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Is Financial VAT Neutral to Financial Sector Size?

Julio López-Laborda and Guillermo Peña

Abstract
The influence of the taxation of financial services in VAT on financial sector size is analyzed empirically. The authors use data from 36 countries of the European Union and the OECD for the period between 1961 and 2012. Dynamic panel data techniques are used, concretely the GMM System. An unbalanced panel is handled. The results allow them to support the theoretical analysis that states financial VAT has no significant effect on financial sector development, being neutral in relation to this variable. Results are robust to the specifications of the dependent variable.

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1. Introduction

In this paper we analyze the influence of financial service taxes[1] on the size of the financial sector, contributing an empirical test to a topic only dealt with in theory to date. Financial service taxes mean taxing financial services by VAT (that is, financial VAT, meaning the elimination of the exemption of financial services from VAT), or by other taxes that levy the value added of financial institutions in a different tax, separate from VAT.

It is worth mentioning there is no literature on the empirical effects of financial VAT on any variable with real data (that is, non-simulated), and as far as we know, this is the first paper on the subject.

After this introduction, section 2 explains what financial depth means and how we can measure it, in order to give a theoretical explanation of the possible influence of financial VAT on the financial sector size in section 3. In section 4 we review the literature on the topic, while section 5 specifies the model to estimate. Section 6 estimates the econometric models arranged in section 5 and discusses the empirical results. Section 7 provides the concluding remarks.

2. Definition of financial development and its measurement

Financial size is, basically, the importance of the financial sector in the total GDP. Nevertheless, a problem emerges when trying to quantify the size of the financial sector, because it is difficult to find available variables for posterior analysis that reflect faithfully the idea of the depth of the financial sector.

Kahn et al. (2006) analyzes financial size by the study of different variables called "*fd*" (acronym of *financial depth*). The variable *fd1* measures the domestic credit provided to the private sector over total GDP. The previous variable plus the total capitalization of the stock exchange as a percentage of the GDP is measured by *fd2*. Finally, *fd3* represents the previous variable plus the capitalization of the public bonds market as a percentage of GDP. The last indicator is the most exhaustive of the three, but it is also the variable with the least data. In contrast, the first variable is the most available, but it is a more limited approach.

[1] Financial services taxes (tax consumption) is different to financial transaction taxes (tax externalities).

Asongu (2014) distinguishes between economic *financial depth*, represented by the money supply over total GDP; *financial system depth*, defined as the total of liquid liabilities over total GDP; *banking system activity*, measured by the domestic private credit provided by the financial institutions; *financial size*, explained by deposit money banks as a percentage of the sum of deposit money banks plus the central banking assets in the real non-financial domestic market. Some authors mention all or some of these variables as indicators of "financial development", such as Huang (2010a), Ayadi et al. (2013) or Huang (2010b).

3. Influence of financial VAT on financial sector size

The development of the financial sector generates many externalities, facilitating the construction of infrastructure by the public government, which encourages all the real economy positively. See Levine (2005) for a literature review. Nevertheless, the excessive size of the financial sector could also generate numerous negative externalities, such as the presence of systemic risk, which could provoke serious financial and economic crises, as the IMF (2010) points out. The fall of a big bank can hamper firms' exposure to financial markets or direct funding, disrupting the traditional channels of interbank lending due to a lack of confidence. The recent experience of the financial crisis of 2007 shows how a small initial shock, such as the relatively minor crisis of the sub-prime mortgages in USA, can lead to major economic repercussions due to the domino effect. This is the case of the international economic crisis that was unleashed by the high economic costs that the financial crisis implied. Furthermore, the systemic financial crises had significant fiscal costs.

As the IMF (2010) points out, the negative external effects generated by financial market failures increase with the presence of a large and complex financial sector. This is due to the important costs of the failure of a financial entity, because financial markets generally expect that governments will support the banking sector with funding in order to avoid adverse consequences. This involves an additional moral hazard for the government.

Due to this, the IMF (2010) advocates a Pigouvian tax capable of reducing the excessive large financial sector in order to avoid higher systemic risks. For this the FAT (*Financial Activities Tax*) was designed. As Lockwood (2014) points out, recently a literature has emerged that studies the undesirable activities of banks that generate

external effects in the deposit and credit margins. The main result is that these external effects could be corrected by Pigouvian taxes that would be applied to the margins, as taxes on credits or deposits. Furthermore, these Pigouvian taxes could be complemented with the taxation of financial services as the financial VAT that could make it possible to recover the VAT on inputs, which cannot be recovered in the current system of exemption of financial services applied in the vast majority of countries.

It is worth mentioning that financial VAT applied in different countries does not act as a Pigouvian tax. This is because the objective of financial VAT is not to eliminate the negative externalities that the financial sector generates, but to tax the consumption of financial services, in contrast to financial transaction taxes.

Aigner and Bierbrauer (2015) have contributed with the first theoretical step on the impact of financial VAT on financial sector size. The authors base their findings on the analytical models of Ramsey (1927) and Mirrlees (1971), in which they include the financial sector. Aigner and Bierbrauer (2015) develop a model with the following features: there is a household sector that receives labor income, which is used to buy a final product. In addition, there is a productive sector that employs the labor force as an input and produces goods. The financial sector is introduced in this way: the workers have to be compensated by their employers after being employed, but before obtaining income for the sale of the products. Thus, a business that wants to hire workers needs a financial intermediary that provides funding for the payment of the wage. The intermediary is compensated by the promise of the repayment of the money by the business after the sale of the goods. In this way, consumers receive the wage before the market of final goods opens. In t=0 households receive a wage, and until *t=1*, the wage is kept on a deposit account provided by the financial intermediaries, receiving the deposit plus the interest in *t=1*. The producers apply for a loan to the banks in *t=0* for paying the wages, which is returned with interest in *t=1*. The consumption of the government is determined exogenously and the government also collects taxes.

