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No. 09/09

The Resource Curse and Fiscal Policy Volatility

by

Michael Bleaney and Håvard Halland

Abstract

Using data from 1980 to 2004, we show that greater fiscal policy volatility acts as a transmission mechanism for the 'resource curse'. Resource exports dominate political and institutional variables as determinants of fiscal policy volatility, with fiscal policy volatility being a significant determinant of growth. The existence of a resource curse is confirmed, in the sense that a higher ratio of natural resource exports to total merchandise exports is associated with significantly slower per capita GDP growth. There are no statistically significant differences between the effects of point-source and diffuse resource exports.

Keywords: Fiscal policy, growth, resource curse.

JEL Nos: H50, O40, Q33

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Outline

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1. Introduction

This paper brings together two different strands of literature: (1) the idea of the "resource curse" – that an abundance of natural resources, although favourable in the short run, holds back a country's development in the longer run – and (2) the effect of the quality of fiscal management on growth, and what sort of institutions or conditions promote good fiscal management.

The likely negative impact of a resources boom on other tradable sectors has been known for a long time (Corden and Neary, 1982), but the idea of a "resource curse" is reflected most prominently in the growth regressions of Sachs and Warner (1995, 1997, 2001), who found a strong negative impact of the share of primary product exports in GDP in a cross-country growth regression for the period 1965-90. Bleaney and Nishiyama (2002) show that Sachs and Warner's findings are robust to the inclusion of other explanatory variables from the growth models of Barro (1991) and Easterly and Levine (1997). Brunnschweiler (2007) provides a good introduction to the recent resource curse literature.

The mechanisms through which the resource curse works remain rather unclear. One possibility is that, because of the price volatility of primary products, countries that specialize in them experience greater real exchange rate volatility (Bleaney, 1996; Cashin *et al*., 2004), although a robust negative relationship between real exchange rate volatility and growth remains to be demonstrated. Another is that natural resources may give rise to civil conflict (Lujala *et al*., 2005; Lujala, 2009; Ross, 2006) or affect political structures and incentives (Caselli and Cunningham, 2009; Isham *et al.*, 2005, Ross, 2001). A third possibility, and the one that we pursue here, is that access to natural resource rents distorts fiscal policy, leading to overexpanded government consumption and general wastage. Some of these theories may be more applicable to resources whose extraction is highly geographically concentrated, so we also investigate whether the resource curse

appears to be worse for point-sourced resources (fuels and minerals) rather than diffuse ones (agriculture and food).

The role of the quality of macroeconomic policy in growth is more controversial. As is implied by the title of their paper ("Institutional Causes, Macroeconomic Symptoms") Acemoglu *et al*. (2003) argue that macroeconomic policy merely reflects the quality of a country's institutions, and that once institutions are controlled for, measures of macroeconomic policy such as the share of government consumption in GDP, the inflation rate or real exchange rate overvaluation add little to the explanation of either the average rate of per capita growth or its volatility in a cross-country sample. This claim that macroeconomic policy is just a transmission mechanism for institutions has been challenged by Fatás and Mihov (2003, 2005), who focus on the volatility rather than the average magnitude of the share of government consumption to GDP. Fatás and Mihov's results show that a country's average per capita growth rate over the period 1960-2000 is negatively correlated with output volatility (as in Ramey and Ramey (1995)), and with the volatility of the government consumption share. They refer to this last variable as "fiscal policy volatility" (hereafter FPV) because this is the best measure of fiscal policy that they can find for a reasonable sample of countries. They also show that there is a strong positive correlation between FPV and output volatility, and that FPV is to a significant extent determined by variables that reflect the quality of political institutions. Finally, they demonstrate that FPV passes the Acemoglu *et al*. (2003) test of remaining significant in a growth regression when these institutional variables are included, which suggests that it is more than just a transmission mechanism for institutional effects.

In this paper we investigate the resource curse as a source of FPV and slow growth. In an updated data set (1980-2004 rather than the 1965-90 sample of Sachs and Warner, 1995, 1997), we show that the share of primary products in total merchandise exports is positively correlated with both output volatility and FPV, and negatively correlated with per capita growth. We also show that FPV is to a

large degree explained by resource exports, and that institutional factors are insignificant in an FPV regression when resource exports are taken into account. Nevertheless we find that FPV exerts an independent negative influence on growth, and our results suggest that resource exports affect growth through other mechanisms as well. Thus we only partially confirm the results of van der Ploeg and Poelhekke (2009), who argue, using a somewhat different methodology, that natural resources negatively affect growth above all through *output* volatility (and also that it is the volatility of resource exports rather than their level which matters).

