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# Public Expenditure and Consumption Volatility

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## Abstract

Recent estimates of the welfare cost of consumption volatility find that it is significant in developing nations, where it may reach an equivalent of reducing consumption by 10 percent per year. Hence, examining the determinants of consumption volatility is of utmost relevance. Based on cross-country data for the period 1960-2005, the paper explains consumption volatility using three sets of variables: one refers to the volatility of income and the persistence of income shocks; the second set of variables refers to policy volatility, considering the volatility of public spending and the size of government; while the third set captures the ability of agents to smooth shocks, and includes the depth of the domestic

financial markets as well as the degree of integration to international capital markets. To allow for potential endogenous regressors, in particular the volatility of fiscal policy and the size of government, the system is estimated using the instrumental variables method. The results indicate that, besides income volatility, the variables with the largest and most robust impact on consumption volatility are government size and the volatility of public spending. Results also show that deeper and more stable domestic financial markets reduce the volatility of consumption, and that more integrated financial markets to the international capital markets are associated with lower volatility of consumption.

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This paper—a product of the Policy Review Unit, Development Economics Vice-Presidency—is part of a larger effort in the department to analyze the effects of public policy and its relationship with consumption volatility in developing countries. Policy Research Working Papers are also posted on the Web at <http://econ.worldbank.org>. The authors may be contacted at [sherrera@worldbank.org](mailto:sherrera@worldbank.org), [bruno.vincent@polytechnique.org](mailto:bruno.vincent@polytechnique.org).

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# Public Expenditure and Consumption Volatility

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## 1 Introduction

Several papers have estimated the welfare cost of consumption or output volatility in developing countries, and though there is a wide range of variation in results across countries, a general finding is that the cost is significantly higher than in developed nations; the average cost in a sample of countries may reach the equivalent of reducing household consumption by 10 percent (Atahasoulis and van Wincoop, 2000; Pallage and Robes, 2003; De Ferranti, et.al. 2000; Herrera, 2007). Given this extraordinarily high cost, it seems relevant determining the causes of consumption volatility and its relationship with economic policy.

Previous papers have focused on the determinants of output volatility. In particular, Fatas and Mihov have written a series of papers on this topic (2003, 2004, 2005), and this one follows closely their methodology to examine the determinants of consumption volatility. The explanation of consumption volatility is based on three sets of variables: one referring to the volatility of income and the persistence of income shocks; the second set refers to policy volatility, considering the volatility of public spending and the size of government; the third set captures the ability of agents to smooth shocks, and includes the depth of the domestic financial markets as well as their integration to international capital markets.

The paper has four main sections. Section 2 presents stylized facts concerning output, consumption, and government spending across the world in the period 1960-2005. Section 3 discusses the construction of our indicator of fiscal policy volatility. Section 4 explores the relationship between fiscal policy volatility and household consumption volatility, and Section 5 presents the results of the analysis. Section 6 provides a conclusion and directions for further research.

## 2 Stylized Facts of Government Expenditure, GDP and Consumption

Table 1 shows the average and the standard deviation of the growth rates of GDP, household consumption and public spending in the period 1960-2005. Regarding the average growth rates, low income countries' GDP and consumption are the lowest, while their public spending grew at the highest rate. The average growth rates of consumption and GDP of middle-income and high-income countries are almost identical, but public spending growth is significantly higher in middle-income countries.

Regarding the volatility of the three aggregates, it is the highest in the low-income countries, and decreases with the group's income. Public spending is significantly more volatile than output and consumption in low and middle-income countries. Table 2 shows the volatility of public spending is almost three times the volatility of output in HIPC and LDC, while in high income the volatility of output is higher than that of public spending. Table 2 also shows that consumption is more volatile than income in low and middle-income countries but the opposite happens in the high-income category

**Table 1: GDP, Consumption and Public Spending:  
Average Growth Rates and Volatility, 1961-2005**

	GDP		Consumption		Public Spending	
	$\mu^a$	$\sigma^b$	$\mu^a$	$\sigma^b$	$\mu^a$	$\sigma^b$
Low income	1.9	2.0	1.1	2.0	5.3	4.5
Middle income	2.7	1.7	2.7	1.7	4.6	2.9
High income	2.6	1.6	2.5	1.4	2.8	1.3

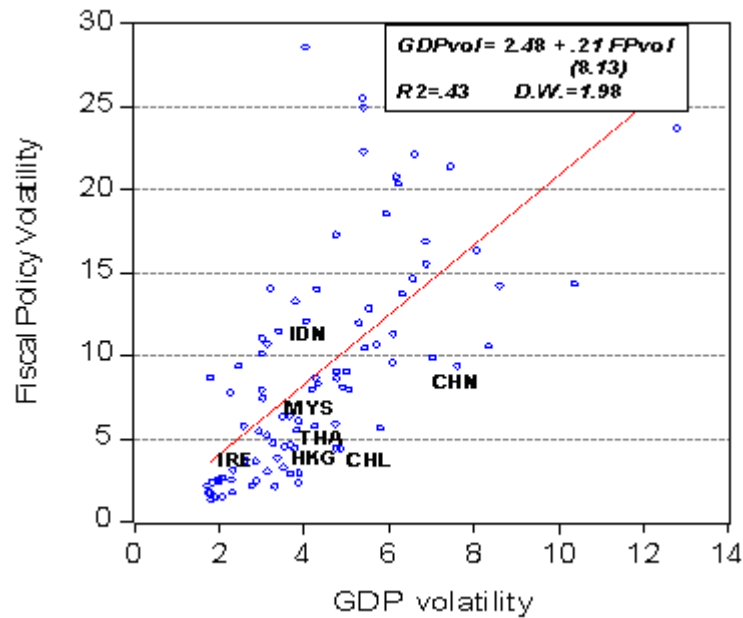
Notes: a. Average. b. Standard deviation. Calculations are based on WDI data. All variables are growth rates. GDP and Consumption are in per capita terms. Government spending is the general government consumption spending

