The persistence of fiscal adjustments in developing countries

SANJEEV GUPTA*, BENEDICT CLEMENTS,
EMANUELE BALDACCI and CARLOS MULAS-GRANADOS‡

International Monetary Fund, 700 19th Street, NW, Washington, DC 20431 and
‡*Universidad Europea de Madrid, Universidad Europea de Madrid, 28670 Villaviciosa de Odón, Madrid*

This study assesses effects of expenditure composition and other variables on the duration of fiscal adjustment episodes in a sample of 29 developing countries. Using survival analysis, the study finds that expenditure composition, size of the fiscal consolidation, and past performance on fiscal consolidation affect the persistence of adjustment.

I. INTRODUCTION

Empirical studies of industrial countries indicate that the composition of fiscal adjustment is an important determinant of whether such adjustment is sustained over time (e.g., Alesina and Perotti, 1996). The key ingredients behind sustained fiscal adjustment are of no less interest in developing countries, as many of them have yet to achieve the macroeconomic stability needed as the foundation for durable economic growth. The determinants of sustained fiscal adjustment in developing countries, however, have yet to be assessed in the literature. This article attempts to fill this void by examining the impact of expenditure composition and other determinants on the persistence of fiscal adjustment in these countries. The study departs from most previous studies by using survival analysis, a methodology that only recently has been applied in the economics literature. The study is based on a dataset for 29 developing countries with IMF-supported programmes in the 1990s.[1]

The results of the study confirm that there is a strong link between public expenditure reform and the sustainability of fiscal consolidations, as fiscal adjustments achieved through curtailing current expenditures are, in general, less likely to be reversed.

II. ECONOMETRIC MODEL

Following Von Hagen and Strauch (2001) and others, fiscal adjustments are defined as sustained if they persist over an adequate period of time. There is a wide consensus among researchers that fiscal consolidations need to be persistent in order to have a positive effect on growth. In general, the persistence of high-quality fiscal adjustment can affect macroeconomic stability and reduce the expectations that higher taxes and interest rates will be needed in the future to finance fiscal disequilibria.

Survival analysis is the appropriate statistical method to assess which factors affect the persistence of fiscal consolidations. Most empirical studies on the sustainability of fiscal consolidations have, in contrast, used a descriptive and indirect approach to measure the determinants of sustainable fiscal adjustments. Survival analysis provides a superior approach, as it allows for the treatment of the duration of fiscal adjustment spells as endogenous. This

method makes use of all the information available in the data, rather than constraining the analysis to consolidation episodes only.

Two alternative approaches could be undertaken to assess the determinants of fiscal sustainability using survival analysis: a gradient approach and a level approach (Adam and Bevan, 2003). Under the latter approach, the end of a fiscal consolidation episode is reached when a country goes above a certain deficit threshold. Under the gradient approach, fiscal adjustment ends when a country fails to keep reducing the deficit by a certain threshold amount each year. Both approaches have merit (Gupta, 2003). In this study, a modified gradient approach is chosen. A fiscal adjustment is considered as continuing if the deficit falls by at least 1.5% of GDP per year. However, to take into account the fact that initial fiscal conditions influence policymakers in deciding how much adjustment is needed to stabilize the public finances, the initial level of the deficit is added as one of determinants of ending a fiscal consolidation episode. In this way, the study controls for the fact that countries with low initial deficits may not feel compelled to continue with fiscal adjustment, as the deficit may already be close to a sustainable level.