The paper is structured as follows. In the next section we examine the relationship between the primary product share of exports and growth. Section Three considers how output volatility and fiscal policy volatility are correlated with growth, without controlling for primary product exports. In Section Four, we discuss how primary product exports affect volatility, and in Section Five, we enter volatility and primary product exports together in a growth regression. Section Six concludes.

2. Primary Product Exports and Growth

Sachs and Warner (1997) and Bleaney and Nishiyama (2002) show the negative correlation of resource exports and growth in a cross-section of countries for the period 1965-90. Here we demonstrate that the correlation still holds for a later period of similar length (1980-2004). The resource export variable is the average share of primary products in total merchandise exports over the period 1995-2004 (we use this shorter period because data for many African countries, in particular, are scarce before 1995).[1] One difference from previous work is that we use the primary product share of *exports* rather than primary product exports divided by *GDP*. The share in GDP is equal to the share in exports multiplied by the share of

[1] The primary product share of exports is persistent over time, so using an average over a more limited period should have little effect on the results (for countries with 1980 data, the correlation with the 1995 primary product export share is 0.87).

exports in GDP, which is strongly affected by factors unrelated to specialization in natural resources such as country size and distance from trading partners (see Guttmann and Richards (2006) for a cross-country investigation of trade openness). For this reason we regard the primary product share of exports as a purer measure.

Table 1 displays our basic growth regressions. The control variables used, which are similar to those used by Fatás and Mihov (2003, 2005), are: initial per capita GDP, the ratio of government consumption expenditure to GDP ("government size"), the relative price of investment goods, secondary school enrolment, the ratio of exports plus imports to GDP ("openness"), and the Rule of Law Index from the Worldwide Governance Indicators Project of the World Bank (a measure of institutional quality with a wide country coverage). For details of the variables see the Appendix.

Table 1 shows that per capita growth is negatively correlated with initial income levels and government size, and positively correlated with schooling, institutional quality and openness. The primary product share is highly significant, and the point estimate implies that an extra 10 percentage points of primary product export share implies a decline in growth of 0.2% p.a.. In column (2) of Table 1, primary product exports are split into point-source (fuels, ores and metals) and diffuse (agricultural raw materials and food). Although the coefficient on the latter is larger, the difference is not statistically significant.

Table 1. Primary product exports and growth 1980-2004

	Dependent variable: per capita growth 1980-2004 (% p.a.)	
Independent variables	(1)	(2)
Constant	11.61*** (4.87)	12.92*** (4.84)
1980 per capita GDP (ln)	-1.18*** (-3.93)	-1.32*** (-4.01)
Government size	-0.0745** (-2.27)	-0.0784** (-2.45)
Investment price	-0.00410 (-1.10)	-0.00541 (-1.26)
Secondary school enrolment	0.0208** (2.58)	0.0206** (2.59)
Openness	0.619* (1.93)	0.6605* (1.95)
Rule of law index	0.950*** (3.38)	1.075*** (4.20)
Primary product export share	-2.02*** (-3.42)	
Point-source PP export share*		-1.24** (-1.98)
Diffuse PP export share*		- 2.48*** (-3.46)
Test of equality of coefficients of * variables		F(1,65)=2.70 (*p*=0.11)
Sample size	75	75
R-squared	0.614	0.631
Standard error	1.18	1.17

Notes. Point-source primary product exports are fuels, ores and metals; diffuse primary product exports are agricultural raw materials and food products. For details on variables, see the data appendix. Figures in parentheses are heteroskedasticity-robust *t*-statistics. ***/**/* denotes significantly different from zero at the 0.01/0.05/0.10 level.

3. Volatility and Growth

In this section we replace the primary product export share in the growth regression by two measures of volatility – first output volatility (the standard deviation of the GDP growth rate), and then a measure of fiscal policy volatility.