**Table 2: Relative Volatilities of Consumption, Output and Public Spending**

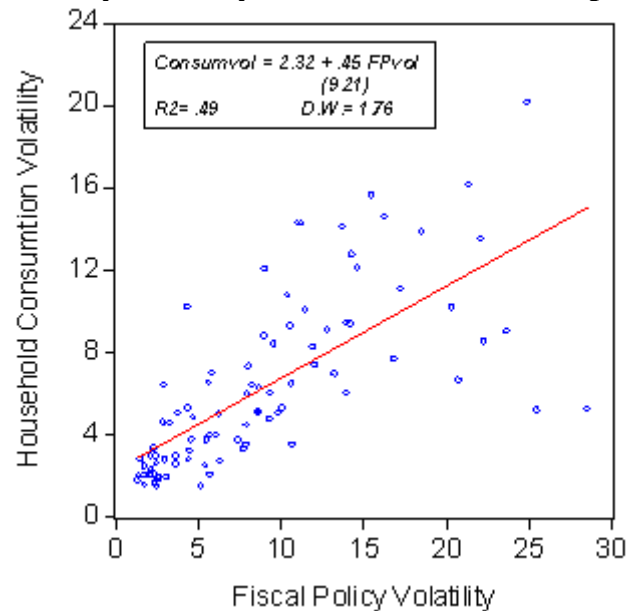
	Con/GDP	PubSp/GDP	PubSp/Cons
<b>Low Income</b>	1.0	2.3	2.3
HIPC	1.2	2.8	2.6
LDC	1.4	2.8	2.0
<b>Middle Income</b>	1.0	1.7	1.6
<b>High Income</b>	0.9	0.8	0.9
EMU	0.9	0.7	0.7

The fact that public spending volatility is higher than that of output and consumption in low and middle-income countries is not necessarily problematic. In fact, it could be interpreted as a successful use of a policy instrument to stabilize the target variable (output or consumption). However, the pro-cyclical nature of fiscal policy in most developing countries, explored elsewhere (Alesina and Tabellini, 2005; Talvi and Vegh, 2005), suggests that fiscal policy may be destabilizing. This is confirmed by the positive association between fiscal policy volatility and output and consumption volatility, as shown in Figures 1 and 2.<sup>2</sup>

<sup>2</sup> Volatility is defined as the standard deviation of the per-capita GDP and consumption growth rates during 1961-2005.

**Figure 1: Fiscal Policy Volatility and GDP Volatility**

Source: Calculations are based on WDI data. Volatility is defined as the standard deviation of growth rates.

**Figure 2: Fiscal Policy Volatility and Household Consumption Volatility**

Source: Calculations are based on WDI data. Volatility is defined as the standard deviation of growth rates

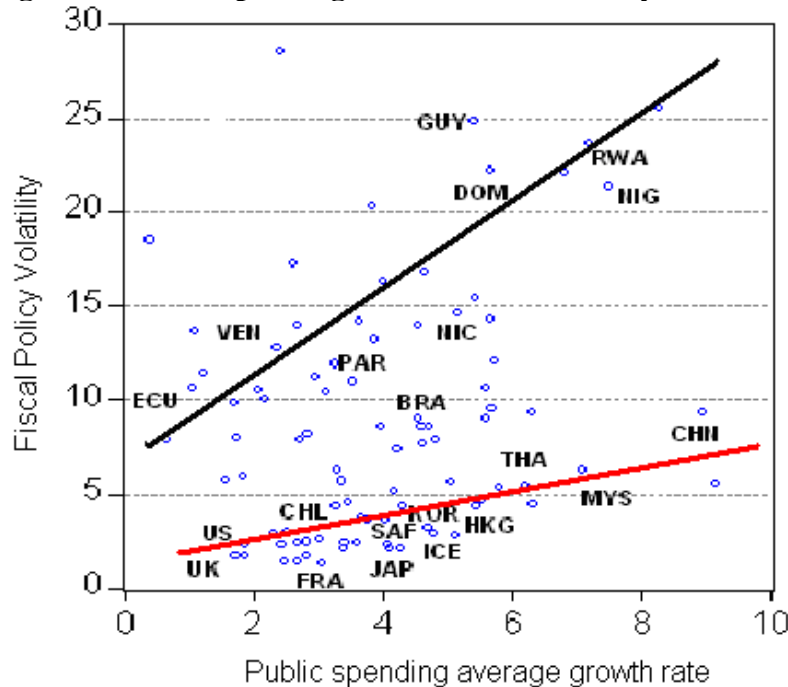
The relationship between fiscal policy volatility and output volatility (Figure 1) has been studied by Fatas and Mihov in a series of papers, but the relationship with consumption

volatility (Figure 2) has yet to be examined carefully, which is the objective of this paper. The positive association may be due to a third (omitted) variable that affects both.

Figure 3 depicts one last fact worth highlighting, namely the positive association between the average growth rate and the volatility of public spending. The positive association can be refined further by noting that there are two distinct groups of countries: the first, composed mostly of the OECD and East Asian economies, shows a positive relationship between the variables, but volatility is significantly lower for any level of growth; Chile and South Africa are included in this group. The second group, composed mostly of Latin American and African economies, also shows a positive association between the average growth rate and the volatility, though much steeper.

The “growth champions”<sup>3</sup> are all on the lower schedule (first group), while the poorer countries tend to be on the higher schedule, making it possible that the income level explains part of the observed relationship between volatility of public spending and consumption volatility. Hence, the remainder of this paper undertakes a more detailed examination of the determinants of consumption volatility.

**Figure 3: Public Spending Growth and Volatility: 1961-2005**



Source: Calculations are based on WDI data.

<sup>3</sup> Terminology used by Harberger (2005) referring to a group of fast growing countries in the last decades: China, Korea, Thailand, Singapore, Vietnam, Hong Kong, Indonesia, Ireland, Chile and Malaysia.

### 3 Measuring Fiscal Policy Volatility

The first step of our analysis is to construct an indicator of fiscal policy (or public spending) volatility that is independent of the business cycle and reflects discretionary policy changes. Following Fatas and Mihov (2003), *discretionary fiscal policy* is defined as the residual  $\varepsilon_{i,t}$  of the following model:

$$\Delta G_{i,t} = \alpha_i + \beta_i \Delta Y_{i,t} + \gamma_i \Delta G_{i,t-1} + \delta_i W_{i,t} + \varepsilon_{i,t} \quad (1)$$

where:

- $\Delta G$  is the growth rate of government spending<sup>4</sup>;
- $\Delta Y$  is the current output growth;
- $W$  is a vector of control variables including inflation and an oil prices.

