

# Panel-Data Analysis of Capital Account Liberalization and Tax Revenue

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## Abstract

The main motive behind financial repression is fiscal. The government wishes to promote development, but lacks the resources to do so. In fact, financial repression is an instrument of government revenue management. This paper examines the impact of capital account liberalization on government's tax revenue. I test the hypothesis empirically, using panel data on 149 countries over the period 1970-2017. Historically, I find that the positive impact of capital account liberalization on tax revenue is predominant in countries where the depth of the banking sector is greater.

**Keywords:** tax, capital account liberalization, bank credit, panel data

**JEL Codes:** O11 (economic development), H2 (taxation), G2 (financial institutions)

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# 1 Introduction

In the last couple of decades a large body of research has examined the link between capital account openness and economic growth. The impact of an open capital account on economic growth has been mixed at best. In general, the evidence is not quite as compelling as the theory. While emerging market countries that have liberalized their capital accounts typically have had higher growth rates, on average, than those that have not, this association does not imply a causal relationship. Statistical analysis suggests that, after controlling for the effects of other factors, the causal effect of capital account liberalization on growth has been weak, at best<sup>1</sup>.

This paper takes a little different approach to analyzing the impact of capital account openness. I investigate the connection between capital account liberalization and tax revenue. I argue that a policy of capital account openness can be accompanied by increases in the level of tax revenue, but it requires a banking sector that can facilitate the new flow of loanable funds.

Theoretically, financial repression is problem because; (1) the flow of loanable funds through the organized banking system is reduced, forcing potential investors to rely on self-finance; (2) the process of self-finance is itself impaired; if the real yield on deposits is negative, firms cannot easily accumulate liquid assets in preparation for making discrete investments and socially costly inflation hedges look more attractive as a means of internal finance; and (3) significant financial deepening outside of the repressed banking system becomes impossible when firms are dangerously illiquid and/or inflation is high and unstable.

In fact, the main motive behind financial repression is fiscal. The government wishes to promote development, but lacks the resources to do so. Through imposition of large liquidity and reserve requirements, it creates a captive demand for its own interest bearing or non-

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<sup>1</sup>See Kose and Prasaad (2012) for details.

interest bearing instruments, respectively, and uses it to finance its own priority spending. It puts a cap on rates, which creates excess credit demand, and directs credit to its own priority sectors. An additional means for capital account repression involves limiting the menu of instruments that the public can hold (e.g. foreign exchange deposits) in order to ensure greater "seigniorage" revenue<sup>2</sup>.

In addition, financial repression is an instrument of government revenue management. Alesina and Tabellini (1989) show that controls limit the ability of residents to avoid the inflation tax on domestic money balances by shifting into foreign assets. Eichengreen (2001) shows that controls are likely to be used where the domestic financial system is tightly regulated and reserve requirements can be used to compel financial institutions to hold public sector liabilities. Leblang (1997) finds that this is consistent with the notion that governments that are less reliant on seigniorage are less likely to have capital controls. Furthermore, [Alesina et al. (1994), Quinn and Inclean (1997), and Milesi-Ferretti (1998)] all find that countries with more independent central banks are less likely to use controls.

With capital account liberalization, however, the above mentioned potential problems of financial repression can be solved throughout the deepening and developing of the financial system<sup>3</sup>. Therefore, as more firms and investors are pulled into to the formal sector, and with the improvements in capital allocation, the government has the potential to raise more tax revenue as share of GDP.

To the best of my knowledge, this is the first empirical paper exploring the relationship between capital account liberalization on tax revenues, and the interaction of financial development and capital account liberalization on tax revenues. Using a panel data of 149 countries over the 1970-2017 period, I find that countries with well developed banking sector benefit proportionately more from capital account openness than countries where the bank-

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<sup>2</sup>For detailed explanation see Agenor and Montiel (2015) and Ulcer (2000).