Fiscal policy volatility is derived in a manner similar to that of Fatás and Mihov (2003, 2005), as the logarithm of the standard deviation of the error term from a regression of the government consumption share of GDP on its previous value, output growth and control variables: [2]

$$G_{it} = \alpha_i + \beta \Delta \ln Y_{it} + \gamma \Delta \ln Y_{it-1} + \delta G_{it-1} + \phi W_{it} + \theta_t D_t + \varepsilon_{it} \qquad (1)$$

Here G_{it} represents government consumption expenditure as percentage of GDP, Y_{it} is real GDP, W_{it} includes inflation, the first lag of inflation and its square , and D_t is a vector of yearly time dummies. The residual ε_{it} now represents discretionary fiscal policy: fiscal policy changes that are exogenous to output growth and automatic stabilizers. Fiscal policy volatility for each country is calculated as the logarithm of the standard deviation of ε_{it} for that country. The estimated regression is shown in the Appendix. We estimate it as a fixed-effects panel rather than on a country-by-country basis, which is the method used by Fatás and Mihov (2003, 2005). We also use the level of government consumption instead of the logarithm, since government consumption is already given as a percentage of GDP. Not taking logs reduces the risk of excessive weight being given to the lower end of the distribution.

[2] See the appendix for the estimated regression. We also do not use instrumental variables, which make very little difference to the estimates of FPV.

Table 2 shows the resulting growth regressions. Both output volatility and fiscal policy volatility have negative coefficients, as found by Fatás and Mihov (2003) and van der Ploeg and Poelhekke (2009), with fiscal policy volatility having rather greater explanatory power. When both variables are included in the regression (column (3)), output volatility becomes insignificant and FPV remains significant at the 0.05 level. This is consistent with the results of Fatás and Mihov (2005), and indicates that the apparent effect of output volatility on growth can be attributed to its correlation with FPV, which is 0.68.

Table 2. Output volatility, fiscal policy volatility and growth 1980-2004

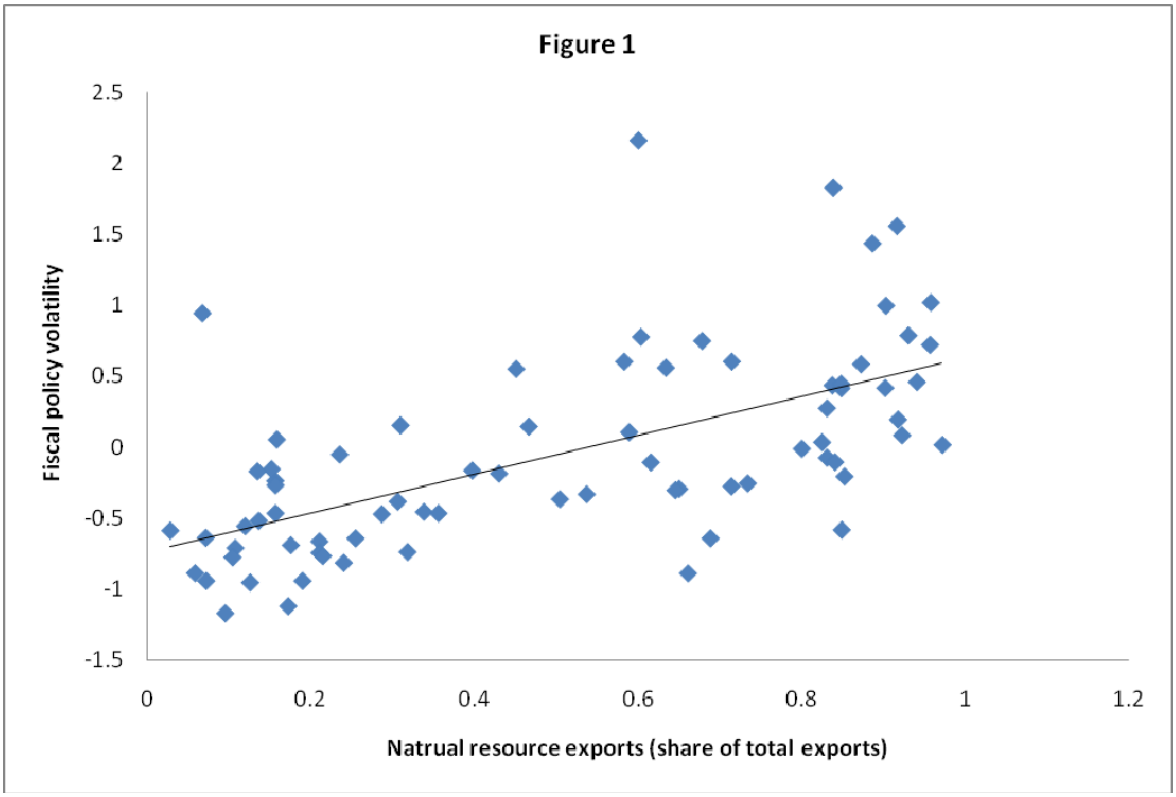
	Dependent variable: per capita growth 1980-2004 (% p.a.)		
Independent variables	(1)	(2)	(3)
Constant	12.29***	10.90***	10.78***
	(4.67)	(4.89)	(5.20)
1980 per capita GDP (ln)	-1.275***	-1.28***	-1.28***
	(-3.66)	(-4.14)	(-4.07)
Government size	-0.0917**	-0.0275	0.0250
	(-2.61)	(-0.63)	(-0.56)
Investment price	-0.00602	-0.00675*	-0.00688
	(-1.50)	(-1.67)	(-1.65)
Secondary school enrolment	0.0223**	0.0187**	0.0188**
	(2.43)	(2.40)	(2.34)
Openness	0.939***	0.887***	0.867***
	(2.97)	(3.02)	(2.73)
Rule of law index	1.21***	0.962***	0.961***
	(4.65)	(3.78)	(3.75)
Output volatility	-0.656*		0.086
	(-1.95)		(0.18)
Fiscal policy volatility		-0.945***	-0.985**
		(-3.44)	(-2.49)
Sample size	75	75	75
R-squared	0.563	0.608	0.608
Standard error	1.262	1.195	1.204