Aigner and Bierbrauer (2015) suppose that products are taxed with a positive marginal rate (hereafter, general rate) by the method of credit-invoice. They also introduce a financial VAT on banks. A realistic fiscal system that exempts financial services from VAT is represented by a positive general rate τ and a financial VAT marginal rate τ_b (hereafter, financial rate), equals to zero. A hypothetic fiscal system with equal

treatment for the financial sector and for the rest of the economy is characterized by general and financial rates that are equal and positive. They study the impact of the exemption comparing the competitive equilibrium achieved in both scenarios.

With a hypothetical fiscal system, the financial sector makes financial transactions when it receives deposits from households and when it provides loans to producers. The authors suppose that the value of the interest on the deposits that the bank must pay is increased by the product of the interest and the financial rate. They also suppose that, taxing these services in VAT, the levy is paid only by the banks, and the tax is not levied on households in the banking intermediation. Furthermore, as the financial transactions are included in VAT and the administration collects by the credit invoice method, banks could credit the financial VAT. By this way, the relevant price paid by families and banks to realize the contract would be the interest only. They are not influenced by the financial rate because the bank can credit the tax. In the same way, the relevant price of loans for producers and banks would be the loan interest.

In the current fiscal system, final consumers of goods and services cannot credit the input VAT, while producers can credit it. If this principle is applied in a hypothetical financial VAT, then a household that acquires a loan to increase its current consumption and pay for it in the future cannot credit the input VAT. In contrast, a business that uses the loan to invest can do so. The authors warn that, as the model is static, there cannot be a financial intermediation among households to exchange opportunities for consumption over time. Nevertheless, they analyze how the possibility for businesses to credit the input VAT affects the equilibrium results. Thus, for each scenario in the economy, with a realistic (financial rate equal to zero and positive general rate), or hypothetical fiscal system (identical and positive rates), two cases are studied. The first case we call limited exemption (in the first scenario) or "differentiated taxation" [2] (in the second scenario), in which businesses do not credit the financial VAT of their

[2] We call it "differentiated taxation", which includes all the variants of financial service taxation other than limited exemption, in which there is no possibility of full credit for the input VAT. These taxes are, firstly, taxes on financial services other than VAT (called "separated taxes", see explanation in section 6). Secondly, situations in which financial VAT is levied through the "addition" or "subtraction" methods (see also the more detailed explanation in section 6). In this way, in spite of the authors considering the "differentiated taxation" case as taxed in VAT, not with other taxes, this case is similar to the circumstances of other countries. We are referring to countries in which financial services are taxed with a "separate tax", or by the methods of "addition" or "subtraction" in VAT, and we consider a hypothetical situation in which the same VAT rate applies to the financial services as to other goods and services (where a general VAT rate is applied). We also consider the case of it not being possible to deduct the input VAT on purchases, a hypothesis that is not usually totally fulfilled.

purchases. A second case of financial VAT follows the "zero rate" method, in the realistic fiscal system, or full taxation on VAT, in the hypothetical fiscal system, in which businesses can credit financial VAT.

Aigner and Bierbrauer (2015) obtain that the financial rate in the second case ("zero rate" or full taxation method) is irrelevant in order to estimate the equilibrium because, by crediting the input VAT, the financial VAT is neutral in relation to the size of the financial sector or the inputs, as neither banks nor businesses are affected by it, due to the credit of the financial VAT, and neither are households, who do not apply for loans in this model.

In this case, the taxes on financial services affect the size of the financial system according to this term:

$$1-\tau \qquad [1]$$

Relative to the first case, in which businesses cannot credit the financial VAT of purchases (limited exemption or separate taxes), they obtain that the equilibrium of the volume of loans differs from the result of the previous case according to:

$$\frac{1-\tau}{1+\tau_b} \qquad [2]$$

Therefore, in case 2, and in a realistic scenario, in limited exemption (exemption of financial services from VAT without crediting input VAT, as applied currently in the vast majority of countries) the ratio [2] would be equal to the ratio [1], due to financial rate equal to zero. Thus, the volume of credit, and hence the financial sector size, would not be altered from case 1. On the other hand, in the hypothetical scenario of a positive financial rate equal to the general one, ratio [2] is applied, due to the financial rate being positive. The loan volume and the size of the financial sector are lower here than in the exemption case. Furthermore, if the financial or general rate increases, the financial sector size diminishes. This is due to non-deductible input VAT that, jointly with a financial rate higher than zero, increases the loan price for the producer businesses, diminishes the credit demand and hence, its volume, and reduces the size of the financial sector too.

4. Determinants of financial sector size: literature review

The topic of how financial VAT influences financial sector size has not been studied empirically before. Therefore, in this literature review we focus on the variables that determine financial sector development. Firstly, it is important to show the lack of theoretical models that explain the determinants of financial sector depth, as Klein and Olivei (2008) point out. Nevertheless, there are some models that aim to explain the influence of some variables on financial size. It is worth mentioning the model of McKinnon (1973), which establishes a positive relationship between financial development and the level of output, which results from the complementarity between money and capital. We also highlight the model of Huybens and Smith (1999), which models the strong negative long run correlation observed between inflation and financial development in countries with a low or moderate long-term inflation rate. English (1999), in contrast, models the increase of financial sector depth due to increased inflation. Finally, Do and Levchenko (2007) estimate a model in which goods differ in their need for external funding, which provokes changes in the equilibrium of financial development in trading countries.