<sup>3</sup>More details can be found with Levine and Zervos (1998).

ing sector is not as developed. However, the results suggest a diminishing marginal benefit where the biggest bang for your buck is achieved with having less developed financial sectors.

The remainder of the paper is organized as follows. Section 2 describes the data and reports empirical results, and Section 3 concludes. All data and computer code used in the paper are available online at the corresponding author's website.

## 2 Empirics

### 2.1 Data

According to Chinn and Ito (2008), it is extremely difficult to measure the extent of capital account controls. Although many measures exist to describe the extent and intensity of capital account controls, it is generally agreed that such measures fail to capture fully the complexity of real-world capital controls for a number of reasons.<sup>4</sup> The key advantages of the Chinn-Ito index is its relative transparency in terms of construction, ease of updating, and wide coverage across countries and time.<sup>5</sup> The variable is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*.

I am also interested whether the effect of capital account liberalization on the level of tax revenue differs depending on the depth of the banking sector across countries. Domestic credit provided by banking sector as a percent of GDP is the commonly used measure in the literature.<sup>6</sup> This includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary

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<sup>4</sup>See Chinn and Ito (2008) for discussions and comparisons for various measures on capital restrictions. For extensive reviews on capital controls policy or financial liberalization, refer to Eichengreen (2002).

<sup>5</sup>Refer to Chinn and Ito (2008) for detailed explanation of the construction of KAOPEN.

<sup>6</sup>See Levine (1998).

authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits).

For controls I draw from the relevant tax literature, specifically Baunsgaard and Keen (2010), Auriol and Warlters (2005), Rodrik (1998), and Tanzi (1987). The control variables are log of GDP per capita, trade openness, inflation, population density, and lagged TAX. See Table 3 for data definitions and sources.

## 2.2 Basic results

In this section, I provide the basic empirical method and results. I adapt the specification derived in Baltagi and Wu (1999). The model fits cross-sectional time-series regression models when the disturbance term is first-order autoregressive.<sup>7</sup> It offers a within estimator for fixed-effects models and a GLS estimator for random-effects models.<sup>8</sup> Consider the following model:

$$\text{TAX}_{it} = \alpha + \beta \text{KAOPEN}_{it} + \mu_i + \epsilon_{it} \quad (2.1)$$

where,

$$\epsilon_{it} = \rho \times \epsilon_{i,t-1} + \zeta_{it} \quad (2.2)$$

and where  $\rho < |1|$  and  $\zeta_{it}$  is independent and identically distributed i.i.d. with zero mean and variance  $\sigma_z \sigma_z$ . If  $\mu_i$  are assumed to be fixed parameters, then the model is a fixed-effects model. If  $\mu_i$  are assumed to be realizations of an i.i.d. process with zero mean and variance

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<sup>7</sup>I tested for autocorrelation in the disturbance term using a Stata command `xtserial` where the null hypothesis is no first-order autocorrelation. The F statistic from the estimate is 192.55 which rejects the null at a one percent level.

<sup>8</sup>Hausman test favors Fixed Effects over Random Effects and I only report the former.

$\sigma_z\sigma_z$ , then it is a random-effects model. In the fixed-effects model, the  $\mu_i$  may be correlated with the covariates  $X_{it}$ . However, the random-effects model maintains the assumption that the  $\mu_i$  are independent of the  $X_{it}$ . On the other hand, any  $X_{it}$  that do not vary over  $t$  are collinear with the  $\mu_i$  and will be dropped from the fixed-effects model. In contrast, the random-effects model can accommodate covariates that are constant over time.<sup>9</sup>

The basic results of the analysis are reported in Table 6. The left column of the table reports the fixed-effects model with auto-regressive disturbance term and the right hand column reports the standard least squared dummy variable (LSDV) fixed effects.<sup>10</sup> In general, I see that the effect of liberalization on the level of tax revenue has a positive and statistically significant effect. As documented in the literature this effect is very likely driven through financial deepening.<sup>11</sup>

## 2.3 Extended results

In this section, I explore the channel through which capital account liberalization affects the level of tax revenue. As I mentioned in Section 2.2, the general consensus of the statistically significant and economically relevant effect of open capital accounts on tax revenue is through financial deepness. Figure 1 provides a clear positive relationship between the interaction of capital account openness and bank credit on the level of tax revenue as a share of GDP. What the following specification does not account for is that poorly functioning bureaucratic systems, such as weak institutions or other third factors, may affect both the capital account liberalization, tax system, and the combination of the two to perform a certain way.