Notes. Point-source primary product exports are fuels, ores and metals; diffuse primary product exports are agricultural raw materials and food products. For details on variables, see the data appendix. Figures in parentheses are heteroskedasticity-robust *t*-statistics. ***/**/* denotes significantly different from zero at the 0.01/0.05/0.10 level.

4. Primary Product Exports and Volatility

We now consider how primary product exports affect volatility. In Table 3, *output volatility* is regressed on initial GDP, openness, institutional quality and the primary product export share. Institutional quality and initial GDP each have negative but insignificant coefficients. Openness and the primary product export share both have highly significant positive coefficients, indicating that more trade in aggregate and a greater share of primary products in exports are each associated with greater output volatility. The point estimate suggests that an extra ten percentage points of primary product exports increases output volatility by 6.5%. In the second column of Table 3 we split the two categories of resource exports into point-sourced and diffuse exports. Both are significant at the 0.01 level, and the estimated impact on volatility is greater for point-sourced exports, although not significantly so.

Figure 1 shows a scatter plot of the relationship between *fiscal policy volatility* and the share of primary products in exports. We see that there seems to be a clear positive relationship between the two variables. Moreover this relationship does not appear to be driven by outliers.



In Table 4 we show regressions with fiscal policy volatility as the dependent variable. We begin with the political variables favoured by Fatás and Mihov (2003). The four political variables (which are described in more detail in the Appendix) are: a measure of constraints on the executive; a dummy for a presidential as opposed to a parliamentary regime; a dummy for a majoritarian rather than a proportional electoral system; and the number of elections over the period 1975-2004. As in Fatás and Mihov (2003, Table III), the most significant of these are executive constraints (negative) and the dummy for a presidential regime (positive), as can be seen from column (1) of Table 4. The four political variables are collectively significant at the 0.01 level.