Huang (2010b) and Ayadi et al. (2013) provide an exhaustive review of the empirical literature. They mention the following variables as the most explanatory: institutional and regulatory variables, variables of political stability, kind of property of the bank, macroeconomic factors such as economic stability or prosperity, variables of fiscal policy, openness to financial flows (financial openness), trade openness, geography, investment and remittances, and other variables such as culture or endowment factors.

One of the first papers to deal with the influence of institutional variables on financial sector size is by La Porta et al. (1997). This paper demonstrates that the countries with the worst investment protection, measured by the nature of the law and the quality of the state of law, have smaller capital markets. Many authors also study the function of institutions in financial development: Levine et al. (2000), Beck et al. (2003), Rajan and Zingales (2003), Law and Demetriades (2005), Chinn and Ito (2006), Djankov et al. (2007), Law and Azman-Saini (2008), Huang (2010a), Luca and Spatafora (2012) and Allen et al. (2014). Other authors focus on the influence of political instability, corruption and other determinants of financial development, such as Barth et al. (2004), Dinc (2005), Detragiache et al. (2005), Micco et al. (2007) and Roe and Siegel (2011). Other kinds of determinants of financial sector depth taken into account in the literature

are macroeconomic factors, for instance economic stability, measured by the inflation rate (Huybens and Smith, 1999; English, 1999; Boyd et al., 2001; Kahn et al., 2006; and Bahadir and Valev, 2015).

Furthermore, other macroeconomic variables are taken into account, such as the degree of economic prosperity of a country, measured by the level of GDP per capita, or the population, variables studied by King and Levine (1993), Levine (1997), Jaffee and Levonian (2001). Other determinants of financial sector development are taken into account, such as the variables relating to the fiscal policy of the country, for instance the public deficit, particularly in Caballero and Krishnamurthy (2004) and Christensen (2005). The literature of financial development has also considered financial openness as a determinant of financial sector size. That is, the openness of accounts to the exterior and financial flows to abroad can influence the financial development, as Klein and Olivei (2008) state. In addition to financial openness, it is also important to consider the influence of trade openness on financial development, measured as the sum of exports plus imports, or economic growth; see Levine (1997), Svaleryd and Vlachos (2002), Rajan and Zingales (2003), Law and Demetriades (2005), Gries et al. (2009), Kim et al. (2010), Kim et al. (2011) and Raza et al. (2014).

Some authors have remarked on the importance of geographical variables as determinants of financial development, but generally focusing on other kinds of variables than the geographical ones. Do and Levchenko (2007) developed a new strategy of instrumentation based on geographical determinants exogenous to trade patterns. Many authors also focus on the variables of investment, both domestic and foreign, and variable remittances (Gupta et al., 2009; Demirgüç-Kunt et al., 2011; Huang, 2010[a] and Ayadi et al., 2013). Other authors find natural resources are also determinants of financial development, such as Shahbaz et al. (2013) and Bhattacharyya and Hodler (2014). In addition to the variables mentioned above, there are many other variables considered in the literature as determinants of financial development. These include the degree of industrial competitiveness, the presence of a banking crisis, or culture, as Kroszner et al. (2007), Braun and Raddatz (2008) and Kim and Lin (2011) point out. Some authors, such as Huang (2010b), aim to estimate a wide-ranging model that attempts to incorporate all the studied variables, at least the most significant.

5. Specification

The main contribution of this section is the determination of the neutrality of levying financial VAT in a country in relation to the size of the financial sector of that country. It is worth mentioning that our purpose is not to study the determinants of financial sector development or size, but to formulate an explanatory model in which we can see the impact of the taxation of the financial services in VAT on the dependent variable. In the models, panel data have been analyzed, with information from 1961 to 2012 for 36 countries, analyzing all the countries of the European Union (27) and the OECD, with the exceptions of Switzerland, Cyprus, Romania and Malta.

In this section we are going to use a dynamic panel data model by the two-step *GMM System* method, following Boyd et al. (2001). We estimate a dynamic model due to supposing that the financial development of the previous period affects the current period, a hypothesis that can easily be checked by the presence of good econometric properties in the model.

Consequently, we are going to estimate a model by the econometric technique of two-step GMM for dynamic panel data models, as in Law and Azman-Saini (2008). It is a technique initially put forward by Arellano and Bond (1991). Concretely, we will estimate dynamic models using the GMM System developed by Arellano and Bover (1995) and Blundell and Bond (1998). The analytical formulation can be seen in the following expression:

$$y_{it} = \gamma y_{it-1} + T\beta_T + \mathbf{x}'_{it}\beta + \varepsilon_{it} \qquad [3]$$

Where y_{it} is the variable that reflects the indicator of financial development of a country, y_{it-j} is the jth lag of the endogenous variable (financial development) and γ_j its coefficient. $\boldsymbol{T}$ is our vector of target variables (financial VAT and taxes separate from VAT), $\mathbf{x}'_{it}$ is the rest of the exogenous variables, α_i and β, the coefficients, and ε_{it}, a Gaussian.

We use different dependent variables as indicators of financial development. The size of the financial sector (*fsize*) is the percentage of domestic credit provided by the financial sector over the total GDP. The banking sector size (*bsize*) is considered as the percentage of domestic credit provided by the banking system over the total GDP. Monetary mass (*M2*) is the money and quasi-money that includes the sum of foreign

currencies held abroad by banks, the demand for deposits other than the central government, and savings and deposits in foreign currencies of domestic sectors other than the central government. Total financial depth (*depth*) is included by the sum of financial sector depth and stock capitalization.