Similarly to the basic specification, the extended specification is modeled as first-order

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<sup>9</sup>xtregar can accommodate unbalanced panels whose observations are unequally spaced over time. For further details on the specification implemented refer to the methods derived in Baltagi and Wu. The information on the xtregar specification can be found by typing help xtregar in the Stata command box.

<sup>10</sup>I find similar results by disaggregating the data to developing vs developed countries; and using lagged (t-1) independent variables.

<sup>11</sup>See Klein and Olivei (1999) for a synthesis of the literature.

auto-regressive.

Consider the following specification:

$$\text{TAX}_{it} = \alpha + \beta \text{KAOPEN}_{it} + \gamma \text{KAOPEN}_{it} \times \text{CREDIT}_{it} + X_{it} + \mu_i + \epsilon_{it} \quad (2.3)$$

where  $\text{KAOPEN}_{it}$  is the measure of capital account openness,  $\text{KAOPEN} \times \text{CREDIT}$  is the interaction term which captures the effect of capital account liberalization across the depth of the banking sector. In Table 8 we see that the effect of capital account openness on the level of tax revenue is positive and statistically significant for both models. In addition, we also see that population density and trade openness have significant impact on tax revenues as a share of GDP. As mentioned earlier, in this paper not only do we investigate the individual effects of liberalization, but also the effects of liberalization across different depths of the banking sector. In both regressions, the interaction term remains negative and statistically significant.

This shows that capital account openness does not provide the same benefits to all countries. Particularly, the positive relationship between liberalization and the level of tax revenue seems to exhibit a diminishing marginal returns. That means that as countries liberalize, they will see the most benefit in increasing their tax revenues in the early stages of liberalization. As their financial sectors evolve over time, the benefit is still there, however tax revenues as a share of gdp increases come at a lower rate.

The findings in this paper are in line with the findings of Tanzi (1987). Therefore, we can say that the effect of capital account liberalization on the level of tax revenue is predominant in countries where the availability to credit is larger.

## 2.4 Generalized Method of Moments GMM

The model in the previous section does not take into account the problem of endogeneity. In this subsection I will further investigate the relationship between capital account openness and tax revenue by the Arellano- Bond Generalize Method of Moments (GMM). The Arellano- Bond estimator sets up a generalized method of moments (GMM) problem in which the model is specified as a system of equations, one per time period, where the instruments applicable to each equation differ (for instance, in later time periods, additional lagged values of the instruments are available).

So why did I choose Arellano-Bond GMM estimation? The capital account openness *KAOPEN* variable is assumed to be endogenous. Because causality may run in both directions, from capital account openness to tax revenue as a share of GDP and vice versa, these regressors may be correlated with the error term. Another issue is that time-invariant country characteristics (fixed effects), such as geography and demographics, may be correlated with the explanatory variables. The fixed effects are contained in the error term in equation 2.3, which consists of the unobserved country-specific effects,  $\epsilon_{i,t-1}$ , and the observation specific errors,  $\zeta_{it}$ :

$$\epsilon_{it} = \rho \times \epsilon_{i,t-1} + \zeta_{it} \tag{2.4}$$

Additionally, the presence of the lagged dependent variable  $TAX_{i,t-1}$  gives rise to autocorrelation and the panel dataset has a short time dimension ( $T = 47$ ) and a larger country dimension ( $N = 134$ ). Arellano-Bond estimation deals with all four issues and the results are reported in Table 9.