Table 3. Primary product exports and output volatility 1980-2004

	Log standard deviation of GDP growth rate 1980-2004 (% p.a.)		
Independent variables	(1)	(2)	(3)
Constant	1.30** (2.34)	1.36*** (2.65)	1.31** (2.46)
1980 per capita GDP (ln)	-0.0480 (-0.81)	-0.0777 (-1.19)	-0.0723 (-1.08)
Openness	0.376*** (4.60)	0.384*** (4.53)	0.373*** (4.43)
Rule of law index	-0.0917 (-1.27)	-0.0718 (-0.95)	-0.0707 (-0.91)
Primary product export share	0.698*** (4.32)		
Point-sourced PP export share		0.844*** (3.37)	0.900*** (2.72)
Diffuse PP export share		0.591*** (3.26)	0.545*** (2.75)
Volatility of point-sourced PP export share			-2.94 (-0.64)
Volatility of diffuse PP export share			3.81 (0.73)
Test of significance of volatility variables			F(2,66)=0.48 (*p*=0.62)
Test of equality of point-source & diffuse X coeffs		F(1,68)=0.80 (*p*=0.38)	
Sample size	74	74	74
R-squared	0.438	0.449	0.453
Standard error	0.369	0.368	0.372

Notes. Point-source primary product exports are fuels, ores and metals; diffuse primary product exports are agricultural raw materials and food products. For details on variables, see the data appendix. Figures in parentheses are heteroskedasticity-robust *t*-statistics. ***/**/* denotes significantly different from zero at the 0.01/0.05/0.10 level.

Table 4. Primary product exports and fiscal policy volatility 1980-2004

	Dependent variable: fiscal policy volatility			
Independent variables	(1)	(2)	(3)	(4)
Constant	0.303 (1.61)	-0.050 (-0.09)	0.486 (0.46)	0.755 (1.12)
1980 per capita GDP (ln)		-0.023 (-0.33)	-0.123 (-0.94)	-0.165** (-2.26)
Executive constraints*	-0.196** (-2.57)	-0.114 (-1.14)		
Presidential*	0.490*** (2.92)	0.170 (1.11)		
Majoritarian*	0.105 (0.81)	0.092 (0.84)		
Elections*	-0.037 (-1.67)	-0.030 (-1.47)		
Primary product export share		1.01*** (3.89)		
Point-sourced PP export share			1.17*** (3.53)	1.37*** (3.84)
Diffuse PP export share			1.01*** (3.50)	1.02*** (3.16)
Volatility of point-sourced X share				-4.27 (-0.54)
Volatility of diffuse X share				4.56 (0.56)
Rule of law index			-0.0729 (-0.57)	
F-test of * variables	F(4, 65) =10.24***	F(4, 63)=1.75 (p=0.150)		
F-test of volatility variables				F(2,69)=0.21 (p=0.81)
Sample size	70	70	75	75
R-squared	0.365	0.501	0.435	0.435
Standard error	0.542	0.488	0.539	0.544

Notes. Point-source primary product exports are fuels, ores and metals; diffuse primary product exports are agricultural raw materials and food products. For details on variables, see the data appendix. Figures in parentheses are heteroskedasticity-robust *t*-statistics. ***/**/* denotes significantly different from zero at the 0.01/0.05/0.10 level.

In the second column of Table 4, we add the export share of primary products and initial GDP. The export share of primary products is positive and highly significant, and the R-squared jumps from 0.365 to 0.501, but the political variables are no longer significant. In other words, resource exports dominate political factors as a determinant of fiscal policy volatility. In the third column, we test an alternative measure of institutions, replacing the political variables with the Rule of Law Index, which like the previous institutional variables comes out non-significant. We then split primary product exports into diffuse and point-source exports, which are estimated to have almost identical effects, with an extra ten percentage points of either adding about 10% to fiscal policy volatility.

5. Primary Product Exports, Fiscal Policy Volatility and Growth

In this section, we enter fiscal policy volatility together with primary product exports in our growth regression. If FPV fails to remain significant when primary product exports are added, and primary product exports are significant, that would suggest that FPV is significant in the growth regressions reported above only because of omitted variable bias. If however, FPV remains significant, the inference would be that FPV matters for growth but that it is one of the transmission mechanisms of the resource curse (Acemoglu *et al*. (2003, pp. 80-1) argue along similar lines in relation to institutions and macroeconomic variables).