The *volatility of fiscal policy* is calculated as the standard deviation of  $\varepsilon_{i,t}$  for any country  $i$ .

Equation (1) was estimated by individual country regressions and by panel methods, using both OLS and instrumental variable (IV) methods, for a total of four alternative estimation methods. Individual country regressions have the advantage of allowing heterogeneity in the estimated coefficients.<sup>5</sup> The panel specifications adopted in this paper impose the coefficient homogeneity assumption, but by including the level of income (GDP per capita) among the control variables we control for the potential source of bias (described in Figure 3), according to which the poorest countries are more volatile simply because of their lower income level.<sup>6</sup>

The Instrumental Variables regressions use the following variables to instrument for current output growth: two lags of output growth; index of oil prices; lagged inflation; lagged value of government spending growth.

The estimates of policy volatility obtained by the individual country regressions (time series) and panel methods are relatively similar, and are reported in Appendix 2. Both methods yield rankings of countries with a clustering of developed economies at the top of the list (low volatility) whereas developing countries, especially those in Africa, cluster at the bottom of the list (high volatility). Appendix 2 also compares the country rankings with Fatas-Mihov results, and with a more basic estimate of volatility which is the standard deviation of the growth rate during the sample period. In general, all the rankings produce similar results.

<sup>4</sup> The variables are described in more details (including sources) in Appendix 1.

<sup>5</sup> Fatas-Mihov estimated their fiscal policy volatility variable using this method.

<sup>6</sup> A Hausman test led to rejecting the random effects model in favor of a fixed effects panel. Commenting a previous paper (Herrera, 2007), Allen Schick suggested the necessity of controlling for income level across countries, leading to the panel estimations that yield the results in all base cases in the remainder of the paper.



## 4 Exploring the Relationship between Consumption Volatility and Fiscal Policy Volatility

This section explains consumption volatility with three sets of variables: the first one refers to the income generating process, considering both the volatility of income and the persistence of income shocks; the second is related to fiscal policy; while the third set of variables refers to the agents' possibilities to smooth income shocks, that depend on the financial sector depth as well as its integration to international capital markets.

The basic model that we used follows Fatas-Mihov's specification:

$$\log(\sigma_i^y) = \alpha + \beta \log(\sigma_i^e) + \gamma' X_i + \nu_i \quad (2)$$

where:

- $\sigma_i^y$  is the volatility of household consumption – calculated as the standard deviation of the growth of household consumption per capita between 1960-2005;
- $\sigma_i^e$  is the volatility of fiscal policy – described in the previous section;
- $X_i$  is a vector of control variables that reflect mostly the volatility of income and persistence of income shocks, as well as the availability of domestic and external financing for consumption smoothing.

$X_i$  includes the following variables:

- Volatility of income;
- Persistence of income;
- Domestic financial sector development (level and volatility of financial liabilities);
- Financial openness;
- Government size;
- Trade variable, defined as the ratio of imports and exports to GDP.

We will now describe in more details some of the explanatory variables that we have been using in Equation (2).

### 4.1 *Income variables: Volatility and persistence of shocks*

The empirical testing of the relationship between consumption and income and their volatilities has been studied extensively (Christiano, 1987). Based on the literature, we include the volatility of income and the persistence of income shocks as explanatory variables for the volatility of household consumption. Intuitively, the higher the volatility and the persistence of income shocks, the higher the volatility of household consumption.

These two parameters are estimated with the following augmented Dickey-Fuller regression<sup>7</sup>:

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<sup>7</sup> All the variables are in log terms, except the time trend.

$$\Delta y_t = \mu + \alpha \cdot y_{t-1} + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \dots + \beta_6 \Delta y_{t-6} + \beta_7 t + \varepsilon_t \quad (3)$$

The volatility of income is defined as the standard deviation of  $\varepsilon_t$  whereas the persistence parameter is defined as  $1+\alpha$ . Some of the specifications that we used included an interaction term between both variables.

#### **4.2 Financial markets: Possibility of smoothing shocks**

The possibility of smoothing consumption will depend on the depth and efficiency of financial markets. The relationship between household consumption volatility and financial markets has been explored recently by Bekaert, Harvey and Lundbal (2006). Here we use financial rather than equity market information, simply because of the availability of data for the sample period and the large set of countries that we are considering. We consider the ratio of total liquid liabilities, defined as the sum of currency, demand and interest-bearing liabilities of banks and other financial intermediaries, to GDP. We also include the volatility of financial liabilities.

Finally, the openness of the capital account is captured through the Chinn-Ito Financial Openness Variable, because the latter coincides with our period of analysis and is available for the entire sample of countries<sup>8</sup>.

#### **4.3 Fiscal policy variables: Expenditure volatility and government size**

In their study of output volatility, Fatas and Mihov included two variables to describe fiscal policy, namely the volatility of fiscal policy and government size. Fiscal policy volatility may be linked to consumption volatility through the connection between public and household budgets. Government size itself is found to be associated with higher output volatility on several occasions in the literature.

Gali (1994) explains the positive relationship between government size and volatility based on the resulting higher labor supply elasticity due to the lower (after tax) labor productivity and the resulting lower employment levels<sup>9</sup>. A recent paper looking at OECD countries also shows that countries with higher share of government expenditure

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<sup>8</sup> The Chinn-Ito indicator is very similar to the Kaminsky-Schmukler indicator, but the first one is available for a larger set of countries. Interestingly, in their paper, Bekaert et al. did not find any significant relationship between capital account openness and consumption volatility.

<sup>9</sup> Gali (1994) uses two variables to capture the size of government: *income tax rate* and the *share of government purchases in GDP*. According to the basic RBC model that he is using, a higher tax rate reduces steady state employment through lower (after tax) labor productivity, thus resulting in higher labor supply elasticity and higher output volatility. On the contrary, an increase in the share of government purchases in GDP results in higher steady state employment – through its negative wealth effect – and, consequently, lower labor supply elasticity and lower output volatility. That is to say the two variables have opposite effects on the volatility of output. When increasing simultaneously the two variables, Gali finds that the first effect more than offsets the second, thus resulting in an overall positive relationship between government size and output volatility.

in domestic output show higher sensitivity of their fiscal position to fluctuations in the business cycle (Girouard and Andre, 2005). More recently, Angeletos and Panousi (2007) explore the supply side effects of government spending and reach a similar conclusion but their result operates through a different channel: given the negative wealth effect of higher government consumption, individuals become more risk averse, which increases the risk premium, thus discouraging investment and leading to lower employment levels. This in turn results in higher labor supply elasticity, so that government size again behaves as an “automatic destabilizer” rather than the opposite.