The results in Table 9 are consistent with the results in the previous subsection. I confirm that capital account openness is not a guarantee in itself that governments' will be able to raise more taxes as a share of GDP. Rather, I validate that countries with deeper financial



sectors will reap more benefits with regards to increased tax revenue as a share of GDP, but this benefit increases at a diminished rate.

The fixed effects and GMM estimation does not consider the the integrating properties of the data. After conducting Im, Pesaran, Shin and Madala and Wu unit root tests, I conclude that the KAOPEN variable is stationary, and therefore, I no longer examine the cointegrating properties of the data.

### **3 Conclusion**

In this paper I investigate the relationship between capital account liberalization and the level of tax revenue. The results show statistically significant and economically relevant effects of capital account liberalization on the level of tax revenue. For a sample of 149 countries over the period 1970-2017 countries with open capital accounts managed to increase their level of tax revenue as a share of GDP. This effect was predominant in countries with a greater depth of the banking sector with the benefit exhibiting diminishing returns. I can conclude that capital account liberalization does not provide the same benefit to all. Specifically, the positive relationship is driven early and consistently by those countries where depth of the banking sector is in place. The results in this paper further the discussion on the appropriate level of capital account openness. If one can break down the tax revenue data into (income taxes, seignorage, trade taxes, corporate taxes etc.), it would be interesting to see which tax revenue source is impacted the most.

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Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
<b>Dependent Variable</b>					
Tax Revenue/GDP	4691	16.49609	7.499801	.0001368	149.2834
<b>Independent Variables</b>					
KA Open	8,592	.0062985	1.398319	-1.916551	2.346708
Credit/GDP	8,737	51.4044	44.33447	-114.6937	328.8417
Log GDPPC	10,470	7.793867	1.623048	4.053333	12.15041
Density	12,307	293.4812	1501.616	.1357916	21389.1
Inflation	8,497	22.02424	322.1898	-60.4964	23773.13
Trade	9,352	74.64146	50.02556	.0209992	860.8

Table 2: Average values of government tax revenue as a share of GDP and average values of Capital Account Openness.

Economic Level	GDP per capita	Tax (% of GDP)	KAOPEN
low	1005 and less	12.77	-0.64
middle	1006 - 3975	15.52	-0.24
	3976 - 12275	17.46	0.33
high	12276 and higher	18.63	0.76

Table 3: Variable Description

Variables	Description
KAOPEN	Capital account openness is an index measuring a country's degree of capital account openness. Source: Chinn, Menzie D. and Hiro Ito (2008). "A New Measure of Financial Openness". Journal of Comparative Policy Analysis, Volume 10, Issue 3, p. 309 – 322 (September).
GDP	gross domestic product per capita in constant (year 2000) dollars, adjusted for PPP. Source: online version of the World Development Indicators (WDI).
BANK CREDIT	Domestic credit provided by banking sector as a percent of GDP. Source: online version of the World Development Indicators (WDI).
TAX	Tax revenue divided by GDP. This ratio downloaded from the Government Finance Statistics. For OECD countries, missing values obtained from the OECD database online.
Agriculture	Share of agriculture in aggregate value added. Source: WDI.
Density of Population	The midyear population divided by land area in square kilometers. Source: WDI.
Inflation	Growth rate of the consumer price index. Source: WDI.
Openness to Trade	The sum of exports and imports of goods and services measured as a share of GDP. Source: WDI.