Table 5 shows the results of this exercise. In column (1) output volatility is not significant, but resource exports remain significant at the 0.01 level, which confirms once more that the significance of output volatility in the first column of Table 2 was simply the effect of omitted variable bias. For FPV (column (2)), the picture is somewhat different, because both FPV and resource exports remain significant at the 0.05 level, with similar *t*-statistics. This indicates that the component of each which is uncorrelated with the other also has a negative impact on growth. Implicitly, resource exports affect growth both through FPV and through other mechanisms, and FPV

matters in its own right, since otherwise it would lose significance once resource exports were entered in the regression. When FPV is included in the growth regression together with natural resource exports, the coefficient of natural resource exports is reduced by 25 percent. This indicates that about a quarter of the resource curse operates through the channel of fiscal policy volatility.

Table 5. Primary product exports, volatility and growth 1980-2004

	Dependent variable: per capita growth 1980-2004 (% p.a.)	
Independent variables	(1)	(2)
Constant	11.79*** (5.10)	11.09*** (5.04)
1980 per capita GDP (ln)	-1.18*** (-3.89)	-1.197*** (-4.14)
Government size	-0.0748** (-2.26)	-0.0339 (-0.83)
Investment price	-0.00397 (-1.05)	-0.00468 (-1.22)
Secondary school enrolment	0.0203** (2.42)	0.0176** (2.32)
Openness	0.686** (2.00)	0.756** (2.49)
Rule of law index	0.940** (3.34)	0.802*** (2.89)
Primary product export share	-1.91*** (-2.70)	-1.486** (-2.56)
Output volatility	-0.192 (-0.50)	
Fiscal policy volatility		-0.647** (-2.35)
Sample size	74	74
R-squared	0.616	0.639
Standard error	1.19	1.15

Notes. Point-source primary product exports are fuels, ores and metals; diffuse primary product exports are agricultural raw materials and food products. For details on variables, see the data appendix. Figures in parentheses are heteroskedasticity-robust *t*-statistics. ***/**/* denotes significantly different from zero at the 0.01/0.05/0.10 level.

6. Conclusions

The resource curse is alive and well. Using a sample of 75 countries over a more recent period (1980-2004) than those used in earlier studies, we have shown that countries with a higher share of natural resource exports tend to have both slower per capita growth and higher volatility of output and government consumption. In contrast to Fatás and Mihov (2003, 2005), we find that the volatility of government consumption is not significantly related to institutional factors, but can to an important extent be explained by natural resource exports. We also find that institutions as measured by the Rule of Law Index do matter for growth, but that this effect is direct rather than through fiscal policy volatility. Our results conflict with those of van der Ploeg and Poelhekke (2009), who find that output volatility is the main transmission channel of the resource curse, and that it is the variability rather than the level of resource exports which matter.

These results suggest that fiscal policy volatility is an important transmission mechanism for the resource curse. Since both resource exports and FPV are significant in a growth regression when included together, the implication is that FPV is also important for growth in its own right, and that the resource curse works through other mechanisms as well. By contrast, output volatility becomes insignificant in a growth regression when resource exports are included, which implies that its apparent significance derives from omitted variable bias.

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APPENDIX:

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Fixed-effects (within) regression               Number of obs      =      1859
Group variable: ccode                           Number of groups   =        75

R-sq:  within  = 0.6518                         Obs per group: min =        17
       between = 0.9938                                        avg =      24.8
       overall = 0.8910                                        max =        25

                                                F(30,1754)         =    109.43
corr(u_i, Xb)  = 0.7919                         Prob > F           =    0.0000