To control for endogenous regressors and deal with measurement error problems, we followed the Fatas-Mihov instrumental variables estimation procedure. This is of particular importance regarding the volatility of fiscal policy (Equation (1)). Indeed, as described in the first part of this paper, countries with higher volatility of consumption tend to have more volatile public spending (Table 2), so that fiscal policy volatility could be endogenous to consumption volatility.

Following Fatas and Mihov, policy volatility was instrumented with institutional characteristics of the electoral and political systems that shape fiscal policy outcomes. Such variables include:

- the nature of the electoral system (majoritarian vs. proportional);
- the nature of the political system (presidential vs. parliamentary);
- the number of elections for the executive and legislative branches;
- the extent of political constraints on the executive to manipulate fiscal policy.

Table 3 summarizes the results of the regressions of the volatility of fiscal policy on these four instruments, based on the volatility numbers calculated from Equation (1) using a panel specification<sup>10</sup>.

All the instruments – except the number of elections when it is the only regressor – appear very strongly correlated with our measure of the volatility of fiscal policy. The level of the R-squared of the regression with the four instrumental variables included altogether (0.61) gives confidence in the use of these variables as instruments for the volatility of fiscal policy.

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<sup>10</sup> The corresponding regressions based on the volatility numbers calculated using individual country regressions yielded similar results, which are not mentioned in the paper.

	(1)	(2)	(3)	(4)	(5)
Majoritarian (1=yes, 0=proportional)	<b>0.667</b> (0.000)				<b>0.332</b> (0.014)
Presidential (1=yes, 0=parliamentary)		<b>1.149</b> (0.000)			<b>0.846</b> (0.000)
Number of elections			<b>-0.670</b> (0.310)		<b>-1.729</b> (0.005)
Political constraints				<b>-2.566</b> (0.000)	<b>-1.308</b> (0.002)
Adjusted R-squared	0.15	0.43	0.01	0.43	0.61
Number of countries	85	88	88	84	82

NB: The p-values in the parentheses are based on heteroscedasticity-robust standard errors. All regressions include an intercept.

The other variable that captures fiscal policy, namely the size of government, was also instrumented using the trade ratio, the dependency ratio, the urbanization rate, the log of total population, and the log of GDP per capita<sup>11</sup>. A key difference with the Fatas-Mihov paper consists in using trade as an instrument for the size of government. In general, Fatas and Mihov estimations include simultaneously both openness and government size, leading to non-robust statistical results on these coefficients. Indeed, following Rodrik (1998), a more open economy increases the vulnerability of domestic agents and hence governments will have more pressure to spend. Hence, in some of our specifications, the size of government was instrumented with the trade variable.

## 5 Consumption Volatility and Fiscal Policy: Results

Initially a cross-section of countries is used, using the average of the variables for the period 1960-2005. In order to exploit the time dimension of the data, the sample was then split in three 15-year sub-periods, and the model was estimated by panel methods.

### 5.1 Cross-country results

The cross-country regressions used two alternative measures of the volatility of fiscal policy: the individual time-series regressions estimates, and the panel estimates. Results are very similar: panel estimates are reported in Table 4, while time-series specifications are mentioned in Appendix 3.

<sup>11</sup> The variables are described in more details (including sources) in Appendix 1.

Table 4 below shows the regression results, and is divided in three panels: the first one, labeled OLS, covers the 4 first columns and refers to basic Ordinary Least Squares regressions with various controls. The second panel, labeled IV-1, covers columns (5) to (8) and refers to Instrumental Variables regressions, using instruments for the volatility of fiscal policy. The third panel, labeled IV-2, covers columns (9) to (11) and reports the results of three IV regressions instrumenting both the volatility of fiscal policy and government size.

The main results of our analysis are as follows:

- 1- Whatever method is used and whatever control variables are included, the *fiscal policy volatility* is always highly significant, as least at the 90% level of confidence<sup>12</sup>, with a positive sign. This is a confirmation of the very strong (positive) and significant impact of the volatility of public spending on the volatility of consumption. Despite the high number of specifications that are considered, the parameter estimates for the volatility of fiscal policy are similar, clustering in the 0.3-0.5 interval, apart from the regressions where no additional controls are included.
- 2- The *volatility of income* is always significant – at the 99% level of confidence – with a strong (positive) parameter estimate, whereas the persistence of shocks is never so.
- 3- The level of *financial development*, as measured by the ratio of liabilities to GDP is not significant, but the volatility of the financial liabilities is always significant, at least at the 95% level of confidence, with the expected sign (positive). Capital account openness is always significant, at least at the 90% level of confidence, again with the expected sign (negative).
- 4- The parameter estimates and the level of significance of the trade and government size variables vary considerably.

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<sup>12</sup> The only case when this is not the case is the IV regression with instruments for the volatility of fiscal policy and all the control variables included at the same time. The lack of significance of the volatility of fiscal policy in this case may be due to some colinearity between our regressors.

Table 4- Cross-country regressions using fiscal policy volatility calculated with a panel regression

