Determinants of the Effective Tax Rate in the BRIC Countries

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ABSTRACT: In this paper, we study the determinants of the effective tax rate (ETR) for corporate taxation for listed companies in the BRIC countries: Brazil, Russia, India, and China. We use a panel of 3,565 companies over the period 2000–2009, and we apply the generalized method of moments estimator for dynamic panel data. The results show that the ETR for one year depends on the tax burden borne the previous year. The only variable that is significant in all the BRIC countries is inventory intensity. Firm size, leverage, and profitability affect the tax burden in three of the four countries considered but with certain differences.

KEY WORDS: BRIC countries, corporate tax burden, dynamic panel data, effective tax rate (ETR).

We analyze the tax burden borne by listed companies in Brazil, Russia, India, and China, which are collectively known as the BRIC countries. Over the past decade, the emerging economies have grown much faster than the developed economies, so the emerging economies now play an important role in the world economy. Among the emerging countries, the BRIC countries stand out in that they share certain characteristics—their economic size, their increasing weight in the world economy, and their great potential for development. They have therefore been the subject of many recent studies from a number of different perspectives. However, to our knowledge, the corporate tax burden in such countries has not yet been studied.

Similarly, corporate income tax (CIT) in the world context has been subject to discussion over recent years in that it is an essential tool within the tax system of every country. It is important because of both its capacity for bringing in revenue and its influence on economic decisions in the companies subject to it. Much research has therefore been done internationally on the corporate tax burden.

From an international perspective, over recent years there has been a gradual reduction in the statutory tax rate (STR). The auditing firm KPMG (2011) states that, for a group of 125 countries, the STR has dropped by 7.07 percentage points over the past decade, from 29.03 percent in 2000 to 22.96 percent in 2011, which amounts to a reduction of over 24 percent. According to Eurostat (2011), the average STR in the BRIC countries dropped from 35.9 percent in 2000 to 28.1 percent in 2011, which amounts to a drop of 7.7 percentage points over the decade—more than 21 percent.

According to an August 2008 report by the U.S. Government Accountability Office (GAO), "Statutory tax rates do not provide a complete measure of the burden that a tax system imposes on business income because many other aspects of the system, such as exemptions, deferrals, tax credits, and other forms of incentives also determine the amount

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of tax a business ultimately pays on its income. The average effective income tax rate that a business faces—the amount of income tax it pays divided by its pretax income—reflects the combined effects of all these tax system components" (GAO 2008, p. 1).

In general, corporate income tax has been studied by many researchers, and in particular, several international studies on corporate income tax focus on the effective tax rate (ETR) and the business factors that determine it. In fact, although countries endeavor to reduce their STRs in order to be more fiscally attractive and to attract new investments, what is relevant is the tax burden actually borne by companies. The international trend toward reducing STRs has been accompanied with increases in the tax base and reduced tax incentives in order to maintain revenue; ETRs have not been reduced in the same proportion. Clearly, when governments establish their fiscal policies, they are aware of the differences between the STR and the ETR as they adopt measures to try to make up for such differences.

Companies, too, should not focus so much on the STR as on the tax burden caused by CIT—that is, the ETR. This measure is closer to reality and is consequently more valuable. However, companies and society in general tend to focus more on the STR, which is the available rate.

Considering that many companies are interested in extending or relocating their businesses in emerging economies, we believe it is of great interest to know the actual ETRs borne by companies in the BRIC countries and to find out their business characteristics and the main factors that determine the corporate tax burden. The variables that explain the ETR borne by companies have been analyzed, both theoretically and empirically, for different countries and different periods. However, as far as we know, no studies have been published on ETRs in the BRIC countries.

More specifically, studies have been carried out on individual countries. In only a few cases, they have been focused on several countries together, but there is one exception: Markle and Shackelford (2010) analyze the ETRs in seventy-eight countries. Most research has focused on the United States, but there have also been studies on Australia, Canada, Hong Kong, Japan, Korea, Malaysia, Taiwan, Thailand, and some countries in the European Union. Liu and Cao (2007), Wu et al. (2012), and Zeng (2010, 2011), among others, have analyzed the ETR in China, but no studies have analyzed companies in the four BRIC countries together.

