors. The error term is denoted by $\varepsilon_{k,t}$. All standard errors are corrected for clustering at the country-year level. As we are interested in the effects of currency crises, the empirical analysis in this section is concentrated on emerging markets.

In this framework, since a currency crisis is a country-year event the identification strategy is based on interaction terms between the ownership dummy (a time-invariant firm-specific variable) and time variant country-specific variables. Our main interest is the coefficient on the interaction term between the $crisis$ dummy and the partially-owned dummy β_1 , which we expect to be negative. Further, one important factor in explaining the debt behaviour of

¹⁰ Empirically, Aguiar (2005) finds that firms with heavy exposure to short-run foreign currency debt before the Mexican devaluation of the peso crisis in 1994 experience relatively low levels of post-devaluation investment. Bleakley and Cowan (2008) examine firms in five Latin American countries and find no support that those firms holding more dollar debt invest less than firms indebted in local currency.

multinational affiliates is the tax rate. Since the interest payments on debt can be deducted from taxes, firms rely more on debt financing than equity in an environment of high taxes. Empirical evidence on such international debt shifting strategies is provided for example by Huizinga et al. (2008) on European firms, and Jog and Tang (2001) on firms operating in Canada. Multinational affiliates can seek a tax shelter especially through loans from their parent companies. Our aim here is to distinguish between multinational affiliates based on the ownership structure. Do partially-owned affiliates exploit this strategy of debt shifting less than wholly-owned affiliates? If the estimated sign of β_2 is negative then the answer is yes.

Table 2 presents the estimation results. In columns (1) to (5) the dependent variable is the ratio of debt from parent companies and related parties in Germany to total assets (loan-ratio). In column (1), the estimated β_1 is negative and significant suggesting that the loan ratio of a partially-owned affiliate is lower than that of a wholly-owned affiliate by 2.5% points in a year of a currency crisis.

In column (2), we introduce the partially-owned dummy and interaction terms between the partially-owned dummy and a vector of controls including the tax rate, GDP, domestic credits to private sector as percent of GDP, the interest rate in the host economy, and sales of the affiliates. The coefficient on the interaction term between the depreciation dummy and the partially-owned dummy β_1 is as expected negative and significant. The estimated coefficient on the interaction term between the partially-owned dummy and the tax rate β_2 is also significant and negative (-0.07). This indicates that partially-owned affiliates are less likely to employ a tax efficient loan policy. In Sect. 3.3, we will scrutinise whether or not this finding can be maintained in a sample of OECD countries.

A partial ownership structure can be decomposed into minority-owned and majority-owned affiliates. In column (3), we introduce dummies capturing this decomposition and multiply these dummies with the *crisis* dummy and the tax rate. Both, the estimated coefficient on the variable “*minority-owned* \times *crisis*” (-0.041) and on the variable “*majority-owned* \times *crisis*” (-0.028) are negative and significant. The coefficient on “*minority-owned* \times *crisis*” in absolute value is larger though, indicating that minority-owned affiliates are particularly less inclined to increase their ratios of loans from the parent firm in periods of crises. Further, the evidence suggests that the loan ratio of *minority-owned* affiliates is not increasing in the tax rate as indicated by an estimated coefficient of -0.112 .

As a robustness check, instead of country-year fixed effects we employ in columns (4) and (5) of Table 2 country, year and industry fixed effects. This allows us to control for potential characteristics that are unique to a certain economic sector within a country and year. In this setup, we can introduce time-variant country-specific variables including the crisis dummy without interaction. The estimated coefficient on the *crisis* dummy is positive and significant suggesting that in a year of currency crisis the loan ratio of a wholly-owned affiliate increases by 2% points. In contrast, the estimated β_1 is as expected negative indicating that the increase in loan ratio is only a feature of the loan ratio of wholly-owned affiliates but not of partially-owned affiliates. According to the international debt shifting hypothesis the loan ratio is expected to positively depend on the tax rate; the higher the tax rate the