Dependent variable: log of volatility of consumption	OLS				IV-1				IV-2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Fiscal policy volatility (calculated with a panel regression)	<b>0.656</b> (0.000)	<b>0.455</b> (0.000)	<b>0.503</b> (0.000)	<b>0.338</b> (0.002)	<b>0.653</b> (0.000)	<b>0.436</b> (0.000)	<b>0.401</b> (0.056)	<b>0.072</b> (0.803)	<b>0.384</b> (0.001)	<b>0.515</b> (0.000)	<b>0.260</b> (0.048)
Government size		<b>0.266</b> (0.047)	<b>0.233</b> (0.070)	<b>0.189</b> (0.161)		<b>0.312</b> (0.027)	<b>0.278</b> (0.042)	<b>0.128</b> (0.515)	<b>0.118</b> (0.600)	<b>0.551</b> (0.021)	<b>0.235</b> (0.242)
Trade		<b>0.0702</b> (0.397)	<b>0.218</b> (0.013)	<b>0.137</b> (0.060)		<b>-0.00607</b> (0.948)	<b>0.169</b> (0.063)	<b>0.125</b> (0.099)			
Volatility of income		<b>0.495</b> (0.000)		<b>0.464</b> (0.000)		<b>0.561</b> (0.001)		<b>0.620</b> (0.000)	<b>0.599</b> (0.000)		<b>0.550</b> (0.000)
Persistence of income		<b>0.151</b> (0.118)		<b>0.106</b> (0.272)		<b>0.158</b> (0.112)		<b>0.0809</b> (0.453)	<b>0.168</b> (0.094)		<b>0.124</b> (0.170)
Financial liabilities			<b>0.101</b> (0.274)	<b>0.144</b> (0.075)			<b>0.0212</b> (0.890)	<b>-0.00250</b> (0.986)		<b>0.0684</b> (0.633)	<b>0.0995</b> (0.347)
Volatility of financial liabilities			<b>0.341</b> (0.000)	<b>0.239</b> (0.006)			<b>0.370</b> (0.002)	<b>0.275</b> (0.011)		<b>0.355</b> (0.000)	<b>0.258</b> (0.004)
Financial openness			<b>-0.189</b> (0.044)	<b>-0.175</b> (0.030)			<b>-0.240</b> (0.048)	<b>-0.265</b> (0.024)		<b>-0.190</b> (0.078)	<b>-0.183</b> (0.024)
Adjusted R-squared	0.64	0.75	0.75	0.80	0.63	0.74	0.74	0.77	0.74	0.73	0.78
Test of OID (p-value)	-	-	-	-	0.30	0.39	0.27	0.59	0.76	0.16	0.25
Number of countries	84	83	81	80	77	76	75	74	75	75	74

NB: The p-values in the parentheses are based on heteroscedasticity-robust standard errors. In the IV regressions, the over-identifying test (OID) reports the p-value from the Sargan-Hansen J-test that the instruments are uncorrelated with the residuals. All regressions include an intercept.

## 5.2 Panel results

In order to exploit the time dimension of our sample, we also estimated model (2) by panel regression, splitting the sample in three 15-year sub-periods: 1960-75, 1975-90, and 1990-2005. The choice of these three sub-periods is arbitrary, but is similar to Wolf's (2004) decadal analysis.

The definition of the variables was the following:

- The volatilities of fiscal policy and income were defined, for each country and each sub-period, using the same panel regressions as in the previous part – *i.e.* Equations (1) and (3) – as the standard deviation of the corresponding residual for each country and each sub-period.
- This was not possible for the persistence of income – that was calculated using country time-series regressions – so we used the 1960-2005 average of this parameter for the 3 sub-periods
- Most of the institutional variables that we used for instrumenting the volatility of fiscal policy were not available for the first sub-period. Indeed, three of the four variables that we are using – nature of the political system, nature of the electoral system and number of elections – were only available from 1975 onwards. Therefore, we used the 1960-2005 average for the four instruments of fiscal policy volatility<sup>13</sup>.

These adjustments to the data have a cost in terms of the variety of specifications that we can use. Indeed, as long as a variable is assumed to be constant throughout the whole period 1960-2005, it will be dropped in any panel regression using fixed effects. This is the case for the instrumented volatility of fiscal policy – since some instruments are constant during the whole period due to lack of data – as well as the persistence of income. Therefore, in order to check the robustness of our results to the instrumentation of the volatility of fiscal policy, we did not include any fixed effects in our regressions. Instead, we used a basic pooling.

The results of the panel regressions are shown in Table 5. The first 4 columns are fixed-effects panel OLS regressions. The next group of columns (IV-1) is the basic pooling with the instrumentation of fiscal policy volatility, and the last set of columns (IV-2) includes the instrumentation of government size as well.

Table 5 shows that results are very similar to the cross-country estimations reported in Table 4. All the variables have the expected signs and there are no major changes in the statistical significance of the coefficients by shifting from OLS to instrumental variable (IV) estimations. However, the magnitude of some of the coefficients varies significantly. For instance, the coefficient of the volatility of fiscal policy almost doubles as well as the coefficient of the volatility of financial liabilities.

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<sup>13</sup> We also ran the regressions using the three sub-period averages (when available) for each variable, but the lack of data significantly reduced the number of observations and the significance of our results.

Table 5- Panel regressions using fiscal policy volatility calculated with a panel regression

Dependent variable: log of volatility of consumption	FIXED EFFECTS REGRESSION				POOLING						
	OLS				IV-1				IV-2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Fiscal policy volatility (calculated with a panel regression)	<b>0.299</b> (0.000)	<b>0.210</b> (0.001)	<b>0.229</b> (0.023)	<b>0.146</b> (0.107)	<b>0.673</b> (0.000)	<b>0.487</b> (0.000)	<b>0.428</b> (0.001)	<b>0.0478</b> (0.810)	<b>0.444</b> (0.000)	<b>0.480</b> (0.000)	<b>0.209</b> (0.046)
Government size		<b>0.254</b> (0.016)	<b>0.304</b> (0.015)	<b>0.263</b> (0.013)		<b>0.266</b> (0.012)	<b>0.289</b> (0.017)	<b>0.208</b> (0.057)	<b>0.167</b> (0.368)	<b>0.543</b> (0.005)	<b>0.329</b> (0.042)
Trade		<b>0.0183</b> (0.840)	<b>0.215</b> (0.142)	<b>0.242</b> (0.043)		<b>0.00256</b> (0.972)	<b>0.181</b> (0.011)	<b>0.152</b> (0.017)			
Volatility of income		<b>0.502</b> (0.000)		<b>0.478</b> (0.000)		<b>0.523</b> (0.000)		<b>0.619</b> (0.000)	<b>0.556</b> (0.000)		<b>0.554</b> (0.000)
Persistence of income						<b>0.133</b> (0.108)		<b>-0.0153</b> (0.868)	<b>0.144</b> (0.079)		<b>0.0147</b> (0.861)
Financial liabilities			<b>-0.163</b> (0.074)	<b>-0.154</b> (0.071)			<b>-0.187</b> (0.058)	<b>-0.264</b> (0.038)		<b>-0.166</b> (0.074)	<b>-0.174</b> (0.036)
Volatility of financial liabilities			<b>0.00322</b> (0.958)	<b>0.0397</b> (0.426)			<b>0.209</b> (0.001)	<b>0.154</b> (0.009)		<b>0.227</b> (0.000)	<b>0.154</b> (0.006)
Financial openness			<b>-0.227</b> (0.000)	<b>-0.174</b> (0.002)			<b>-0.107</b> (0.150)	<b>-0.212</b> (0.009)		<b>-0.0918</b> (0.180)	<b>-0.149</b> (0.009)
Dummy period 1					<b>0.0831</b> (0.402)	<b>-0.0522</b> (0.570)	<b>-0.00853</b> (0.931)	<b>-0.149</b> (0.119)	<b>-0.0610</b> (0.496)	<b>-0.0348</b> (0.736)	<b>-0.157</b> (0.080)
Dummy period 2					<b>0.197</b> (0.012)	<b>0.104</b> (0.151)	<b>0.169</b> (0.020)	<b>0.0349</b> (0.679)	<b>0.109</b> (0.109)	<b>0.131</b> (0.093)	<b>0.0454</b> (0.532)
Adjusted R-squared	0.14	0.43	0.23	0.46	0.47	0.66	0.63	0.70	0.66	0.61	0.71
Test of OID (p-value)					0.04	0.03	0.19	0.20	0.12	0.03	0.02
Number of observations	248	241	195	194	227	218	190	187	215	190	187