The survival process can be easily described using two variables: The hazard rate and the survival function. The unconditional hazard function expresses the relative risk that a fiscal consolidation ends at time t, provided it was still ongoing in the previous period:

$$\hat{h}(t) = \frac{d_t}{n_t} \qquad (1)$$

where d_t represents the number of failures registered in moment t, and n_t is the surviving population in moment t, before the change in status (e.g., the end of the consolidation) takes place. The survival function for duration t is calculated as the product of one minus the existing risk until period t:

$$\hat{S}(t) = \prod_{j|t_j \leqslant t} \left(\frac{n_j - d_j}{n_j} \right) \qquad (2)$$

A model that has been widely used to estimate the hazard function is the *Model of Proportional Hazard* (PH), which assumes that the hazard function can be described as follows:

$$h(t, X) = h_0(t) * g(X) \qquad (3)$$

where $h_0(t)$ is the baseline hazard function and $g(X)$ is a function of individual covariates. This is usually defined as $g(X) = \exp(X'\beta)$. This model can be estimated without imposing any specific functional form to the baseline hazard function, following Cox (1972):

$$h(t, X) = h_0(t) * \exp(X'\beta) \qquad (4)$$

In this model, the effect of the individual covariates is to rescale the conditional probability of ending the period of fiscal consolidation. The interpretation of the model's parameters vector β is straightforward: this represents the effect on the logarithm of the hazard function of a unit change in the individual covariates. Using Equation 4, the probability of interrupting a fiscal adjustment is regressed on a set of variables that, according to the literature, are likely to have an effect on the duration of the adjustment.

The independent variables include (1) the size of the fiscal adjustment, measured as the cumulative change in the budget balance during the fiscal consolidation effort. The larger the size of the consolidation, the longer the effort is hypothesized to last, because a larger adjustment tends to signal the willingness of the authorities to achieve fiscal sustainability so as to raise market confidence; (2) the level of the fiscal deficit at the beginning of the episode. This control variable captures the size of the adjustment required to achieve a sustainable level of fiscal balance; (3) change in per capita growth. Exogenous factors affecting growth, such as changes in commodity prices or a worldwide economic slowdown, can affect fiscal consolidation efforts; (4) the change in the composition of government spending, including both the share of current spending in total government spending and the share of transfers in current spending; (5) the change in tax revenues and social spending, all expressed as ratios to GDP. These variables control for the contributions of investment in human capital and improvements in tax collection to the consolidation effort. In particular, the social spending variable is a proxy for how willing the government is to support pro-poor spending. As such, these variables account for the possible trade-off between fiscal consolidation and the need to protect the poor from the possibly negative effect of government spending cuts; (6) the previous number of failures in the adjustment process in the period under consideration. This is meant to control for the effect of exogenous growth shocks and the country's past adjustment performance; and (7) variables capturing the effect of the composition of deficit financing as a ratio to GDP.

III. EMPIRICAL RESULTS

Fiscal adjustment periods are based on the observed change in the fiscal deficit as a share of GDP above 1.5 percentage points of GDP. This definition is broadly comparable to that employed in previous empirical studies (e.g., Alesina and Perotti, 1995; Von Hagen and Strauch, 2001). Deficits were generally reduced during the period, with an average annual improvement of approximately 0.5 percentage point of GDP. Only 43% of the fiscal adjustment periods persisted until the end of the second year (Figure 1).