Table 4: Correlation Matrix

	TAX	KAOPEN	CREDIT	GDPPC	AGR	Density	Inflation	Trade
TAX	1.0000							
KAOPEN	0.7768	1.0000						
CREDIT	0.1579	0.1801	1.0000					
GDPPC	-0.1967	-0.2090	-0.2670	1.0000				
AGR	0.1817	0.0878	0.0048	-0.0085	1.0000			
Density	0.0354	0.0385	-0.0048	-0.0759	0.0079	1.0000		
Inflation	-0.0615	-0.0560	-0.0133	0.0469	-0.0003	-0.0599	1.0000	
Trade	0.0227	0.0323	0.0271	-0.0437	0.0053	0.0399	-0.0095	1.0000

Table 5: Countries in Data set

Region	Income Level	Countries
Africa	low	Burkina Faso, Burundi, Cameroon, Congo, Cte d'Ivoire, Ethiopia, Kenya, Madagascar, Mali, Lesotho, Senegal, Sierra Leone, Togo, Uganda, Zambia
	middle	Algeria, Benin, Botswana, Mauritius, Seychelles, South Africa, Swaziland, Tunisia
Americas	middle	Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Grenada, Guatemala, Honduras, Jamaica, Mexico, Panama, Paraguay, Peru, St. Kitts, St. Vincent, Trinidad and Tobago, Uruguay, Venezuela
	high	Bahamas, Canada, USA
Asia & Pacific	low	Bangladesh, Bhutan, India, Indonesia, Myanmar, Nepal, New Guinea
	middle	Cambodia, Fiji, Mongolia, Philippines, Sri Lanka, Thailand, Vietnam, Malaysia
	high	Australia, Japan, New Zealand, South Korea, Singapore
Middle East	low	Pakistan
	middle	Bahrain, Egypt, Iran, Jordan, Syria, Turkey, Yemen
Post-Soviet	high	Israel, Kuwait, Qatar
	middle	Albania, Armenia, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Moldova, Poland, Romania, Russia
	high	Czech Republic, Estonia, Slovak Republic, Slovenia
Western Europe	high	Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, UK

Table 6: Regressions of Tax Revenue on Capital Account Openness

series type	Fixed Effects AR			Fixed Effects		
	intercept	slope	$R^2$	intercept	slope	$R^2$
Time Effects	2.38 (0.188)***	0.14 (0.085)*	0.001	15.61 (0.570)***	0.27 (0.067)***	0.01
No Time Effects	17.48 (0.031)***	0.25 (0.085)***	0.013	16.69 (0.059)***	0.54 (0.057)***	0.013

Table 7: Multivariate Regressions of Tax Revenue - No Time Fixed Effects

Dependent Variable:	Tax Revenue	
	Fixed Effects AR	Fixed Effects
KAOPEN	0.15 (0.063)**	0.16 (0.073)**
BANK CREDIT	0.001 (0.002)	0.00 (0.002)
BANK $\times$ KAOPEN	-0.002 (0.001)**	-0.002 (0.001)*
Lag TAX	0.73 (0.012)***	0.78 (0.025)***
GDP	0.05 (0.073)	0.06 (0.096)
Density	-0.00 (0.000)**	-0.00 (0.000)***
Inflation	0.00 (0.000)	0.00 (0.000)***
Trade	0.01 (0.002)***	0.01 (0.003)***
# of Countries	134	134
# of Observations	2637	2771
Overall $\mathbb{R}$	93%	93.3%

Note: Standard errors in parentheses, \*\*\* (\*\*, \*) indicate significance at 1 (5, 10).

Table 8: Multivariate Regressions of Tax Revenue - With Time Fixed Effects

Dependent Variable:	Tax Revenue	Fixed Effects
KAOPEN		0.17 (0.073)**
BANK CREDIT		0.00 (0.002)
BANK $\times$ KAOPEN		-0.002 (0.001)*
Lag TAX		0.78 (0.026)***
GDP		-0.16 (0.165)
Density		-0.00 (0.000)***
Inflation		0.00 (0.000)***
Trade		0.01 (0.003)**
# of Countries		134
# of Observations		2771
Overall $\mathbb{R}$		94%

Note: Standard errors in parentheses, \*\*\* (\*\*, \*) indicate significance at 1 (5, 10).