In the previous literature, there is more or less consensus on the main variables that explain ETR: firm size, leverage, capital and inventory intensity, and profitability. However, the results are not conclusive because differences are found from country to country and even within a single country.

The purpose of this paper is to provide evidence on the determinants of the ETR caused by CIT for listed companies in Brazil, Russia, India, and China. This subject is relevant for several reasons. It contributes to the literature on ETRs by analyzing the BRIC countries that have not yet been studied. It covers a recent period (2000–2009) and applies econometric techniques that are unusual in the prior literature. Specifically, we apply the generalized method of moments (GMM) estimator developed by Arellano and Bond (1991) for dynamic panel data. GMM models also control for the presence of unobserved firm-specific effects and the endogeneity of the explanatory variables. As far as we know, econometric panel data techniques with dynamic effects are only used to analyze the determinants of ETR in the studies by Feeny et al. (2006) and Harris and Feeny (2003) for Australian companies, and Fonseca Díaz et al. (2011) for the Spanish banking sector.

Determinants of Effective Tax Rate and Hypotheses Proposed

It is important to consider the possible explanatory variables for the ETR borne by companies because most business decisions have fiscal repercussions. Conversely, the tax burden should be considered when companies make business decisions. Companies should be aware that their ETRs are affected by their previous investment and funding decisions.

Firm Size and Effective Tax Rate

Firm size is the most widely used variable in the prior research on the corporate tax burden for two opposing reasons. The relationship will be positive under the political cost hypothesis, where the greater visibility of larger firms exposes them to greater regulatory actions. In contrast, the relationship will be negative if large firms have greater scope for tax planning or adopt accounting practices that lower their ETRs. Larger firms might also enjoy political power.

The empirical evidence does not show a clear relationship between firm size and the ETR. Authors such as Calvé Pérez et al. (2005), Noor et al. (2010), Omer et al. (1993), Plesko (2003), Wang (1991), and Zimmerman (1983) show a positive relationship between firm size and tax burden, in line with the political cost hypothesis. Conversely, Chen et al. (2010), Derashid and Zhang (2003), Harris and Feeny (2003), Janssen (2005), Kim and Limpaphayom (1998), Porcano (1986), and Richardson and Lanis (2007) show a negative relationship, maintaining that firm size may be inversely related to the tax burden. However, Feeny et al. (2006), Fernández-Rodríguez (2004), Gupta and Newberry (1997), Liu and Cao (2007), Stickney and McGee (1982), and Wilkinson et al. (2001) do not show any significant relationship between firm size and ETR. Finally, Fernández-Rodríguez and Martínez-Arias (2011) and Fonseca Díaz et al. (2011) find a nonlinear relationship between firm size and ETR so that, up to a certain firm size, the relationship is positive, but after that level, the tax burden of large companies becomes lower. In line with the above, the first hypothesis to be tested is as follows:

Hypothesis 1: Firm size affects ETR.

From the theoretical perspective, any type of relationship between firm size and ETR can be expected. This is confirmed in the prior research. The diverse results obtained by researchers may be determined by the geographical areas and periods used in each study. It is therefore not easy to predict what the relationship will be.

Leverage and Effective Tax Rate

The relationship between corporate capital structure and tax burden has been extensively studied in the literature, both theoretically and empirically. The deductibility in CIT of interest payments on debt reduces the cost of financing with debt in comparison with other alternatives (Badarau-Semenescu and Semenescu 2010). This option may make leverage preferable to equity because, in most countries, equity does not enjoy a tax incentive in CIT.

According to this traditional approach, Modigliani and Miller (1963) maintain that the tax savings that result from business leverage mean that the value of the firm depends not only on the value of investment opportunities but also on any financing decisions taken.

In fact, they state that only when the existence of CIT is considered does the value of the leveraged firm equal that of the unleveraged firm plus the value of the debt tax shield.