------------------------------------------------------------------------------
Gov. cons. exp. 80-04 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------------------+--------------------------------------------------------
Real GDP growth (-1)  |   .7545853   .9902627     0.76   0.446    -1.187634    2.696805
Real GDP growth       |  -4.253195   1.013131    -4.20   0.000    -6.240266   -2.266124
Inflation (-1)        |    .272925   .2237381     1.22   0.223    -.1658964    .7117463
Gov. cons. exp. (-1)  |   .7773853   .0146749    52.97   0.000     .7486031    .8061675
Inflation             |  -2.949677   .4568264    -6.46   0.000    -3.845659   -2.053696
Inflation squared     |   .6484976   .1096738     5.91   0.000     .4333925    .8636027
Dummy 1981            |   .1516264   .3100788     0.49   0.625    -.4565365    .7597894
Dummy 1982            |   .0179443   .3098161     0.06   0.954    -.5897035    .6255921
Dummy 1983            |  -.3316754   .3110071    -1.07   0.286     -.941659    .2783081
Dummy 1984            |  -.1071725   .3089714    -0.35   0.729    -.7131634    .4988184
Dummy 1985            |  -.5518943   .3083309    -1.79   0.074    -1.156629    .0528405
Dummy 1986            |  -.0987508   .3088287    -0.32   0.749     -.704462    .5069603
Dummy 1987            |  -.3431614   .3079046    -1.11   0.265    -.9470599    .2607372
Dummy 1988            |  -.9331822    .307397    -3.04   0.002    -1.536085   -.3302791
Dummy 1989            |  -.7010204    .307477    -2.28   0.023     -1.30408   -.0979604
Dummy 1990            |  -.3951707   .3084029    -1.28   0.200    -1.000047    .2097052
Dummy 1991            |  -.4676076   .3084042    -1.52   0.130    -1.072486    .1372709
Dummy 1992            |  -.6706135   .3096528    -2.17   0.030    -1.277941   -.0632859
Dummy 1993            |   -.421396   .3094826    -1.36   0.173     -1.02839    .1855976
Dummy 1994            |  -.5751256   .3069833    -1.87   0.061    -1.177217    .0269661
Dummy 1995            |  -.8092201   .3080526    -2.63   0.009    -1.413409   -.2050311
Dummy 1996            |  -.7644822   .3085529    -2.48   0.013    -1.369652    -.159312
Dummy 1997            |  -.7070251   .3099781    -2.28   0.023    -1.314991   -.0990597
Dummy 1998            |  -.7495958   .3110942    -2.41   0.016     -1.35975   -.1394413
Dummy 1999            |  -.8360648   .3116972    -2.68   0.007    -1.447402   -.2247276
Dummy 2000            |  -.7672661   .3098181    -2.48   0.013    -1.374918   -.1596144
Dummy 2001            |  -.3766013   .3113845    -1.21   0.227    -.9873251    .2341226
Dummy 2002            |  -.5484481   .3107085    -1.77   0.078    -1.157846    .0609499
Dummy 2003            |     -.6257   .3104895    -2.02   0.044    -1.234669   -.0167315
Dummy 2004            |  -.7013357   .3099425    -2.26   0.024    -1.309231   -.0934401
Constant              |    4.31105   .3372176    12.78   0.000     3.649659     4.97244
---------------------+--------------------------------------------------------
     sigma_u |  1.0922874
     sigma_e |  1.8552921
         rho |  .25739808   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(74, 1754) =     2.67            Prob > F = 0.0000
```

Variables

Time series used for panel estimation of fiscal policy volatility

Real government consumption. The share in GDP of central government final consumption expenditure in local currency units. Data source: World Development Indicators. Series identifier in the original data set: General government final consumption expenditure (% of GDP) (NE.CON.GOVT.ZS).

Growth Rate of Real GDP. Calculated as the difference in the logarithm of real GDP in constant local currency. Data source: World Development Indicators. Series identifier in the original data set: GDP (Constant LCU) (NY.GDP.MKTP.KN).

Inflation. Calculated as the difference in the logarithm of the GDP deflator. Source: World Development Indicators. Series identifier in the original data set: GDP deflator (NY.GDP.DEFL.ZS). To reduce the risk of results being driven by outliers, we transform inflation according to the following algorithm: $\frac{100\pi_t}{100+\pi_t}$

Variables used for estimating cross-country regressions

Average real growth rate per capita 1980-2004. Calculated as the difference in the logarithm of real GDP per capita adjusted for purchasing power parity, then averaged over the period 1980-2004. Source: Penn World Tables, (version 6.2). Series identifier in the original data set: rgdpch. The variable is multiplied by 100 so as to get coefficients that can be interpreted as percentage changes. The logarithm of the standard deviation of this variable is used to estimate pr. capita output volatility.

Real GDP/capita 1980. Initial per capita GDP. Same source as above: Penn World Tables, (version 6.2). Series identifier in the original data set: rgdpch. We use the logarithm of this variable. Values for 1995 were used.