Table 1. Methods of taxing financial services and countries that apply them

Method	**Countries where applied**	**Method**	**Countries where applied**
Zero-rating	*Quebec (until 2013), New Zealand (since 2005, Merrill (2011)),*	Net operating income	*Mexico (since 1992, Schatan (2003))*
Taxing explicit fees and commissions	*Australia (since 2000, De la Feria and Walpole (2009)), Singapore (since 1994, Jenkins and Khadka (1998)), South Africa (since 1996, Merrill (2011))*	Full invoicing	
Exemption with input credits	*Australia, Singapore*	Accrual method	
Option to tax	*Austria, Belgium, Estonia, France, Germany and Lithuania (all since 2006, Merrill (2011))*	Modified reverse-charging	
Addition method	*Quebec, Michigan (since 1950, De la Feria and Krever (2012)), France (since 1979, Pons (2006)), Israel (since 1976, Gillis (1987)), Denmark (since 1988, Møller and Hjerrild (2013))*	Financial Activities Tax	
Subtraction method	*Italy (since 1998, Keen et al. (2010)), Japan (it was going to be settled in 1950, but it was abolished a few years before, De la Feria and Krever (2012)), proposed in Canada*	Separate tax rates	
Separate taxes	*Quebec, Israel (since 1981, Gillis (1987)), France, Denmark, Italy*	Cash-flow method	
Taxation of gross interest	*Argentina (since 1992, Zee (2004))*		

Source: López-Laborda and Peña (2016b)

The following variables are related with the public sector. One of our interest variables is financial VAT[3] (*fVAT*), being a binary variable that takes the value 1 when financial VAT is taxed and 0 when it is not[4] , applying the value 1 to data in table 1, with the exception of separate taxes. The last variable of interest to include is *separate.* This variable takes the value 1 if the country applies a financial service tax other than financial VAT or the value 0 otherwise. The size of the public sector is incorporated as

[3] We have estimated using alternative variables to this, which reflect separately the main methods of financial VAT (methods of "option to tax", and the other methods in financial VAT), obtaining no significant differences between both.

[4] We consider that Lithuania takes the value "0" in the variables fVAT, option and separate in our models. Hence we consider this country keeps the exemption for financial services. This is due to, as Borselli (2009) points out, the "option to tax" method in Lithuania being applied to a limited list of specific financial products (foreign exchange transactions, for instance, as Borselli (2009) and Merrill (2011) state), and it is not widely extended among financial entities. Thus,if we consider it is not applied to financial services in general but to specific ones, then the vast majority of financial services are exempted, considering this country still applies the exemption.

an explanatory variable by the variable *psize*, measured by the logarithm of public expenditure, considered as the government payments for operating activities for the provision of goods and services, including workers' remuneration (as wages and salaries), interests and subsidies, donations, social benefits and other expenditures. The last variable related to the public sector is *debt*, which measures the public debt of the central government as a percentage of GDP.

The commercial or geographical variables are: trade openness (*openness*), measured as the fraction between the sum of exports plus imports and the GDP; *closed*, a dummy variable that takes the value 1 if the country is not open to the sea, or 0 otherwise; *distance*, which measures the average of the three bilateral distances between each country of the sample and France, Japan and the USA; and *area*, which is the size of a country measured by its area.

The variables of the economic context included in the study are the following. The variable *gdppc* is the growth rate of GDP per capita, the fraction of the GDP of a country and its population. The presence of a financial crisis is included by the variable *crisis*, which takes the value 1 in the year of a banking crisis and 0 otherwise. The last variable of the economic context is *inflation*, measured as the growth rate of the price index.

In addition, we incorporate some institutional variables, such as *language*, used as a proxy of institutional quality, representing the presence of at least one significant minority population whose native language is one of the five main languages of Europe (English, French, German, Spanish and Russian). Another variable in this group is *instability*, which is the World Bank's "Political Stability and Absence of Violence/Terrorism", which "measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5".

There are also variables of investment, such as *fdi*, a variable that measures the net flows obtained in the acquisition of at least 10% of the shares in a business that operates in a different economy than the investor, or *investment*, measured by gross investment over GDP, being the investment the purchases of fixed assets plus the net variation of stocks.

The next group of variables is related to the population and human capital. The gross rate of secondary education, which is the total of students in secondary school over the

total people in the age range, is measured by the variable *secondary*. The variable *density* reflects the current population divided by the area of the country. The population is incorporated by the variable *population*, which is the growth rate of the current population estimated at the half of the year.

Other groups are sectorial variables, such as *agriculture*, which is the participation of agriculture in the GDP, measured as the logarithm of the percentage of the aggregated value of agriculture over total GDP. The participation of industry in the GDP, included as *industry*, is measured as the logarithm of the proportion of the aggregated value of the industry over total GDP.

We also include some financial variables, such as *lerner*, a measure of the market power of the banking system. It compares the price of the final good with the margin costs (i.e. the *mark-up*). An increment of this variable indicates a depreciation of the competitive conduct of the financial intermediates. The depth of credit information is included by the variable *information*, which is an indicator that measures the rules affecting the accessibility, breadth, and quality of the information available in the registers. The index takes the values 0 - 8, and higher values represent an availability of more credit information.

The last group of variables is related to infrastructure: the variable *mobiles* measures the mobile phone lines for each 100 people and the variable *energy* refers to the use of primary energy before its transformation to other fuels of final use.