Table 2 Currency crises and intra-company financing

Dependent variable	Debt to enterprises in Germany/total asset				
	(1)	(2)	(3)	(4)	(5)
<i>Crisis</i>					
Partially-owned \times <i>crisis</i>	-0.025* (.014)	-0.028** (.035)		0.020** (.008)	0.017* (.10)
Partially owned	-0.07*** (.002)	-0.07 (.05)		-0.21** (.011)	-0.026** (.011)
Partially-owned \times tax rate		-0.070** (.03)		-0.08 (.052)	-0.06 (.05)
Partially-owned \times credit/GDP		0.010** (.000)		-0.086** (.033)	-0.07** (.03)
Partially-owned \times GDP		0.001 (.002)		0.012** (.006)	0.12** (.006)
Partially-owned \times sales		-0.001 (.0008)		0.002 (.002)	0.001 (.002)
Partially-owned \times interest		0.018 (.01)		-0.001* (.0007)	-0.001* (.00)
Minority-owned \times <i>crisis</i>			-0.041*** (.01)	0.017 (.018)	0.022 (.018)
Majority-owned \times <i>crisis</i>			-0.028* (.01)		
Minority-owned			-0.10* (.05)		
Majority-owned			-0.12* (.06)		
Minority-owned \times tax rate			-0.112** (.04)		
Majority-owned \times tax rate			0.001 (.04)		
Minority-owned \times credit/GDP			0.017* (.008)		
Minority-owned \times GDP			0.001 (.002)		
Minority-owned \times sales			-0.000 (.000)		
Minority-owned \times interest			0.010 (.018)		
Majority-owned \times credit/GDP			0.026*** (.008)		
Majority-owned \times GDP			0.004 (.003)		
Majority-owned \times sales			-0.003** (.001)		
Majority-owned \times interest			0.033* (.017)		
Tax rate				0.27*** (.04)	2.05*** (.75)

Table 2 continued

Dependent variable	Debt to enterprises in Germany/total asset				
	(1)	(2)	(3)	(4)	(5)
Credit/GDP					
GDP				0.35*** (.012)	0.04 (.04)
Interest rate				−0.02*** (.007)	−0.06*** (.01)
Sales				0.01 (.01)	0.20*** (.08)
<i>Crisis</i> × tax rate		−0.002*** (.0007)	−0.002*** (.0007)	−0.002*** (.007)	−0.006*** (.001)
<i>Crisis</i> × credit/GDP					0.13 (.16)
<i>Crisis</i> × sales					−0.01** (.004)
<i>Crisis</i> × interest rate					−0.001 (.002)
Country-year fixed effects	Yes	Yes	Yes	No	0.019 (.018)
Country fixed effects	No	No	No	Yes	No
Year fixed effects	No	No	No	Yes	Yes
Industry fixed effects	No	Yes	Yes	Yes	Yes
Number of observations	28,178	27,821	28,178	27,821	27,821
Adjust <i>R</i> ²	0.05	0.09	0.09	0.09	0.09

Depreciation is a dummy that is equal to 1 if the year is identified as a currency crisis year; see Sect. 2.1. Tax rate is the statutory corporate income tax rate. Partially-owned is a dummy that is equal to 1 if the affiliate is not entirely-owned by a German parent company. Minority-owned and majority-owned are dummies equal to 1 if the affiliate is minority-owned and majority-owned respectively. For a detailed description of the data on German multinational affiliates see Sect. 2. Credit/GDP is the ratio of credit to private sector to GDP. Standard errors reported in parentheses are robust corrected for clustering at the country-year level

***, **, * indicate significance at the level of 1, 5 and 10% respectively

higher the benefits from financing through loans. Indeed, the estimated coefficient on the tax rate is positive and significant. However, the estimated sign of β_2 is negative suggesting that partially-owned affiliates are less sensitive to the tax rate than wholly-owned affiliates.