Table 9: GMM Regressions of Tax Revenue

Dependent Variable: Tax Revenue	GMM estimates
KAOPEN	0.14 (0.073)*
BANK CREDIT	-0.004 (0.003)*
BANK $\times$ KAOPEN	-0.001 (0.001)*
GDP	-0.13 (0.106)
Density	0.001 (0.000)***
Inflation	0.00 (0.000)***
Trade	0.03 (0.003)***
Lag Tax (1)	0.67 (0.024)***
# of Countries	133
# of Observations	2588
# of instruments	52

Note: Standard errors in parentheses, \*\*\* (\*\*, \*) indicate significance at 1 (5, 10).

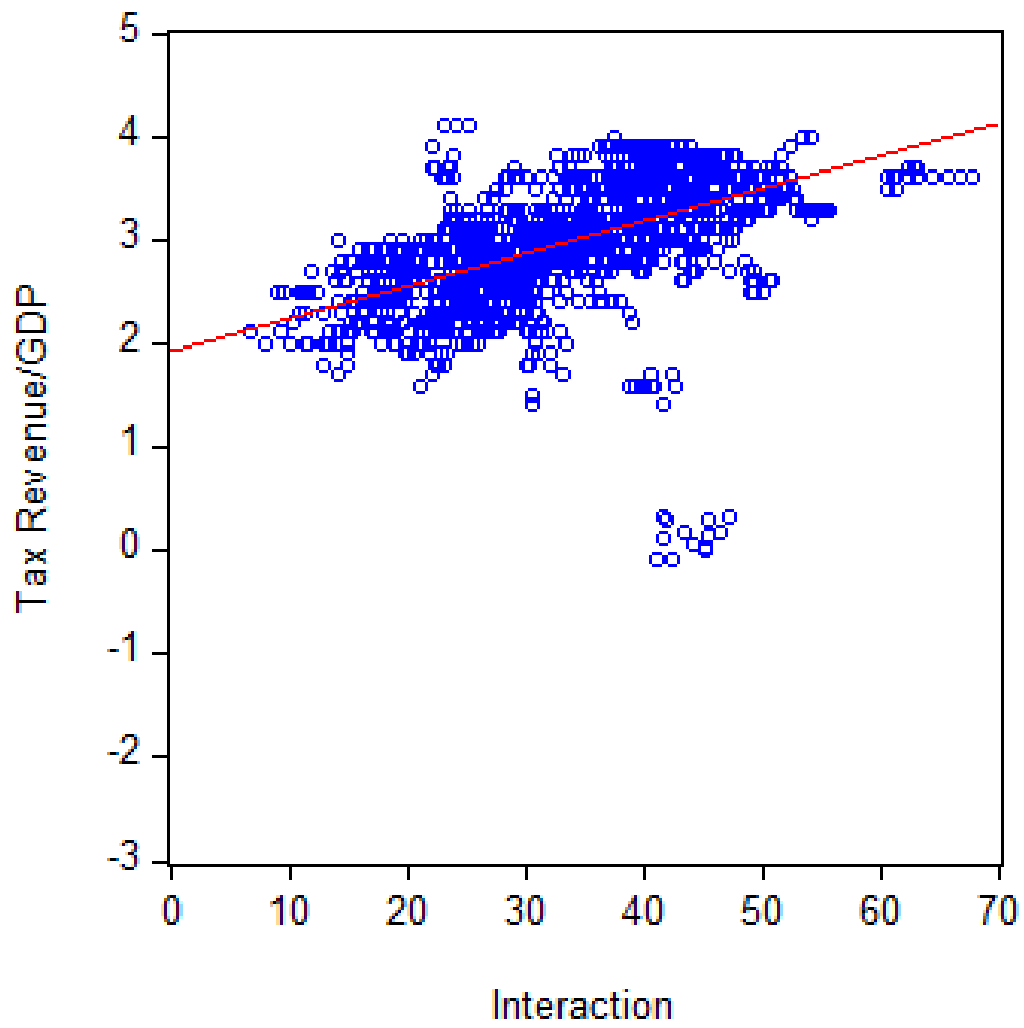


Figure 1: Tax and Interaction