The relationship between leverage and tax burden has been tested empirically in studies such as those by Calvé Pérez et al. (2005), Fernández-Rodríguez (2004), Liu and Cao (2007), Noor et al. (2010), Plesko (2003), Richardson and Lanis (2007), and Stickney and McGee (1982), which find a negative relationship between leverage and tax burden in line with this traditional approach. Alternatively, it is possible to find a positive relationship between ETR and leverage to the extent that firms may be motivated to take on debt in order to reduce their ETRs. Chen et al. (2010), Feeny et al. (2006), Harris and Feeny (2003), and Janssen (2005) find this positive relationship. However, Kim and Limpaphayom (1998) and Wilkinson et al. (2001) do not find any significant relationship between leverage and ETR. Finally, Fernández-Rodríguez and Martínez-Arias (2011) find a nonlinear relationship between leverage and ETR; it is positive up to a certain level, after which it becomes negative. We therefore pose the second hypothesis as follows:

Hypothesis 2: Firm leverage affects ETR.

Although there is not unanimous agreement on this, a negative relationship between tax burden and leverage can be expected because of the deductibility of interest.

Asset Mix and Effective Tax Rate

The asset mix may have a clear influence on the ETR borne by firms. In all tax regimes, firms are usually allowed to deduct for depreciation of property, plant, and equipment (tangible fixed assets). This means that companies with high levels of tangible fixed assets should have a lower tax burden than those with low levels. In some countries, the acquisition of tangible fixed assets enjoys tax incentives with beneficial effects for the company's tax burden. We therefore pose the third hypothesis as follows:

Hypothesis 3: Capital intensity affects ETR.

There is empirical evidence that a greater weight of tangible fixed assets leads to a lower ETR. This is shown by Calvé Pérez et al. (2005), Chen et al. (2010), Derashid and Zhang (2003), Fonseca Díaz et al. (2011), Gupta and Newberry (1997), Janssen (2005), Noor et al. (2010), Richardson and Lanis (2007), and Stickney and McGee (1982), indicating that there is an inverse relationship between capital intensity and ETR.

Conversely, Feeny et al. (2006), Plesko (2003), and Wilkinson et al. (2001) have found a direct link between capital intensity and tax burden. However, other studies do not find any link between capital intensity and ETR (Fernández-Rodríguez 2004; Liu and Cao 2007).[1] Finally, Fernández-Rodríguez and Martínez-Arias (2011) find a nonlinear relationship between capital intensity and tax burden—positive up to a certain level of noncurrent assets and negative thereafter.[2]

When considering the relation between ETR and assets, we should remember that the sector of activity clearly determines the asset mix, so the possibility of obtaining lower ETRs will depend on the volume of current assets that firms need for their activity and, more specifically, on their inventory level. From this perspective, investment in inventories is considered an alternative to using funds for tangible fixed assets, so it limits the possibility of reducing the ETR. Inventory intensity could therefore be considered to lead to a larger tax burden. We therefore pose our fourth hypothesis:

Hypothesis 4: Inventories affect ETR.

Inventory level as an explanatory variable for ETR is not widely used in the prior research. Only Fernández-Rodríguez (2004), Gupta and Newberry (1997), and Richardson and Lanis (2007) use it, finding a statistically significant relation. Derashid and Zhang (2003) and Adhikari et al. (2006) also analyze inventories but without finding any statistically significant relationship.

From the perspective of the asset mix and considering all the above arguments, and in line with most previous studies, a positive relationship can be expected between ETR and inventory intensity. However, for capital intensity we do not predict the sign because of the varied results in the literature.

Finally, H3 and H4 could be related because an unexpected variation in the cost of capital and the lending rate has a negative effect on investment (Peltonen et al. 2011).

Firm Profitability and Effective Tax Rate

Profitability is obviously a determining factor for tax burden because the most profitable firms have larger profits and pay taxes every year. Less profitable firms have lower profit levels, or even losses, so they pay either less tax or none at all. Moreover, with carrybacks or carryforwards, firms can reduce their tax liability for previous or subsequent financial years. All of this represents a benefit in terms of tax burden for firms incurring losses.