As a further robustness check, column (5) includes the same set of fixed effects as in column (4) but in addition it contains interaction terms between the *crisis* dummy and all control variables. The results are robust. β_1 and β_2 maintain their sign and significance while most estimated coefficients on these interaction terms are insignificant at a convenient level. The ratio of credits to the private sector to GDP captures the liquidity of the financial market of the host economy. Intuitively, high liquidity in the financial market of the host economy may negatively affect the loan-ratio. Our estimates, however, are positive and significant rejecting this intuition. German affiliates seem not to rely extensively on the capital market of the host economy. Therefore, in the time of a credit boom in the host economy they may demand more loans from their parents to keep up with local competitors.¹¹ Concerning the interest rate of the host economy, it is insignificant in specification 4. However, in specification 5, the interest rate is positive indicating that a high interest rate in the host economy leads to a higher loan ratio from the parent firm.

Thus far, we have established that wholly-owned affiliates seem to receive more loans from their parents than partially-owned affiliates during periods of sharp real currency depreciation. An important question that arises is what happens to the total debt ratio of both types of affiliates during periods of sharp currency depreciation? In columns (1)–(5) of Table 3, we estimate the same set of specifications as in columns (1)–(5) of Table 2 but use the total debt ratio as the dependent variable. In all specifications, the total debt ratio of partially-owned affiliates decreases in years of crises. With reference to columns (1)–(5) of Table 2, most of this decrease is attributed to the decrease in loans from the parent firm and related parties. In the case of wholly-owned affiliates however, the reference group in specification (4) of Table 3 for example, the total debt ratio increases during episodes of currency crises by a magnitude of 2.8% points. Further, with regard to the total debt ratio, the estimates suggest that minority-owned affiliates seem to be particularly financially less flexible in years of currency rises as indicated by the coefficient of -0.054 in column (3). The negative coefficients on the partially-owned dummy reported in specifications (1), (2), (4) and (5) suggest that partially-owned affiliates are less indebted than wholly-owned affiliates. Furthermore, unlike in the case of the intra-company loan ratio, the effect of the tax rate on the total debt ratio is insignificant indicating that tax sheltering through debt policy of multinational firms is especially achieved through loans from the parent company and affiliated parties.

In sum, the results presented in this section point to two potential costs of shared ownership. First, wholly-owned affiliates seem to be financially more flexible to manage crises while the loan ratio of partially-owned affiliates decreases in periods

¹¹ Some studies consider the other side of the issue, namely, the effects of FDI on the host market financial development. See for example Harrison and McMillan (2003).

Table 3 Currency crises and total debt

Dependent variable	Total debt/total asset				
	(1)	(2)	(3)	(4)	(5)
<i>Crisis</i>					
Partially-owned \times <i>crisis</i>	-0.031* (.01)	-0.028* (.015)		0.028*** (.01)	0.01 (.20)
Partially owned	-0.024*** (.004)	-0.40*** (.008)		-0.026* (.015)	-0.31** (.08)
Partially-owned \times tax rate		0.04 (.05)		-0.38*** (.08)	-0.38*** (.08)
Partially-owned \times credit/GDP		0.01 (.009)		0.010 (.06)	0.03 (.06)
Partially-owned \times GDP		0.01*** (.004)		0.01 (.008)	0.01 (.008)
Partially-owned \times sales		0.00 (.00)		0.019*** (.004)	0.01*** (.004)
Partially-owned \times interest		-0.024 (.02)		0.00 (.00)	0.00 (.00)
Minority-owned \times <i>crisis</i>			-0.054*** (.02)	-0.014 (.02)	-0.013 (.02)
Majority-owned \times <i>crisis</i>			0.01 (.01)		
Minority-owned			-1.04*** (.11)		
Majority-owned			-0.20** (.09)		
Minority-owned \times tax rate			0.14 (.09)		
Majority-owned \times tax rate			0.00 (.07)		
Minority-owned \times credit/GDP			0.10*** (.01)		
Minority-owned \times GDP			0.04*** (.00)		
Minority-owned \times sales			0.003* (.00)		
Minority-owned \times interest			-0.03 (.030)		
Majority-owned \times credit/GDP			0.01 (.01)		
Majority-owned \times GDP			0.01*** (.005)		
Majority-owned \times sales			-0.006*** (.002)		
Majority-owned \times interest			-0.04* (.02)		
Tax rate				0.23*** (.08)	-0.95 (1.4)