All the variables are obtained from the World Bank, with the exceptions of *language* and *closed*, obtained by the authors; the variable *instability*, obtained from the World Bank database "Worldwide Governance Indicators"; and the variable *distance*, obtained according to the definition of Chang et al. (2009), and as a source of the database CEPII (Mayer and Zignago, 2011). The variables *fVAT* and separated were created by the authors, following López-Laborda and Peña (2016a). Table 2 summarises the expected signs of the variables and the source.

Table 2. Expected signs

Variable group	Variable	Sign	Source
Fiscal	*fVAT*	0	Aigner and Bierbrauer (2015)
	separate	(-)	Aigner and Bierbrauer (2015)
	psize	(-)	Kahn et al. (2006) and Bahadir and Valev (2015)
	debt	(-)	Caballero and Krishnamurthy (2004), Christensen (2005) and Ayadi et al. (2013)
Commercial	*openness*	(+/-)	(+): Rajan and Zingales (2003), Law and Demetriades (2005), Kahn et al. (2006), Klein and Olivei (2008) and Roe and Siegel (2011), (-): Kim et al. (2010, 2011)
	closed	(+)	Roe and Siegel (2011)
	distance	(+/-)	Demirgüç-Kunt et al. (2011)
	area	(+)	Jaffee and Levonian (2001), Roe and Siegel (2011)
Context	*gdppc*	(+)	King and Levine (1993), Djankov et al. (2007), Allen et al. (2014)
	crisis	(-)	Kroszner et al. (2007) and Braun and Raddatz (2008)
	inflation	(+/-)	(-): Boyd et al. (2001), Detragiache et al. (2005), Do and Levchenko (2007), Kim et al. (2010), Luca and Spatafora (2012), Asongu (2014) and Bahadir and Valev (2015), (+): Kahn et al. (2006)
Institutional	*language*	(+)	Huang (2010b)
	instability	(-)	Law and Azman-Saini (2008), Roe and Siegel (2011)
Investment	*fdi*	(0,-)	(0): Ayadi et al. (2013) and Raza et al. (2014), (-): Asongu (2014)
	investment	(+)	Huang (2010a) and Luca and Spatafora (2012)
Population	*secondary*	(+)	Kim et al. (2011), Demirgüç-Kunt et al. (2011)
	population	(-)	Asongu (2014)
	density	(-/0, +)	(-/0): Allen et al. (2014) , (+): Demirgüç-Kunt et al. (2011)
Sectorial	*agriculture*	(-)	Raza et al. (2014)
	industry	(+)	Rajan and Zingales (2003) and Allen et al. (2014)
Financial	*lerner*	(-)	Braun and Raddatz (2008)
	information	(+)	Detragiache et al. (2005), Djankov et al. (2007)
Infrastructure	*mobiles*	(+)	Allen et al. (2014)
	energy	(+)	Shahbaz et al. (2013)

Table 3 shows the main descriptive statistics of the variables used.

Table 3. Descriptive statistics

Variable	No observations	Average	Standard Deviation	Minimum	Maximum	Skewness	Kurtosis
fsize	1547	85.66195	54.73184	9.647092	346.2096	1.527045	6.000094
bsize	1540	61.6239	42.1042	5.874088	311.063	1.419644	5.474296
M2	1090	58.51556	35.74661	8.860457	241.9432	2.285547	9.931867
depth	806	160.369	90.91461	13.37731	574.3445	0.9552905	3.950426
openness	1583	54.5929	32.23505	6.816077	184.9007	1.27402	4.616137
lerner	535	0.1851031	0.1177539	-1.60869	0.503105	-6.738992	103.026
agriculture	1045	1.473432	0.9068354	-1.236742	3.996702	0.0771902	3.023725
psize	578	34.33628	9.040107	10.67037	62.14905	-0.4492487	2.837009
information	322	4.543478	1.487111	0	6	-1.965872	6.780263
investment	1527	23.59319	5.197639	2.388235	53.31139	0.556939	4.171909
language	1872	0.5555556	0.4970368	0	1	-0.2236068	1.05
industry	1344	32.56407	7.131807	12.93013	65.11715	0.9270982	5.658791
density	1794	4.020583	1.359454	0.3031956	6.215697	-0.8825959	3.277587
secondary	1323	93.75018	19.41376	20.83333	160.6186	-0.3141531	5.032756
mobiles	1848	25.74963	43.29911	0	172.3224	1.450417	3.642715
energy	1679	129945.7	328119.5	522.175	2337014	5.009691	28.97829
instability	504	0.7041914	0.6414413	-1.623045	1.668068	-1.42873	5.029877
debt	480	56.28303	34.57125	3.610249	196.5443	0.9048843	3.937589
fdi	1246	2.965927	13.23697	-57.4297	430.6407	27.33251	877.4937
inflation	1518	11.16206	39.33546	-4.479938	1058.374	16.56859	374.7155
gdppc	1587	2.65145	3.629739	-31.17752	17.55749	-1.155455	11.06197
crisis	1836	0.0827887	0.2756376	0	1	3.02807	10.16921
closed	1689	0.0544701	0.2270102	0	1	3.92636	16.4163
distance	1872	19577.42	6560.57	15561.77	43059.43	2.684951	9.06083
population	1870	0.7413397	0.8295421	-2.57432	6.017009	0.5313929	5.586254
fVAT	1872	0.0440705	0.204981	0	1	4.442619	20.75573
separated	1872	0.0438034	0.2047122	0	1	4.458147	20.87508

6. Estimation and results

In order to avoid multicollinearity problems, we are going to evaluate the correlation matrix of those variables (see Table 4). It can be seen there is no variable with a correlation higher than 0.5.