The empirical evidence points to a positive relation between profitability and ETR, as shown by Calvé Pérez et al. (2005), Chen et al. (2010), Fernández-Rodríguez (2004), Fernández-Rodríguez and Martínez-Arias (2011), Gupta and Newberry (1997), Plesko (2003), Richardson and Lanis (2007), Stickney and McGee (1982), and Wilkie and Limberg (1993), who find that the most profitable companies are subject to a greater tax burden than those that are less profitable. However, in studies focusing on Malaysia (Derashid and Zhang 2003; Noor et al. 2008, 2010), the results are the opposite—that is, the most profitable firms have a smaller tax burden because of the tax compensation granted by the government to the most efficient companies. Molina Llopis (2005) also finds a negative relation between profitability and tax burden for Spanish firms, although the reference is the return on equity rather than the return on assets, which is usually studied. Finally, in the Spanish banking sector, Fonseca Díaz et al. (2011) do not find that profitability significantly affects ETR. Based on these ideas, we pose our fifth hypothesis:

Hypothesis 5: Firm profitability affects ETR.

Although there is not unanimous agreement on this, the expected result is that the most profitable firms in the BRIC countries will have a greater ETR; consequently, a positive relation is expected between these variables.

Sample, Empirical Model, and Variable Definitions

Sample

For this research, the data were obtained from the Compustat database using the financial information on listed firms in the BRIC countries over the period 2000–2009—that is, ten consecutive years and 3,565 firms (Table 1). As is usual in other research, some of which is referred to in this study, companies falling within the "finance, insurance, and real estate" sector are not considered because their special characteristics would distort

Table 1. Distribution of sample across countries and industries

SIC description	Brazil	Russia	India	China	BRIC
Agriculture, forestry, fishing	3	1	7	29	40
Mining	3	10	28	44	85
Construction	7	1	66	28	102
Manufacturing I	62	26	513	504	1,105
Manufacturing II	61	24	521	705	1,311
Transportation, communication, electric, gas, and sanitary services	61	51	94	182	388
Wholesale trade	4	0	28	52	84
Retail trade	9	6	10	67	92
Services I	7	2	178	74	261
Services II	9	0	26	23	58
Nonclassifiable establishments	3	0	7	29	39
Total	229	121	1,478	1,737	3,565

the research. In fact, except for the study on the Spanish banking sector (Fonseca Díaz et al. 2011), all the studies quoted in this paper exclusively consider nonfinancial firms.

As is usual in this type of study (Collins and Shackelford 1995; Omer et al. 1993; Richardson and Lanis 2007; Wilkie and Limberg 1993; Zimmerman 1983), all observations in which the firms declare losses or negative ETRs are eliminated because interpretation of the tax burden in such cases would be complex and questionable. As in other research (Feeny et al. 2006; Gupta and Newberry 1997; Richardson and Lanis 2007; Stickney and McGee 1982), and to avoid distorting the results, observations in which ETRs exceed one (rates of 100 percent) are also eliminated.

Following Collins and Shackelford (1995), all the companies are grouped by industrial sector using the standard industrial classification (SIC). Other studies also use the sector of activity (Calvé Pérez et al. 2005; Chen et al. 2010; Derashid and Zang 2003; Feeny et al. 2006) but follow a different type of classification.

Empirical Model and Variable Definitions

We apply the GMM estimator developed for dynamic models of panel data by Arellano and Bond (1991). This methodology is specifically designed to address three relevant econometric issues: (1) the presence of unobserved firm-specific effects, which are eliminated by taking first-differences of all variables; (2) the autoregressive process in the data regarding the behavior of effective tax rates (i.e., the need to use a lagged dependent variables model to capture the dynamic nature of the effective tax rates); and (3) the likely endogeneity of the explanatory variables. The panel estimator controls for this potential endogeneity by using instruments based on lagged values of the explanatory variables.

To test the relations considered for the determinants of ETR, the following model is estimated:

$$\begin{aligned} ETR_{it} = {} & \beta_0 + \beta_1 ETR_{it-1} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 CAPINT_{it} \\ & + \beta_5 INVINT_{it} + \beta_6 ROA_{it} + \beta_7 YEAR + \beta_8 INDUSTRY + \nu_i + \varepsilon_{it}. \end{aligned} \quad (1)$$

As already stated, the dependent variable is the effective tax rate (*ETR*). Several definitions for ETR are used in the literature (see the reviews by Callihan 1994; Fullerton

1984; Graham et al. 2012; Hanlon and Heitzman 2010; Plesko 2003). In this study, we use the ratio of current tax expense to earnings before income tax.

The first of the explanatory variables, ETR_{t-1} (the first lag of the dependent variable), is included in the model to identify potential temporary adjustments of ETRs. A significant coefficient for this variable would indicate that adjustments' effective tax rates are relevant. The other explanatory variables are those that are traditionally used in this type of study.