Table 3 continued

Dependent variable	Total debt/total asset				
	(1)	(2)	(3)	(4)	(5)
Credit/GDP					-0.14* (.08)
GDP				0.05** (.02)	-0.08*** (.02)
Interest rate				-0.07*** (.01)	0.23 (.18)
Sales				-0.03 (.03)	-0.003 (.004)
<i>Crisis</i> × tax rate		0.007*** (.00)	0.007*** (.00)	0.007*** (.001)	-0.021 (.36)
<i>Crisis</i> × credit/GDP					0.002 (.009)
<i>Crisis</i> × sales					0.001 (.004)
<i>Crisis</i> × interest rate					0.01 (.04)
Country-year fixed effects	Yes	Yes	Yes	No	No
Country fixed effects	No	No	No	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes
Industry fixed effects	No	Yes	Yes	Yes	Yes
Number of observations	28,178	27,821	27,821	27,821	27,821
Adjust R^2	0.05	0.13	0.13	0.12	0.13

Depreciation is a dummy that is equal to 1 if the year is identified as a currency crisis year; see Sect. 2.1. Tax rate is the statutory corporate income tax rate. Partially-owned is a dummy that is equal to 1 if the affiliate is not entirely-owned by a German parent company. Minority-owned and majority-owned are dummies equal to 1 if the affiliate is minority-owned and majority-owned respectively. For a detailed description of the data on German multinational affiliates see Sect. 2. Credit/GDP is the ratio of credit to private sector to GDP. Standard errors reported in parentheses are robust corrected for clustering at the country-year level

***, **, * indicate significance at the level of 1, 5 and 10% respectively

of crises. Second, consistent with a tax efficient strategy, the intra-company loan policy of wholly-owned affiliates is sensitive to the tax rate of the host economy which is not the case for the loan policy of partially-owned affiliates.

3.2 Performance of multinational affiliates during periods of sharp currency depreciation

The financial flexibility of multinational affiliates may affect their performance during periods of currency crises. In this section, we consider the question: can we observe differences in performance of both types of affiliates during currency crises? The answer seems to depend on what do we mean by performance. We examine two measures of performance, sales growth and employment growth, within a similar empirical specification to the one presented in Eq. 2:

$$growth_{k,n,t} = \alpha + \delta(crisis_{n,t} \times partially_k) + \Phi \mathbf{q}_{k,n,t} + \eta_{n,t} + e_{k,t} \quad (3)$$

where growth is either sales growth or employment growth of the affiliate and is measured as annual change. The vector Φ is a vector of coefficients corresponding to the controls in $\mathbf{q}_{k,n,t}$. The error term is denoted by $e_{k,t}$. In this specification, the coefficient δ is our main interest. A negative δ would indicate a decline in the performance of partially-owned affiliates in years of crises.

Table 4 displays the results. In terms of sales growth, columns (1)–(4), the results suggest that wholly-owned affiliates manage to keep their sales unchanged during periods of currency crises. The coefficient on the interaction term between the partially-owned dummy and the *crisis* dummy (δ) is negative and significant indicating that sales of partially-owned affiliates decline during currency crises. For example, the coefficient of -0.27 in column (1) indicates that partially-owned affiliates' sales growth in a year of crisis is 27% points lower than wholly-owned affiliates' sales growth. While in columns (1) and (2) we use country-year fixed effects, as a robustness check we account for unobserved heterogeneity of affiliates by using in column (3) a set of country-industry fixed effects and in column (4) a set of affiliates and year fixed effects. The coefficient on the *crisis* dummy, although negative, is insignificant indicating that wholly-owned affiliates manage to keep their sales growth unaltered in episodes of sharp currency depreciations. However, δ remains negative and significant.