Table 4. *Correlation matrix of independent variables*

	openness	*lerner*	*agriculture*	*psize*	*information*	*investment*
openness	1					
lerner	-0.1835	1				
agriculture	-0.0079	-0.1473	1			
psize	0.2936	-0.0354	-0.0233	1		
information	-0.2808	0.2227	0.0803	-0.2104	1	
investment	0.1764	0.0212	0.366	-0.4265	-0.0903	1
language	-0.0217	-0.0278	-0.2676	0.0476	0.0312	-0.0209
industry	0.2525	-0.1345	0.303	-0.2637	0.073	0.3965
density	0.3172	0.1242	-0.4585	0.3238	-0.0389	-0.3016
secondary	-0.1834	-0.0774	0.0459	0.005	0.0425	0.0934
mobiles	0.2801	-0.1232	-0.0936	0.2792	-0.0689	-0.0733
energy	-0.3745	0.1836	-0.2481	-0.398	0.3059	-0.1289
instability	0.1904	-0.1946	-0.1517	0.0211	-0.2521	0.0229
debt	-0.2605	0.1016	-0.1493	0.1638	0.2315	-0.3611
fdi	0.1302	0.0692	-0.2284	0.0742	-0.2866	0.0122
inflation	0.1482	-0.1689	0.391	-0.018	-0.1304	0.3588
gdp	0.2054	0.0777	0.134	-0.1994	-0.1489	0.4612
crisis	-0.0321	0.0048	-0.3187	0.3289	-0.0027	-0.3761
closed	0.3447	-0.161	0.0828	0.0662	-0.061	0.2088
distance	-0.3064	-0.1656	0.3349	-0.2069	0.1241	0.1656
population	-0.285	0.0615	-0.2088	-0.0573	-0.0311	0.0931
fVAT	0.0692	-0.0808	-0.0405	0.0677	0.0804	0.0904
separated	-0.1524	0.1049	-0.0932	0.1174	0.0082	-0.1084

Table 4. *Correlation matrix of independent variables (continuation)*

	language	*industry*	*density*	*secondary*	*mobiles*	*energy*
language	1					
industry	-0.3463	1				
density	0.0781	-0.1933	1			
secondary	0.2015	-0.0708	-0.3408	1		
mobiles	0.031	0.0267	0.1797	-0.1328	1	
energy	0.1745	-0.2664	-0.0261	-0.2338	-0.3637	1
instability	-0.2239	0.1862	-0.2717	0.1704	0.1372	-0.2667
debt	-0.1184	-0.3017	0.3826	-0.1636	-0.1859	0.2051
fdi	0.0936	-0.1836	0.0685	-0.0437	0.1397	-0.0645
inflation	0.0276	0.0513	-0.2193	-0.138	0.0791	-0.0896
gdp	-0.0805	0.2492	-0.0291	-0.0648	-0.1042	-0.0424
crisis	0.2237	-0.4253	0.1978	-0.0157	0.2432	0.1363
closed	-0.2055	0.4595	0.1499	-0.3553	0.1062	-0.1219
distance	0.1712	-0.0714	-0.4413	0.4611	-0.2061	-0.0185
population	0.0584	-0.1272	-0.2484	0.3003	-0.2269	0.0858
fVAT	0.4035	-0.1311	-0.1214	0.2908	-0.0272	-0.0765
separated	0.2175	-0.1116	0.1845	0.1017	0.2142	-0.0519
	instability	*debt*	*fdi*	*inflation*	*gdp*	*crisis*
instability	1					
debt	-0.1242	1				
fdi	0.1269	-0.1135	1			
inflation	-0.2074	-0.2156	0.0242	1		
gdp	0.1602	-0.1899	0.06	0.0876	1	
crisis	-0.1364	0.2234	0.0989	-0.0047	-0.3895	1
closed	0.1549	-0.12	-0.0321	-0.0044	0.1646	-0.106
distance	0.0765	-0.0804	-0.0647	0.0056	-0.0119	-0.2075
population	0.1282	-0.0747	0.1489	0.0237	-0.0552	0.0146
fVAT	0.0868	-0.0723	-0.0207	-0.0374	-0.0379	0.065
separated	-0.0403	0.1488	-0.0589	-0.0912	-0.0798	0.0728
	closed	*distance*	*population*	*fVAT*	*separated*	
closed	1					
distance	-0.096	1				
population	-0.1026	0.222	1			
fVAT	0.0454	0.4474	0.0607	1		
separated	-0.1017	-0.071	-0.0245	-0.1435	1	

Thus, in our models, there is a lack of multicollinearity. Tables 5 to 8 reflect four specifications with two models for each one.

Table 5. Robust dynamic panel data for the variable *fsize*

Dependent Variable: *fsize*	Model 1.1			Model 1.2		
Explanatory variables	Coefficient	Significance	p-value	Coefficient	Significance	p-value
fsize t-1	0.5892965	*	0.051	0.9521957	***	0
openness	-0.1071957		0.753	-0.2425069	***	0
lerner	-27.8793		0.83			
agriculture	-18.87514		0.242			
psize	-1.31576		0.612			
information	1.108844		0.643			
investment	0.0506714		0.963			
language	-77.64194		0.404			
industry	-2.030806		0.408			
density	-17.12073		0.338	-3.444515	***	0.01
secondary	-0.1342282		0.693			
mobiles	0.2583422		0.234	0.1752441	***	0
energy	-0.0000261		0.707			
instability	-44.65929		0.28			
debt	0.342446		0.566	-0.1877361	***	0.006
fdi	0.0453004		0.465			
inflation	-1.456681		0.378	-0.2283566	*	0.094
gdp	0.3401443		0.711			
crisis	-1.401697		0.732	-6.360162	**	0.028
closed	-17.63983		0.893			
distance	-0.002532		0.776			
population	20.32827		0.593			
fVAT	21.78376		0.257	-4.776666		0.305
separated	125.9739		0.616	-19.73552		0.357
constant	342.6926		0.281	40.21026	***	0
Sargan (p-value)	0.6705			0.9909		
Arellano-Bond (p-value 1st,2nd order)	0.2307	0.2901		0.0281	0.4776	
No Observations	189			425		
No Instruments	35			52		