All Countries

Duration of Consolidation Episodes (Years)
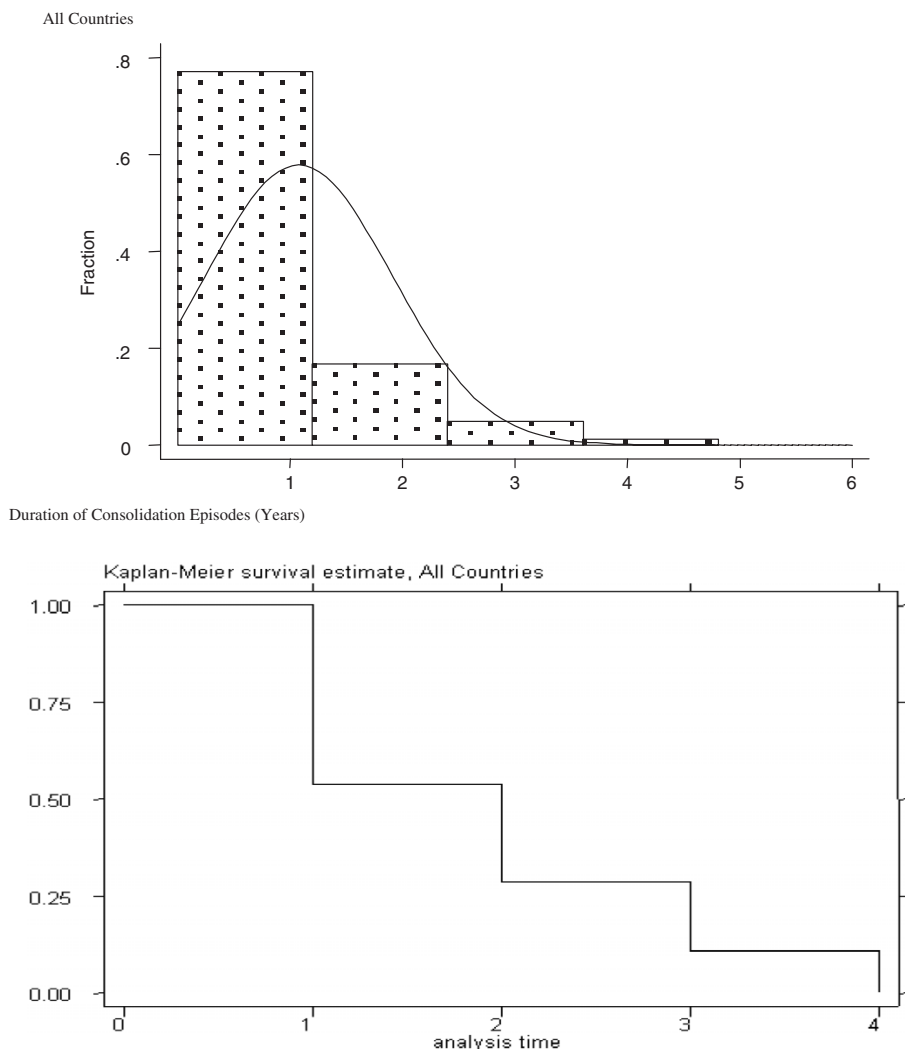
Source: Authors' calculations.

Fig. 1. *Sustainability of fiscal consolidations in developing countries: hazard and survival functions*

Results of the semi parametric model estimation are reported in Table 1.[2] The reallocation of current expenditures to capital outlays is positively related to the persistence of the adjustment. Large levels of wages and salaries, transfers, and subsidies increase the probability of ending a fiscal adjustment. At the same time, allocating more public spending on capital outlays is helpful for the sustainability of adjustment. Reallocating current spending away from transfers and subsidies has a positive impact on the probability of continuing fiscal consolidation, while spending more on health and education is not harmful to the persistence of the adjustment.

The size of the fiscal adjustment effort also matters. The coefficient for the size of the adjustment is negative and highly significant. For each one percentage point of GDP increase in cumulative fiscal adjustment, the probability of ending the fiscal consolidation episodes falls by 4%. Thus, there appears to be little evidence of 'adjustment fatigue'. Countries with larger cumulative reductions in the deficit are less likely to abandon their adjustment efforts than others.

Initial fiscal conditions and past performance on fiscal consolidation are also important for the persistence of fiscal consolidations. Under one model specification, countries that start the consolidation process with high budget deficits are more likely to end a fiscal consolidation. More robust results are obtained for the impact of past failures on the likelihood of persistent fiscal adjustment. Under all three specifications, a high number of aborted adjustment episodes foreshadows continued failure.

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[2] The overall fit of the model is satisfactory. The goodness of fit indicators range between 16% and 21%. These low values are, however, highly dependent on the amount of censored information. Abstracting from these, the goodness of fit is above 80%. The model specification was also tested using the Grambsch and Therneau test, which confirms that the proportional hazard assumption is valid in the sample.