Government size. Government size is proxied for by using the 1980 to 2004 average of government consumption expenditure, as specified above. Series identifier in the original dataset: General government final consumption expenditure (% of GDP) (NE.CON.GOVT.ZS).

Investment price. Initial price level of investment, adjusted for Purchasing Power Parity, 1980-2004 yearly average. Source: Penn World Tables (version 6.2). Series identifier in the original data set: pi.

Secondary school enrolment. Numbers for year 2000 were used, since data for previous years was very incomplete. Source: World Development Indicators. Series identifier in the original dataset: School enrolment, secondary (% gross) (SE.SEC.ENRR).

Openness. Sum of imports and exports as shares of GDP, 1980-2004 yearly average. Source: World Development Indicators. Series identifiers in the original data set are,

respectively: Exports of goods and services (% of GDP) (NE.EXP.GNFS.ZS) and Imports of goods and services (% of GDP) (NE.IM.GNFS.ZS). For ease of interpretation, and comparability with Fatás and Mihov (2003, 2005), we divide this variable by 100.

Point-sourced natural resource exports. The sum of the share of ores and metals exports and fuel exports in total merchandise exports, 1995-2004 yearly average. Source: World Development Indicators. Series identifiers in the original data set are, respectively: Ores and metals exports (% of merchandise exports) (TX.VAL.MMTL.ZS.UN) and Fuel exports (% of merchandise exports) (TX.VAL.FUEL.ZS.UN).

Diffuse natural resource exports. Sum of the shares of agricultural raw materials exports and food exports in total merchandise exports, 1995-2004 yearly average. Source: World Development Indicators. Series identifiers in the original data set are, respectively: Agricultural raw materials exports (% of merchandise exports) (TV.VAL.AGRI.ZS.UN) and Food exports (% of merchandise exports). (TX.VAL.FOOD.ZS.UN).

Rule of Law Index: From the World Bank Worldwide Governance Indicators Project. The values used here are for 1996, the first year for which the index is available. Retrieved 20.05.09 from http://info.worldbank.org/governance/wgi/index.asp

Executive constraints. Constraints on the executive, calculated as the sum of four dummy variables: Constraints = Legislature + Upper Chamber + Judiciary + Federal. Each of the dependent variables takes the value of unity for countries that satisfy the following criteria: Legislature=1 for countries where there are free elections to parliament and the parliament is independent of the executive. Upper Chamber=1 in countries where there is a bi-cameral legislature. Judiciary=1 in countries where the judiciary is independent from the executive. Federal=1 in countries where power is shared between national and regional governments. Source: Henisz (2000).

Presidential. This dummy variable refers to the type of political system, and takes the value of 1 for presidential regimes and 0 for parliamentary regimes. Mid-period values (1995) are used. Source: Database of Political Institutions (Beck, Clarke, Groff, Keefer and Walsh, 2001, updated from the World Bank website). As in Fatás and Mihov (2005), the variable is recoded from the original values to a dummy variable. Series identifier in the original dataset: system.

Majoritarian: This dummy variable refers to the type of electoral system, and takes the value of one for majoritarian systems and zero for proportional systems. Mid-period values (1995) are used. Source: Database of Political Institutions (Beck et al., 2001, updated from the World Bank website). Series identifier in the original dataset: Pr.

Number of elections. The sum of legislative and executive elections over the period 1975-2004. Source: Database of Political Institutions (Beck, Clarke, Groff, Keefer and Walsh, 2001, updated from the World Bank website). Series identifier in the original dataset: legelec and execelec.

Description of the Sample

Data for 75 countries were used, covering the period 1980-2004. The sample and the period were chosen in function of the data availability. Given the fragmented character of the data on natural resource exports for African countries before 1995, we used 1995-2004 averages for these data.

The countries are: Algeria, Argentina, Australia, Austria, Bangladesh, Benin, Bolivia, Brazil, Burkina Faso, Burundii, Canada, Central African Republic, Chile, China, Colombia,
Costa Rica, Côte d'Ivoire, Denmark, Ecuador, Egypt, El Salvador, Finland, France, Gabon, Gambia, Germany, Greece, Guatemala, Honduras, Hong Kong, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Kenya, South Korea, Madagascar, Malawi, Malaysia, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Niger, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Saudi Arabia, Senegal, Singapore, South Africa, Spain, Sweden, Switzerland, Syria, Thailand, Togo, Trinidad and Tobago, Tunisia, Uganda, United Kingdom, United States, Uruguay, Venezuela and Zambia.