Table 6. Robust dynamic panel data for the variable *bsize*

Dependent Variable: *bsize*	Model 2.1			Model 2.2		
Explanatory variables	Coefficient	Significance	p-value	Coefficient	Significance	p-value
pesosb t-1	0.7882688	***	0	0.9105172	***	0
openness	-0.2588469	*	0.093			
lerner	77.32085		0.251	38.37277	**	0.035
agriculture	-16.34509		0.174			
psize	-1.232959	**	0.021			
information	0.8724514		0.574			
investment	0.1134357		0.858	2.39	***	0
language	-90.93254		0.359			
industry	-0.210904		0.906			
density	19.49505		0.344			
secondary	0.0985115		0.791			
mobiles	0.0886974		0.506			
energy	-0.0000845		0.81			
instability	3.411147		0.52			
debt	-0.2223415		0.327			
fdi	-0.006449		0.831			
inflation	0.353142		0.57	-0.6287204	**	0.033
gdp	-0.6387419		0.191	-0.930003	***	0
crisis	3.245313		0.556			
closed	-64.65462		0.611			
distance	0.0044922		0.688			
population	-10.24915	*	0.08			
fVAT	-2.62316		0.74	-1.177189		0.818
separated	-105.079		0.844	9.891002		0.348
constant	-6.694468		0.976	-46.36137	***	0
Sargan (p-value)	0.9910			0.5268		
Arellano-Bond (p-value 1st,2nd order)	0.9709	0.2509		0.0376	0.1901	
No Observations	189			500		
No Instruments	35			38		

Table 7. Robust dynamic panel data for the variable *M2*

Dependent Variable: *M2*	Model 3.1			Model 3.2		
Explanatory variables	Coefficient	Significance	p-value	Coefficient	Significance	p-value
M2 t-1	0.1951949		0.793	0.8800394	***	0
openness	0.9103008		0.472			
lerner	(omitted)					
agriculture	-5.796598		0.806			
psize	-0.3287277		0.892	0.1869499	***	0.005
information	8.356639		0.404			
investment	-0.8871554		0.603			
language	(omitted)					
industry	2.482082		0.548			
density	18.8207		0.277			
secondary	0.5193065		0.562			
mobiles	-0.914399		0.279	0.0647209	**	0.046
energy	-0.0000842		0.436			
instability	(omitted)					
debt	0.3672754		0.444			
fdi	0.0546748		0.964			
inflation	-5.014102		0.537			
gdp	0.1107364		0.904			
crisis	46.3808		0.373			
closed	(omitted)					
distance	-0.0054306		0.291			
population	61.5262		0.372			
fVAT	(omitted)			5.120384		0.144
separated	(omitted)					
constant	(omitted)					
Sargan (p-value)				0.9928		
Arellano-Bond (p-value 1st,2nd order)				0.0569	0.9612	
No Observations	106			336		
No Instruments	35			48		

Table 8. Robust dynamic panel data for the variable *depth*

Dependent Variable: *depth*	Model 4.1			Model 4.2		
Explanatory variables	Coefficient	Significance	p-value	Coefficient	Significance	p-value
depth t-1	0.3455291		0.25	0.4162007	***	0
openness	-0.7344469		0.468			
lerner	65.07553		0.82			
agriculture	-34.48407		0.493			
psize	1.318382		0.774			
information	0.1365418		0.982			
investment	-1.271441		0.482			
language	-211.3876		0.269			
industry	1.635361		0.773	3.580444	***	0
density	-50.96235		0.627			
secondary	0.4148559		0.822			
mobiles	0.5037969		0.18	0.4567909	***	0.003
energy	-0.0004546		0.484			
instability	-11.28184		0.882			
debt	-0.1992268		0.733			
fdi	-0.029591		0.791			
inflation	-3.056023		0.262	-0.1079805	***	0
gdp	1.652443		0.494			
crisis	-37.94703		0.031			
closed	-442.236		0.748			
distance	0.0279354		0.485			
population	15.87234		0.629			
fVAT	18.72098		0.134	7.58337		0.728
separated	-93.52206		0.885	-0.0504272		0.999
constant						
Sargan (p-value)	0.1429			0.9587		
Arellano-Bond (p-value 1st,2nd order)	0.0860	0.0572		0.0135	0.15031	
No Observations	189			689		
No Instruments	34			51		

Dynamic models are estimated in the two-step GMM. First we estimate the model in a non-robust way, in order to apply the Sargan test (of over-identification of the instruments), and of Arellano-Bond (of no autocorrelation of the residues). The lags usually added in the economic literature to explanatory models of financial sector size (one lag) are incorporated in the specification. Finally, robustness is applied, and two models are obtained for each of the four specifications, using different indicators of

financial development as dependent variables. The first model includes all the variables that are relevant for the literature, in addition to a constant and our target variables, financial VAT (*fVAT*) and separate taxes (*separate*). As the first model does not have good econometric properties, we create the second model, obtained from the previous one, eliminating successively the non-significant variables until we obtaining a model where all the control variables are significant.