NB: The p-values in the parentheses are based on heteroscedasticity-robust standard errors. In the IV regressions, the over-identifying test (OID) reports the p-value from the Sargan-Hansen J-test that the instruments are uncorrelated with the residuals. All regressions, except fixed-effects regressions, include an intercept.



Some differences with the cross-country results are worth noting, however:

- 1- The persistence of income indicator turns significant in two of the panel specifications – using the income variables as controls, but excluding the financial variables.
- 2- The level of financial liabilities is always significant at the 90% level of significance – contrary to the cross-country regressions. The negative sign is as expected, and relates to the capacity of financial markets to smooth consumption.
- 3- In the panel regressions with fixed effects, the volatility of financial liabilities is not significant anymore – just the level of financial liabilities seems to matter.
- 4- P-values of the over-identifying tests are, in general, much lower than in the cross-country regressions. This would mean that our instrumentation works better on the panel sample than on the cross-section sample.

## **6 Conclusions and Directions for Future Work**

The volatility of household consumption is mostly explained by the volatility of income and that of fiscal policy. Government size, as measured by public expenditure as a share of GDP, also affects positively consumption volatility. The policy implications are clear: rules that stabilize public spending will also stabilize private consumption, with the corresponding welfare gain. The impact of public spending volatility on private consumption volatility has implications for program or project evaluation: unless additional public spending is funded with spending cuts in other areas, it will imply higher private consumption volatility, with its implicit welfare cost.

Additional work is needed to better understand this linkage. Whether public spending volatility affects private consumption volatility because of labor supply effects – as in Gali (1994) – or through its impact on risk aversion and investment – as in Angeletos and Panousi (2007) – still needs to be verified in future micro research.

These results provide support for policies that promote financial deepening and foster the development of capital markets that stabilize the growth of financial liabilities. An open capital account also leads to lower volatility of household consumption.

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## Appendix 1: Description of the variables

### A- Variables used for measuring the volatility of fiscal policy

**Growth rate of government spending:** difference in the log<sup>14</sup> of the series *General government final consumption expenditure (constant LCU)* from the WDI

**Current output growth:** difference in the log of the series *GDP (constant LCU)* from the WDI

**Inflation:** difference in the log of the series *GDP deflator (base year varies by country)* from the WDI

**Index of oil prices** (source: DECPG/Bank Wide Data)

**Real GDP per capita:** log of series *Real GDP per capita on PPP basis*, from Penn World Tables, Pennsylvania University, <http://pwt.econ.upenn.edu/>

### B- Variables used for estimating the volatility of household consumption

**Volatility of household consumption:** log of standard deviation of the series *Household final consumption expenditure per capita growth (annual %)* from the WDI

**Volatility of fiscal policy:** log of the standard deviation of the residual from regression (1), using a cross-country or a panel specification.

**Nature of the electoral system:** variable equal to 1 if the country has a majoritarian system, 0 else (source: World Bank Database of Political Institutions)

**Nature of the political system:** variable equal to 1 if the country has a presidential system, 0 if it has a parliamentary system (source: World Bank Database of Political Institutions)

**Number of elections** for the executive and legislative branches (source: World Bank Database of Political Institutions)

**Political constraints:** Variable POLCONV from W.J. Henisz web-site: <http://www-management.wharton.upenn.edu/henisz/>

**Government size:** log of series *General government final consumption expenditure (% of GDP)* from the WDI

**Trade:** log of sum of the series *Exports of goods and services (% of GDP)* and *Imports of goods and services (% of GDP)* from the WDI

**Volatility of income:** log of the standard deviation of the residual from regression (3), using a panel specification.

**Persistence of income shocks:** calculated as  $1+\alpha$ , where  $\alpha$  comes from regression (3), using individual country time-series regressions

**Financial liabilities:** log of the series *Liquid Liabilities / GDP* from the World Bank Database on Financial Development and Structure

**Volatility of financial liabilities:** standard deviation of the difference in log of the series *Liquid Liabilities / GDP* from the World Bank Database on Financial Development and Structure.

**Financial openness:** defined as  $\ln(2+C)$ , where C is the Chinn-Ito Financial Openness Variable (source: Chinn and Ito, "A New Measure of Financial Openness" (2007), <http://www.ssc.wisc.edu/~mchinn/research.html>)

**Dependency ratio:** series *Age dependency ratio (dependents to working-age population)* from the WDI

**Urbanization rate:** series *Urban population (% of total)* from the WDI

**Population:** log of series *Population, total* from the WDI

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<sup>14</sup> Throughout the paper, variables are considered most of the time in log terms, so that the corresponding parameter estimates can be interpreted as elasticities.

## Appendix 2: Comparison of various measures of the volatility of fiscal policy

The measures of fiscal policy volatility using the four methods are as follows.