Firm size (*SIZE*) is measured as the logarithm of the firm's total assets.[3] As stated above, it is not possible to predict the sign for the expected relationship. A positive sign would be in line with the political cost hypothesis—that is, that larger firms would have a higher tax burden because of greater governmental control. A negative sign would be expected between *SIZE* and *ETR* if a larger firm size makes it possible to reduce ETR by tax planning and/or accounting practices.

Leverage (*LEV*) is also used as a possible determinant variable of *ETR*. Following most of the prior research, *LEV* is defined as the ratio of total debt to total assets (Derashid and Zhang 2003; Feeny et al. 2006).

According to the traditional hypothesis, company debt can be expected to be negatively related to the dependent variable (*ETR*) because debt generates tax deductible interest in CIT and, as a result, reduces the ETR for firms with greater leverage. However, the positive and significant association of *LEV* is consistent with the alternative argument that firms may be motivated to take on debt in order to reduce their ETRs.

The *CAPINT* variable is included to measure firms' capital intensity and is defined as the ratio of tangible fixed assets to total assets. According to the theory, the level of tangible fixed assets is negatively related to ETR because depreciation is tax deductible in the CIT, which reduces tax burden. However, considering prior research in which findings vary, it may be that there is a positive relation between capital intensity and ETR.

As stated above, some of the prior research complements the variable *CAPINT* with another variable representing inventory intensity (*INVINT*). In this study, we aim to consider this second variable as indicating the asset mix. Following the usual literature (Derashid and Zhang 2003; Fernández-Rodríguez 2004; Gupta and Newberry 1997; Richardson and Lanis 2007), the variable is defined as the ratio of inventories to total assets. Bearing in mind that inventories do not generate any tax-deductible expense, the expected relationship between *INVINT* and *ETR* is positive.

Profitability is considered as a possible explanatory variable for the tax burden. Different measures exist depending on the type of profitability being measured. For this type of research, the most suitable measure is return on assets (*ROA*) defined as the ratio of earnings before income tax to total assets, which is used here because the aim is to analyze the effect of greater or lesser profitability on CIT. It is necessary that the result not be affected by income tax, which would happen if net income were taken. According to the theoretical arguments, a positive relationship can be expected between ROA and ETR, although there are some exceptions to this in the literature.

Finally, to control for the year and industry sector effects, we include dummies for all years (*YEAR*) and eleven industries (SIC classification) (*INDUSTRY*). The first of these is a set of dummy time variables, one for each year, to capture the influence of variables affecting all the sample firms—that is, where there is a variation not between firms but from one year to the next. The second is a set of dummy variables to control for differences in the ETRs associated with the particular characteristics of each sector of activity.

Results

Descriptive Analysis

Before offering the results of the research, we first show in Table 2 the average ETRs for each of the BRIC countries over the ten years studied, with their respective STRs and the differences between them.

The most relevant aspects of Table 2 are the following:

- The STRs drop in all countries, with the largest drops in Russia (from 35 percent to 20 percent) and in China (from 33 percent to 25 percent). In the other two countries, the drop is moderate, reaching 34 percent in 2009, when the worldwide average was much lower (25.51).
- The ETRs do not drop to the same extent as the STRs. The ETRs remain relatively stable throughout the decade, with the highest rates in Russia and the lowest in China. This can perhaps be explained because the drops in STRs are accompanied with increased tax bases because of the differences between accounting and taxation and with a reduction or elimination of tax incentives. As has already been stated, this is normal in most countries.
- The ETR is less than the STR in all the countries except Russia. A similar result is found in others articles (Lee and Swenson 2008, 2009). This can perhaps be explained by the differences between accounting and tax regulations leading to a higher tax base in Russia.

Table 3 shows the descriptive statistics for the variables used. The most important aspects are the following:

- Average ETR varies from one country to another, between a maximum of 30.03 percent in Russia and a minimum of 18.49 percent in China. Those of Brazil and India are similar: 25.21 percent and 24.45 percent, respectively.
- Mean size of firms varies among the BRIC countries. Listed firms in Russia are the largest, and those in India are the smallest.
- Mean leverage also varies among the four countries. Russian firms have the least debt followed closely by China. Brazilian firms have the highest debt.
- Mean capital intensity is almost identical in all the BRIC countries except for Russia, where levels are much higher.
- Mean inventory intensity is similar in Brazil and Russia and is higher in India and China.
- Mean profitability is lowest in Brazil and China, which have similar rates. Russia has twice as much, and India is somewhere in between.