Table 1. *Sustainability of fiscal consolidations and budget composition in developing countries: results from Cox Proportional-Hazard Model, 1990–2000*[a]

	Coefficient	z-Test	Coefficient	z-Test	Coefficient	z-Test
Size of adjustment	−0.04	−3.06***	−0.03	−3.67***	−0.04	3.68***
Initial deficit	0.01	1.20	0.01	1.60	0.02	1.74*
ΔGrowth	−0.02	−1.99**	−0.02	−2.42**	−0.02	−1.95*
ΔSocial spending/GDP	−0.04	−1.07	0.01	0.08	0.02	0.47
Number of previous failures	0.01	3.75***	0.01	4.46***	0.01	4.01***
ΔTax revenues/GDP	−0.08	−2.51**	−0.11	−4.71***	−0.06	1.82*
ΔTransfers/current spending	0.03	2.18**	0.02	1.72*	0.02	1.79*
ΔCurrent/total spending	0.12	3.92***	0.12	5.05***	0.11	3.13***
ΔExternal financing/GDP	0.07	4.22***				
ΔDomestic financing/GDP					0.01	0.07
Number of episodes	167		188		167	
Number of failures	107		118		107	
Time at risk	239		272		239	
Log likelihood	−467.43		−532.03		−472.07	
Wald test	86.62		75.66		65.24	
Probability	0.00		0.00		0.00	

Note: Significance levels at 10%, 5%, and 1% are indicated by *, **, and ***, respectively.
[a]ML estimates with robust standard errors.

When fiscal consolidations are supported by accelerated revenue efforts, the probability of ending an adjustment is lower. In the context of developing countries – where revenue ratios to GDP are generally modest – higher tax revenue collection can be triggered by improvements in tax administration, elimination of exemptions, and curbing of tax evasion rather than an increase in tax rates. These factors are likely to have a positive effect both on the fiscal stance and on growth.

The availability of external financing tends to reduce the probability of continuing a fiscal consolidation, while there is no evidence that this is true for domestic financing. Finally, moderate empirical support is found in favour of an independent effect of economic growth on the duration of the fiscal adjustment.

The robustness of these results has been tested using alternative parametric specifications of the hazard functions.[3]

IV. CONCLUSIONS

Using survival analysis, this study has sought to shed light on the relationship between expenditure composition and other variables on the sustainability of fiscal adjustment in developing countries. Consistent with the previous findings in the literature on industrial countries, the results point to a significant relationship between the duration of fiscal adjustment and expenditure reforms. Thus, tilting the overall composition of public expenditure towards more

productive uses is not only important for boosting growth, but also for achieving more sustained fiscal adjustments. Finally, fiscal difficulties in the past appear to foreshadow continued troubles in shoring up the public finances. Countries with unfavourable initial fiscal conditions are more likely to end fiscal consolidations, as well as those with a history of past failure in this endeavour.

REFERENCES

Adam, C. and Bevan, D. (2003) Staying the course: maintaining fiscal control in developing countries, paper prepared for the Brookings Institution Trade Forum Conference.

Alesina, A. and Perotti, R. (1995) Fiscal expansion and fiscal adjustments in OECD countries, *Economic Policy*, **21**, 205–48.

Alesina, A. and Perotti, R. (1996) Fiscal adjustments in OECD countries: composition and macroeconomic effects, IMF Working Paper: 96/70.

Gupta, S. (2003) Comments on: staying the course: maintaining fiscal control in developing countries, prepared for the Brookings Institution Trade Forum Conference.

Von Hagen, J. and Strauch, R. (2001) Fiscal consolidations: quality, economic conditions, and success, *Public Choice*, **109**, 327–46.

[3] Results for the parametric specification are not reported here due to space limitations. They are available from the authors upon request.