	Time Series		Panel	
	OLS	IV	OLS	IV
Algeria	0.069	0.072	0.045	0.071
Argentina	0.027	0.027	0.036	0.040
Australia	0.019	0.023	0.012	0.022
Austria	0.010	0.013	0.011	0.012
Bangladesh	0.107	0.175	0.024	0.191
Belgium	0.016	0.034	0.012	0.019
Benin	0.095	0.098	0.018	0.101
Bolivia	0.044	0.067	0.043	0.056
Botswana	0.039	0.049	0.021	0.046
Brazil	0.074	0.075	0.044	0.084
Burkina Faso	0.110	0.111	0.019	0.120
Burundi	0.154	0.210	0.036	0.175
Cameroon	0.091	0.091	0.035	0.099
Canada	0.017	0.018	0.012	0.022
Chad	0.104	0.106	0.043	0.177
Chile	0.032	0.038	0.036	0.044
China	0.050	0.051	0.028	0.061
Colombia	0.063	0.114	0.014	0.073
Congo, Dem. Rep.	0.138	0.142	0.049	0.169
Congo, Rep.	0.128	0.129	0.032	0.146
Costa Rica	0.019	0.019	0.021	0.026
Cote d'Ivoire	0.059	0.062	0.032	0.091
Denmark	0.016	0.016	0.013	0.019
Dominican Republic	0.125	0.134	0.033	0.130
Ecuador	0.064	0.082	0.019	0.090
Egypt, Arab Rep.	0.051	0.060	0.016	0.065
El Salvador	0.088	0.091	0.026	0.095
Finland	0.016	0.016	0.016	0.021
France	0.009	0.009	0.011	0.013
Gabon	0.105	0.139	0.055	0.119
Gambia, The	0.087	0.103	0.020	0.113
Germany	0.012	0.012	0.010	0.016
Ghana	0.120	0.140	0.028	0.129
Greece	0.034	0.035	0.023	0.040
Guatemala	0.054	0.056	0.016	0.046
Guinea-Bissau	0.122	0.143	0.050	0.153
Guyana	0.211	0.623	(*)	(*)
Honduras	0.062	0.074	0.018	0.074
Hong Kong, China	0.031	0.033	0.025	0.036
Hungary	0.052	0.068	0.025	0.060
Iceland	0.020	0.020	0.023	0.027
India	0.049	0.051	0.017	0.053
Indonesia	0.081	0.083	0.031	0.107

Iran, Islamic Rep.	0.063	0.139	0.043	0.115
Ireland	0.024	0.032	0.015	0.035
Italy	0.012	0.012	0.014	0.017
Japan	0.016	0.027	0.022	0.020
Kenya	0.071	0.075	0.027	0.079
Korea, Rep.	0.022	0.022	0.021	0.030
Lesotho	0.110	0.110	0.039	0.131
Luxembourg	0.018	0.020	0.018	0.024
Madagascar	0.053	0.059	0.026	0.064
Malawi	0.074	0.089	0.031	0.108
Malaysia	0.054	0.070	0.020	0.058
Mali	0.116	0.116	0.032	0.147
Mauritania	0.165	0.173	0.025	0.190
Mexico	0.022	0.022	0.025	0.031
Morocco	0.063	0.065	0.026	0.072
Netherlands	0.013	0.018	0.012	0.017
New Zealand	0.026	0.027	0.018	0.027
Nicaragua	0.105	0.111	0.067	0.138
Niger	0.097	0.104	0.038	0.104
Nigeria	0.182	0.222	0.043	0.198
Norway	0.016	0.016	0.010	0.017
Pakistan	0.075	0.083	0.014	0.089
Papua New Guinea	0.065	0.065	0.030	0.076
Paraguay	0.109	0.290	0.022	0.115
Peru	0.058	0.068	0.051	0.073
Philippines	0.033	0.041	0.019	0.044
Portugal	0.024	0.034	0.020	0.029
Rwanda	0.189	0.232	0.078	0.222
Senegal	0.048	0.049	0.024	0.054
South Africa	0.025	0.025	0.016	0.030
Spain	0.015	0.015	0.016	0.022
Sri Lanka	0.070	0.072	0.010	0.089
Sudan	0.091	0.092	0.038	0.134
Sweden	0.014	0.015	0.012	0.020
Switzerland	0.014	0.015	0.014	0.017
Syrian Arab Republic	0.080	0.082	0.030	0.114
Taiwan, China	0.025	0.025	0.021	0.037
Thailand	0.041	0.047	0.023	0.044
Togo	0.121	0.121	0.034	0.135
Trinidad and Tobago	0.067	0.067	0.025	0.079
Tunisia	0.028	0.071	0.020	0.030
United Kingdom	0.014	0.021	0.011	0.020
United States	0.017	0.018	0.012	0.024
Uruguay	0.040	0.042	0.027	0.056
Venezuela, RB	0.081	0.088	0.035	0.092
Zambia	0.172	0.299	0.029	0.188
Zimbabwe	0.167	0.169	0.044	0.195

With the above estimates of fiscal policy volatility, the countries can be ranked, and we can compare our rankings with two benchmarks:

- basic ranking using the standard deviation of the growth rate of government spending between 1960-2005 (series *General government final consumption expenditure (annual % growth)* from the WDI);
- Fatas-Mihov ranking (available on Fatas' website, using the methodology described in the paper "*The case for restricting fiscal policy discretion*").

The rankings that we get are as follows (top-ranked countries have the lowest volatility of fiscal policy).