Empirical Results

The results of Model (1) are given in Table 4. The coefficient of the lagged dependent variable (ETR_{t-1}) is significant in all the regressions. This is consistent with the hypothesis that the tax burden for one year depends on the tax burden of the previous year. Therefore, the dynamic model used is more appropriate than other methodologies that do not incorporate the lagged dependent variable. The sign of the relation in three of the cases is positive, as in other articles (Feeny et al. 2006; Fonseca Díaz et al. 2011; Harris and Feeny 2003). However, in Russia the sign is negative, indicating that one year's tax

Table 2. Statutory tax rate versus effective tax rate

	Brazil			Russia			India			China		
	STR (percent)	ETR (percent)	STR minus ETR	STR (percent)	ETR (percent)	STR minus ETR	STR (percent)	ETR (percent)	STR minus ETR	STR (percent)	ETR (percent)	STR minus ETR
2000	37	22.33	14.67	35	35.26	–0.26	38.50	15.40	23.10	33	16.63	16.37
2001	34	24.13	9.87	35	23.28	11.72	39.60	23.10	16.50	33	15.24	17.76
2002	34	22.49	11.51	24	36.83	–12.83	35.70	25.52	10.18	33	19.37	13.63
2003	34	25.16	8.84	24	31.82	–7.82	36.80	24.55	12.25	33	19.68	13.32
2004	34	27.22	6.78	24	28.68	–4.68	35.90	23.71	12.19	33	18.72	14.28
2005	34	25.62	8.38	24	28.97	–4.97	36.60	23.71	12.89	33	19.89	13.11
2006	34	26.95	7.05	24	30.20	–6.20	33.70	24.79	8.91	33	19.47	13.53
2007	34	27.60	6.40	24	32.35	–8.35	34.00	25.30	8.70	33	19.36	13.64
2008	34	24.60	9.40	24	29.56	–5.56	34.00	27.64	6.36	25	17.31	7.69
2009	34	23.53	10.47	20	25.99	–5.99	34.00	25.87	8.13	25	18.40	6.60
Mean	34.30	25.21	9.09	25.80	30.03	–4.23	35.88	24.45	11.43	31.40	18.49	12.91

Source: Authors' calculations based on Eurostat (2011).

Table 3. Descriptive analysis

	ETR	SIZE	LEV	CAPINT	INVINT	ROA
Brazil						
Observations	1,453	2,074	2,074	2,074	2,069	1,925
Mean	0.2521	6.1217	0.6101	0.3635	0.0977	0.0444
Median	0.2644	6.0755	0.6042	0.3551	0.0711	0.0444
Standard deviation	0.1658	2.1822	0.2360	0.2226	0.1023	0.0988
Minimum	0.0000	–6.9078	0.0028	0.0000	0.0000	–0.3301
Maximum	0.9760	12.2370	1.0000	0.9468	0.4834	0.3648
Russia						
Observations	774	891	891	890	887	859
Mean	0.3003	7.0321	0.4518	0.5424	0.0955	0.0899
Median	0.2726	7.0288	0.4235	0.5611	0.0618	0.0768
Standard deviation	0.1694	1.7241	0.2267	0.2273	0.0939	0.0932
Minimum	0.0000	–1.0272	0.0017	0.0002	0.0001	–0.2598
Maximum	1.0000	12.5516	1.0000	0.9426	0.5002	0.3628
India						
Observations	10,356	12,442	12,442	12,442	12,435	12,222
Mean	0.2445	4.0453	0.5461	0.3610	0.1500	0.0685
Median	0.2623	4.0193	0.5806	0.3463	0.1334	0.0586
Standard deviation	0.1595	1.7954	0.2085	0.2106	0.1283	0.0921
Minimum	0.0000	–6.9078	0.0000	0.0000	0.0000	–0.3255
Maximum	1.0000	10.9416	1.0000	0.9936	0.9414	0.3641
China						
Observations	13,101	14,645	14,645	14,645	14,645	14,444
Mean	0.1849	5.3767	0.4873	0.3626	0.1431	0.0486
Median	0.1603	5.2871	0.4915	0.3348	0.1224	0.0435
Standard deviation	0.1446	1.2740	0.1945	0.2021	0.1142	0.0752
Minimum	0.0000	–4.8283	0.0017	0.0000	0.0000	–0.3311
Maximum	0.9949	12.2993	1.0000	0.9872	0.9936	0.3657