If performance is considered in terms of consequences for the employment of the affiliate, in all specifications, the estimated coefficient on the interaction term between the partially-owned dummy and the *crisis* dummy is insignificant. Additionally, the results in columns (7) and (8) in Table 4 indicate a decrease in the number of employees in crises periods of about 3% points regardless of the ownership structure of the affiliate. This is not necessarily surprising. Domestic co-owners of partially-owned affiliates in emerging markets may be keen on a cautious rather than massive reduction in employment for social and political reasons. Also, we do not have details of the type of employment contracts prevailing across types of firms. It is possible that the cost of labour is higher for wholly-owned multinational affiliates because they offer more insurance or higher

Table 4 Currency crises and firm performance

Dependent variable	Sales growth			Employment growth				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crisis			-0.02 (.09)	-0.09 (.07)			-0.038** (.014)	-0.032* (.018)
Partially-owned × crisis	-0.27*** (.08)	-0.29*** (.08)	-0.23*** (.07)	-0.15* (.08)	-0.002 (.03)	-0.005 (.03)	-0.014 (.02)	-0.001 (.02)
Partially-owned	-0.01*** (.02)	-0.39*** (.18)	-0.06 (.20)		-0.03 (.008)	-0.13** (.06)	-0.19*** (.007)	
Lag sales	-0.24*** (.01)	-0.21*** (.01)	-0.39*** (.01)	-0.68*** (.02)	-0.03*** (.003)	-0.04*** (.00)	-0.06*** (.006)	-0.08*** (.00)
Lag assets	0.10*** (.008)	0.08*** (.009)	0.14*** (.01)	0.26*** (.02)	0.01*** (.002)	0.012 (.02)	0.017*** (.003)	0.01 (.008)
Lag employment					0.00 (.00)	0.00 (.00)	0.00 (.00)	-0.00 (.00)
Partially-owned × lag sales		-0.11*** (.02)	-0.04* (.02)	-0.03 (.02)		0.013** (.006)	-0.005 (.006)	-0.008 (.01)
Partially-owned × lag assets		0.07*** (.01)	-0.04*** (.01)	0.04 (.02)		-0.002 (.005)	0.022*** (.006)	0.026*** (.008)
Partially-owned × lag employment						0.00 (.00)	0.00 (.00)	0.00 (.00)
Partially-owned × economic growth		0.45 (.62)	0.40 (.56)	0.84 (.68)		-0.11 (.25)	0.008 (.19)	0.10 (.21)
Partially-owned × inflation rate		0.07* (.04)	0.07*** (.02)	-0.04 (.03)		0.007 (.011)	-0.003 (.006)	-0.001 (.01)
Economic growth			1.41*** (.38)	0.16* (.51)			0.38*** (.14)	0.30* (.17)
Inflation rate			-0.006 (.008)	-0.02** (.01)			0.010 (.007)	0.006 (.006)
Country-year fixed effects	Yes	Yes	No	No	Yes	Yes	No	No
Country-sector fixed effects	No	No	Yes	No	No	No	Yes	No
Firm fixed effects	No	No	No	Yes	No	No	No	Yes
Year fixed effects	No	No	No	Yes	No	No	No	Yes
No. observations	23,187	23,187	23,187	23,187	21,735	21,735	21,735	21,735
Adjusted R^2	0.19	0.19	0.30	0.47	0.04	0.04	0.05	0.12