The Sargan test has as null hypothesis the validity of the instruments used and is analyzed in the first model before applying robustness. Analyzing the second model, the definitive one, before applying robustness, the null hypothesis is accepted.

The Arellano-Bond test has the null hypothesis of serial autocorrelation of the residues of order i, and in the case of the second models, the definitive ones, it is accepted that residues are AR(1) and we reject that they are AR(2).

According to the theory (Aigner and Bierbrauer, 2015), all the estimations obtain that financial VAT does not influence financial sector size. In contrast, all the models also obtain that the taxes on financial services separate from VAT do not influence financial sector size, in an apparent contradiction to what we would expect from the theory. But it is worth mentioning that the case studied in the theory is a VAT situation similar to a specific case of separate tax (in which the margin rate is equal to the general VAT rate and we cannot credit input VAT). Nevertheless, in the vast majority of the countries the margin rate of the separated financial tax is different to general VAT, and furthermore, businesses can partially credit input VAT.

All the estimated models have good econometric properties, hence it is correct to think that the most suitable specification is the dynamic one. The model 1.2 is the definitive model for the variable *fsize*, obtaining that the following variables determine financial development as measured by the loans of the financial sector as a percentage of GDP: *openness*, *density*, *mobiles*, *debt*, *inflation* and *crisis*. All the signs are as expected. Openness has a positive sign, as found in Rajan and Zingales (2003), Law and Demetriades (2005), Kahn et al. (2006), Klein and Olivei (2008) and Roe and Siegel (2011). The logarithm of population density in a country keeps a negative relationship with financial development, as shown in Allen et al. (2014). The development of infrastructure, measured by an index of mobile ownership by the population, encourages the size of the financial sector, according to Allen et al. (2014). A higher public sector

debt reduces the percentage of private credit over GDP, with the *crowding-out* effect appearing, empirically tested by Christensen (2005) and Ayadi et al. (2013). The *inflation* coefficient keeps its negative sign, as in Boyd et al. (2001), Detragiache et al. (2005), Do and Levchenko (2007), Kim et al. (2010), Luca and Spatafora (2012), Asongu (2014) and Bahadir and Valev (2015). We find a negative relationship for the presence of financial crisis in a country in a specific year, as Kroszner et al. (2007) and Braun and Raddatz (2008) also obtained. The R2 of this model estimated by fix effects is 0.5829.

Model 2.2 is the definitive model for the variable *bsize* (percentage of domestic credit provided by the banking system over total GDP), obtaining that the following variables determine financial development measured by the loans of the banking system as a percentage of GDP: *lerner*, *investment*, *inflation* and *gdppc*. The sign of the variables is as expected in all of them with the exceptions of *lerner* and *gdppc*, in which they are opposite to those expected. The negative effect of fiscal competition on banking sector development and the positive effect on the financial sector overall, could be interpreted as due to the fact that banking competition must obtain lower profits in banking, and businesses prefer to set up in other more profitable financial sectors, raising the overall size. The fact that GDP growth discourages the banking development can be explained by considering that when income increases, the population can afford to demand financial services from other kinds of financial intermediaries, so that the size of the financial sector is increased but the banking system specifically reduces its size due to this effect. We obtain the expected positive sign in the coefficient of the variable investment, as in Kahn et al. (2006) and Luca and Spatafora (2012), and the sign of the variable inflation is negative as with the variable *fdepth*. The R2 of this model estimated by fix effects is 0.2649.

Model 3.1 includes omitted variables and we cannot verify their properties. Model 3.2 is the definitive model for the variable *M2*. We find that the following variables determine financial development measured by the money supply as percentage of the GDP: *psize*, *mobiles*. The variable mobiles appear with the expected sign, similar to the specification with *fsize*, in contrast, the variable *psize* does not have the expected sign. But it is reasonable to consider a positive correlation between both variables, because policies of fiscal expansion (increased *psize*) are usually combined with expansive monetary policies (increased *M2*). The R2 of this model, when estimated by fix effects, is 0.3902.

Model 4.2 is the definitive model for the variable *depth*, finding that the following variables determine financial development measured by the sum of the credit provided by the financial sector plus the stock capitalization, both as a percentage of GDP: *industry*, *mobiles* and *inflation*. In this model, as in the model 1.2, all the variables have the sign theoretically expected. The variables *mobiles* and *inflation* are similar to the specification with *fsize*, and the variable *industry* has the same positive sign as in Rajan and Zingales (2003) and Allen et al. (2014). The R2 of this model estimated in static by the fix effects method is 0.4109.

7. Conclusions

In this paper we have studied the existing theoretical literature on the possible influence of financial VAT on financial development (Aigner and Bierbrauer, 2015), which sustains that financial VAT in general, and in contrast to Pigouvian taxes, does not influence the size of the financial sector. The case called "differentiated taxation" (which includes hypothetical situations of separate taxes and some methods of financial VAT taxation) obtains that the size of the financial sector would decrease in relation to exemption.

In addition, we contribute empirical evidence about this lack of relationship, for the first time as far as we know, from a panel with 36 countries for the period 1961 - 2012 by the econometric technique of dynamic panel data models. The result, with a robustness corroborated by the analysis of the different measures of financial development, show that neither financial VAT nor other taxes on financial services separate from VAT affect the size of the financial sector, by obtaining a non-significant and robust coefficient in all the parameters associated with the target variables. Consequently, we can conclude that, as currently designed, VAT on financial services is not a good instrument, for avoiding the systemic risks caused by the excessive size of the banking sector.

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