burden has a negative effect on that of the next year. These results seem consistent with Russia's exceptional situation of having an STR lower than its ETR.

The *SIZE* variable is significant in all cases except India. The relation is positive in Brazil and China, in line with the government control hypothesis, which predicts larger ETRs for larger firms because of greater control over profit and taxes. In Russia, however, the relation is the opposite, in line with greater fiscal planning by the larger firms, which leads to a lower tax burden. India is the only country where size is not significant. This can perhaps be explained by the smaller size of firms in this country.

The *LEV* variable is significant in Brazil, Russia, and India—negative in the first two cases and positive in the third. In line with the initial approach that financial expenses reduce the tax burden, in Brazil and Russia there is an inverse relation between *LEV* and *ETR*. However, in India the relation is the opposite. Moreover, in India leverage is high and average ETR is fairly low. We believe the reason for this may be the amount of interest—that is, the level of leverage has less influence than do financial expenses. India is a clear example of this because, even though it has a high level of leverage,

Table 4. Determinants of corporate effective tax rates

	Expected sign	Model (1) Brazil	Model (1) Russia	Model (1) India	Model (1) China
ETR_{t-1}	+	0.0602***	–0.1148***	0.2127***	0.3441***
		(10.90)	(–12.43)	(16.67)	(19.45)
SIZE	+/–	0.0254***	–0.0473***	–0.0087	0.0746***
		(6.49)	(–8.33)	(–1.34)	(7.38)
LEV	–	–0.1304***	–0.0807***	0.1296***	–0.0276
		(–8.98)	(–3.34)	(3.89)	(–1.08)
CAPINT	+/–	–0.0008	–0,3245***	0.0937**	0.0394
		(–0.07)	(–16.26)	(2.39)	(1.31)
INVINT	+	0.0735**	0.4548***	–0.1055*	0.1450***
		(2.13)	(4.28)	(–1.85)	(2.56)
ROA	+	0.0428**	–0.9715***	–0.0556	0.6134***
		(2.20)	(–19.33)	(–1.08)	(12.69)
Year dummies		Yes	Yes	Yes	Yes
Industry dummies		Yes	Yes	Yes	Yes
m_1		–5.40***	–3.21***	–14.55***	–13.65***
m_2		–1.42	–0.10	0.85	0.83
Sargan test		167.68	102.11	342.52	500.47
Observations		815	455	6,568	8,506

Notes: The regressions are estimated for 2000–2009 using the Arellano and Bond (1991) GMM difference estimator for panel data with lagged dependent variable. *t*-statistics are in parentheses.
* Statistically significant at 10 percent; ** statistically significant at 5 percent; *** statistically significant at 1 percent.

proportionally the amount of interest is fairly low. Therefore, firms in India are motivated to take on more debt to try to reduce their tax burden, which is the reason for the positive relation between *LEV* and *ETR*.

The *CAPINT* variable is only significant in two countries, and with opposing signs. The *INVINT* variable, which has been only rarely used in the literature, is significant in all the regressions performed. More specifically, in Brazil and China, *INVINT* is significant and *CAPINT* is not, so the firms with the highest inventory intensity have a greater tax burden. In Russia the two variables representing the asset combination are significant, so more capital-intensive firms have a lower tax burden, and the more inventory-intensive firms have a higher tax burden. Last, in India the results are the opposite. The firms with the largest ETRs are the most capital intensive and the least inventory intensive; no explanation is found for this.

Finally, the coefficient for *ROA* is positive and significant, as expected, in Brazil and China. It is also significant in Russia but has a negative sign, which indicates that the most profitable firms are those with the smallest tax burden. In India this variable has no influence over firms' ETRs.