	Benchmarks		Time series		Panel	
	Basic St Dev	Fatas-Mihov	OLS	IV	OLS	IV
	A	B	C	D	E	F
France	1	1	1	1	4	2
Austria	2	2	2	4	6	1
Netherlands	3	6	5	11	12	6
United Kingdom	4	10	8	16	5	11
Germany	5	8	4	3	3	3
Italy	6	17	3	2	14	4
Spain	7	13	9	6	19	15
Norway	8	14	11	8	2	5
Japan	9	4	14	21	37	12
Sweden	10	3	6	5	7	10
United States	11	9	16	12	10	17
Finland	12	16	10	9	23	13
Belgium	13	7	13	27	9	9
Australia	14	15	18	19	11	16
Denmark	15	11	12	10	13	8
Canada	16	12	15	13	8	14
Korea, Rep.	17	56	21	18	35	24
Iceland	18	25	19	15	39	20
New Zealand	19	21	25	23	27	19
Switzerland	20	5	7	7	16	7
Tunisia	21	39	27	46	32	23
Argentina	22	82	26	22	66	28
Ireland	23	18	22	24	18	26
South Africa	24	33	24	20	20	22
Costa Rica	25	27	17	14	36	18
Chile	26	47	29	29	68	32
Hong Kong, China	27	23	28	25	46	27
Greece	28	22	31	28	40	29
Mexico	29	24	20	17	47	25
Portugal	30	19	23	26	33	21
Philippines	31	30	30	30	30	31
India	32	20	37	35	24	35
Thailand	33	29	34	32	41	30
Botswana	34	40	32	34	34	33
Guatemala	35	36	41	36	22	34
Senegal	36	72	36	33	42	36
Uruguay	37	49	33	31	52	38
Malaysia	38	35	40	45	31	39

Bolivia	39	52	35	43	73	37
Honduras	40	32	44	49	25	46
Colombia	41	54	46	66	15	44
Egypt, Arab Rep.	42	37	38	38	21	41
Madagascar	43	57	39	37	49	40
Peru	44	50	42	44	79	45
Papua New Guinea	45	45	48	40	56	47
El Salvador	46	28	59	58	50	56
Morocco	47	41	45	41	48	43
Sri Lanka	48	42	51	47	1	52
Brazil	49	53	54	51	75	50
Kenya	50	26	52	50	51	48
Trinidad and Tobago	51	60	49	42	44	49
Pakistan	52	38	55	55	17	51
Cameroon	53	46	60	59	65	57
Benin	54	51	61	60	26	58
Malawi	55	80	53	57	57	61
Syrian Arab Republic	56	43	56	53	55	62
Cote d'Ivoire	57	31	43	39	60	54
Ecuador	58	55	47	52	28	53
Algeria	59	34	50	48	76	42
Niger	60	59	62	61	69	59
Venezuela, RB	61	61	57	56	64	55
Indonesia	62	48	58	54	58	60
Paraguay	63	44	67	81	38	63
Togo	64	69	72	68	63	69
Ghana	65	62	71	72	53	66
Burkina Faso	66	68	69	64	29	65
Chad	67	65	63	62	71	76
Gabon	68	78	64	71	80	64
Nicaragua	69	73	65	65	81	70
Congo, Rep.	70	70	75	69	61	71
Guinea-Bissau	71	64	73	74	78	73
Lesotho	72	58	68	63	70	68
Zambia	73	77	80	82	54	77
Mauritania	74	66	78	76	45	78
Burundi	75	74	77	78	67	75
Congo, Dem. Rep.	76	79	76	73	77	74
Nigeria	77	76	81	79	72	81
Zimbabwe	78	63	79	75	74	80
Dominican Republic	79	71	74	70	62	67
Rwanda	80	67	82	80	82	82
Mali	81	75	70	67	59	72
Bangladesh	82	81	66	77	43	79

The rank-correlations between the series are as follows:

A-B: 0.85; C-A: 0.98; C-B: 0.84; D-A: 0.95; D-B: 0.83; E-A: 0.74; E-B: 0.74; F-A: 0.98; F-B: 0.86



### Appendix 3: Cross-country regressions using fiscal policy volatility calculated with individual country time-series regressions

Dependent variable: log of volatility of consumption	OLS				IV-1				IV-2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Fiscal policy volatility (calculated with individual country time-series regressions)	<b>0.577</b> (0.000)	<b>0.338</b> (0.000)	<b>0.375</b> (0.000)	<b>0.206</b> (0.011)	<b>0.667</b> (0.000)	<b>0.449</b> (0.000)	<b>0.546</b> (0.029)	<b>0.159</b> (0.601)	<b>0.326</b> (0.001)	<b>0.526</b> (0.000)	<b>0.221</b> (0.047)
Government size		<b>0.237</b> (0.118)	<b>0.212</b> (0.161)	<b>0.149</b> (0.330)		<b>0.410</b> (0.005)	<b>0.451</b> (0.012)	<b>0.198</b> (0.359)	<b>0.0261</b> (0.904)	<b>0.483</b> (0.091)	<b>0.176</b> (0.396)
Trade		<b>0.0228</b> (0.790)	<b>0.229</b> (0.021)	<b>0.126</b> (0.101)		<b>-0.0659</b> (0.483)	<b>0.0400</b> (0.822)	<b>0.0808</b> (0.455)			
Volatility of income		<b>0.647</b> (0.000)		<b>0.560</b> (0.000)		<b>0.586</b> (0.000)		<b>0.595</b> (0.000)	<b>0.673</b> (0.000)		<b>0.596</b> (0.000)
Persistence of income		<b>0.130</b> (0.197)		<b>0.0761</b> (0.454)		<b>0.124</b> (0.235)		<b>0.0791</b> (0.423)	<b>0.129</b> (0.222)		<b>0.0952</b> (0.308)
Financial liabilities			<b>0.0372</b> (0.666)	<b>0.102</b> (0.191)			<b>0.103</b> (0.511)	<b>0.0423</b> (0.794)		<b>0.0939</b> (0.456)	<b>0.0995</b> (0.347)
Volatility of financial liabilities			<b>0.392</b> (0.000)	<b>0.264</b> (0.003)			<b>0.353</b> (0.000)	<b>0.263</b> (0.015)		<b>0.365</b> (0.000)	<b>0.259</b> (0.005)
Financial openness			<b>-0.245</b> (0.012)	<b>-0.213</b> (0.007)			<b>-0.166</b> (0.313)	<b>-0.229</b> (0.084)		<b>-0.174</b> (0.140)	<b>-0.188</b> (0.019)
Adjusted R-squared	0.58	0.72	0.71	0.78	0.55	0.71	0.69	0.77	0.71	0.69	0.77
Test of OID (p-value)	-	-	-	-	0.50	0.61	0.56	0.63	0.89	0.23	0.35
Number of countries	85	83	82	80	78	76	76	74	75	76	74

NB: The p-values in the parentheses are based on heteroscedasticity-robust standard errors. In the IV regressions, the over-identifying test (OID) reports the p-value from the Sargan-Hansen J-test that the instruments are uncorrelated with the residuals. All regressions include an intercept.