Crisis is a dummy that is equal to 1 if the year is identified as a currency crisis year; see Sect. 2.1. Tax rate is the statutory corporate income tax rate. Partially-owned is a dummy that is equal to 1 if the affiliate is not entirely-owned by a German parent company. Minority-owned and majority-owned are dummies equal to 1 if the affiliate is minority-owned and majority-owned respectively. For a detailed description of the data on German multinational affiliates see Sect. 2. Standard errors reported in parentheses are robust corrected for clustering at the country-year level

***, **, * indicate significance at the level of 1, 5 and 10% respectively

wages etc. Unfortunately, we are not able to compare the reactions of employment of domestic firms and employment of multinational affiliates during crises since data on domestic firms are not available. For instance, it is possible that domestic firms decrease employment by more than multinational affiliates do. Alvarez and Görg (2007) consider the employment response of multinational subsidiaries and local firms in a period of economic slowdown in Chile, and find no evidence on differential reactions between both types of firms.

3.3 International debt shifting: OECD countries

The previous sections have highlighted the lower financial flexibility of partially-owned compared to wholly-owned affiliates operating in emerging markets. This lower flexibility prevailed in reaction to currency crises as well as in response to different tax incentives. One may ask the question: Do costs of shared ownership of affiliates arise only in emerging markets? Clearly, due to the absence of currency crises in major developed countries during the period 1996–2006 we cannot check whether the differential flexibility to currency depreciations carries over to affiliates located in OECD countries. It is possible, however, to compare affiliates' responses to tax rate differences across emerging and more developed countries. This is the objective of the present section. From a theoretical point of view, Schindler and Schjelderup (2008) put forward a model according to which the benefits of an international debt shifting tax plan are shared with all owners even though some co-owners did not contribute to the funding of the plan. Such externalities complicate the implementation of a tax efficient strategy. Thus, joint ventures in this model are less effective in tax planning than wholly-owned affiliates. As we will show empirically ownership of affiliates in emerging and more affluent economies has a very similar effect. Whether located in OECD countries or emerging markets, our empirical evidence suggest that partially-owned affiliates react less sensitively to tax rate differences than wholly-owned affiliates.

We employ in this section a similar empirical approach to the one used in Sect. 3.1 but on the entire sample and on the sample of OECD countries.¹² Table 5 presents the results. The dependent variable is the ratio of debt to the parent company and related parties to total assets, which is expected to positively depend on the tax rate only in the case of wholly-owned affiliates.¹³ All specifications include a vector of controls containing interaction terms between controls and the ownership dummy(s). The controls are the logarithm of the GDP, the interest rate in the host economy and the logarithm of sales of affiliates (results are not reported). All reported standard errors are corrected for clustering at the country-year level. The sample in columns (1)–(4) contains all countries. We restrain the sample in columns (5)–(8) to include only OECD countries. The variable

¹² In a related application, Mintz and Weichenrieder (2005, Chap. 5) study the “indirect” determinants of outbound German FDI by splitting the sample into a wholly-owned sample and a partially-owned sample without distinguishing between OECD and emerging markets. We prefer here to include a dummy variable capturing the ownership structure, which enables us to directly compare the behaviour of both types of affiliates.

¹³ Lehmann et al. (2004) examine the role of borrowing from the capital market of the host economy.

Table 5 Taxes and intra-company financing

	Dependent variable: debt to enterprises in Germany/total asset							
	All countries				OECD countries			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Tax rate		0.12*** (.03)	0.15*** (.04)			0.15*** (.04)	0.16*** (.04)	
Partially-owned \times tax rate	-0.05*** (.02)	-0.04* (.02)	-0.06** (.02)		-0.09*** (.03)	-0.06*** (.01)	-0.06* (.03)	
Partially-owned	-0.11*** (.01)	-0.12*** (.01)			-0.25*** (.04)	-0.25*** (.03)		
Minority-owned \times tax rate				-0.09*** (.02)				-0.22*** (.03)
Majority-owned \times tax rate				-0.008 (.02)				-0.4 (.03)
Minority-owned				-0.09*** (.01)				-0.35*** (.05)
Majority-owned				-0.08*** (.01)				-0.25*** (.04)
Country-year fixed effects	Yes	No	No	Yes	Yes	No	No	Yes
Country-industry fixed effects	No	Yes	No	No	No	Yes	No	No
Year fixed effects	No	Yes	Yes	No	No	Yes	Yes	No
Firm fixed effects	No	No	Yes	No	No	No	Yes	No
No. observations	106,809	106,809	106,809	106,809	87,099	87,099	87,099	87,099
Adjusted R^2	0.07	0.10	0.63	0.03	0.03	0.10	0.64	0.03