In summary, in line with expectations, the lagged dependent variable is significant in all the BRIC countries. Strangely, the only explanatory variable significant in all the BRIC countries is inventory intensity, although in India it has a negative sign. The remaining variables are not repeated as explanations for the ETR in the BRIC countries, although firm size, leverage, and profitability are significant in three of the four countries considered, with some particularities: firm size is positive in two of the countries (Brazil and China)

but negative in Russia; leverage is negative in Brazil and Russia but positive in India; profitability is negative in Russia but positive in Brazil and China. Capital intensity is significant in only two of the countries (Russia and India) but with opposite signs.

Finally, we re-estimate the model using a variant for the dependent variable. Specifically, we use an alternative measure for ETR: the ratio of current tax expense to earnings before interest and taxes. The results are similar to those obtained with Model (1), and therefore they are not being provided.

Summary and Conclusions

We analyze the determinants of the tax burden caused by corporate income tax for listed companies in the BRIC countries. More specifically, using Compustat data, we analyze the determinants of the effective tax rate using a data panel of 3,565 firms over the period 2000–2009. We apply the GMM difference estimator to control for the adjustment effective tax rates, unobserved heterogeneity, and potential endogeneity of the explanatory variables.

The data show that over the ten-year period of the study, there is a large drop in the statutory tax rate, especially in Russia and China. The ETRs do not drop by the same proportion. They remain similar even in China, despite the reduction in STR. The explanation in China may be the increased tax base and the reduction or elimination of tax incentives.

When the two rates are compared, STR minus ETR, a large difference is found, indicating that listed firms in the BRIC countries bear a lower tax burden than was initially expected—except for Russia, where the opposite is the case. A possible explanation for this may be the differences between accounting and tax, which cause an increase in tax base.

Average STRs over the ten-year study period are 34.30 percent in Brazil, 25.80 percent in Russia, 35.88 percent in India, and 31.40 percent in China; however, the average ETRs during this period are 25.21 percent, 30.03 percent, 24.45 percent, and 18.49 percent, respectively. This suggests that if firms were to make decisions based on the STR instead of the ETR, then Russia would seem to be the most interesting country, when in fact, it has the largest tax burden.

Our results show that the lagged dependent variable is statistically significant and, therefore, that the tax burden for a year depends on that borne the previous year. This explains why the dynamic model used is more appropriate than other methodologies that do not incorporate the lagged dependent variable.

Undoubtedly, firms thinking of expanding or locating their businesses in a BRIC country need to analyze many factors, including corporate taxation. They should determine the most suitable location according to their particular characteristics. Bearing in mind the results of this research, larger firms seem to be subject to greater control in Brazil and China and bear a larger tax burden; firms with greater leverage are treated best in Brazil and China; those that are more inventory intensive are only better off in India; those that are more capital intensive have a smaller tax burden in Russia; and finally, those that are most profitable have larger ETRs in Brazil and China. The results therefore point to heterogeneity among the four countries from the perspective of the actual tax burden.

We believe this study amounts to an advance in research on the tax burden caused by CIT both because of the use of dynamic analysis techniques and because of the field of research, which focuses on listed companies in the BRIC countries, which are of

tremendous relevance today. However, we are aware that these conclusions cannot be generalized to all types of firms in these countries because the analysis focuses on a single type of firm—that is, listed companies. Finally, the results provide information of interest regarding location decisions for firms and regarding tax competition for governments, not only those of the BRIC countries.

Notes

1. Harris and Feeny (1999) use depreciation instead of capital intensity as the explanatory variable for ETR, reaching the conclusion that there is no significant relation between depreciation and ETR.

According to Liu and Cao (2007), the possible explanation for the lack of significance in the relation between capital intensity and ETR is that the benefit from other tax policies is larger than that from tangible fixed assets.

2. Pastor-Agustín et al. (2011) show interrelations among fixed assets affecting their investment and disinvestment decisions.

3. We use the logarithm of total assets, the most commonly used measure. Some researchers use sales (Porcano 1986; Stickney and McGee 1982), so we carried out robustness checks taking the logarithm of sales as an alternative for firm size. Since the sales logarithm variable shows an unusual breakdown and in some industry sectors is not very representative of firm size, these results are not given.

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