Tax rate is the statutory corporate income tax rate. Partially-owned is a dummy equals to 1 if the affiliate is not entirely-owned by a German parent company. Minority-owned and majority-owned are dummies equal to 1 if the affiliate is minority-owned and majority-owned respectively. All specifications include a vector of controls and/or interaction terms between controls and the ownership dummy(s). The controls are the logarithm of the GDP, the interest rate in the host economy and the logarithm of sales of affiliates. For a detailed description of the data on German multinational affiliates see Sect. 2. Standard errors reported in parentheses are robust corrected for clustering at the country-year level

***, **, * indicate significance at the level of 1, 5 and 10% respectively

“*partially-owned* \times *tax rate*” is estimated to have a negative sign in both samples in all specifications. Considering the sample of all countries, in column (3) for example, the coefficient on the tax rate is positive and significant at the 1% level suggesting that a 10% increase in the tax rate increases the intra-company loan ratio of wholly-owned affiliates by 15 percentage points. Very similar coefficients in terms of the sign and the magnitude are found for the sample of OECD countries; columns (6) and (7).

The upshot of the analysis presented in this section is that with regard to the reaction of intra-company loan ratio to the tax rate there seem to be no differences between affiliates operating in emerging markets and affiliates operating in OECD economies. Wholly-owned multinational affiliates shift financing from equity to intra-company loans in high tax countries in order to benefit from the deduction of interest payments from the tax bill. Overall, the evidence shows that wholly-owned affiliates rely more on international debt shifting than partially-owned affiliates.

4 Conclusion

The empirical results documented in this paper are related to various strands in the literature. We contribute to the literature on the cost of shared ownership by considering the debt behaviour of German affiliates abroad and providing evidence on two sorts of potential costs of shared ownership. First, during periods of sharp currency depreciation the loan ratio of wholly-owned affiliates increase. However, partially-owned affiliates, especially minority-owned affiliates, are less likely to take advantage of their parent companies during periods of sharp currency depreciation. This finding has a potential relevance for the macroeconomic stabilisation effect of FDI in crises periods. It suggests that the effect works especially through FDI loans to wholly-owned affiliates and questions a stabilising role of FDI loans to minority-owned multinational firms. Second, wholly-owned affiliates rely more on international debt shifting than partially-owned affiliates. This indicates that partially-owned multinational affiliates are restrained from fully exploiting a tax minimising strategy. While the lower financial flexibility of partially-owned affiliates during currency crises could only be tested for a set of emerging countries, the analysis of tax effects has shown that there are no systematic differences between affiliates in emerging markets and OECD countries. In both sets of countries, ownership is similarly important.

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Appendix

See Table 6.

Table 6 Depreciation dates

Country	Depreciation years
Argentina	2002
Brazil	1999
Bulgaria	1999
Chile	None
China	None
Colombia	1999
Croatia	1997, 1999
Egypt	2003
Hong Kong	None
India	None
Indonesia	1998
Korea	1998
Latvia	None
Lithuania	None
Malaysia	None
Mexico	2003
Morocco	None
Peru	1999
Philippines	1998
Poland	1999
Romania	1999
Russia	1999
Singapore	None
South Africa	2000
Taiwan	None
Thailand	1997
Tunisia	1997
Turkey	None
Ukraine	1999
Uruguay	None
Venezuela	None

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