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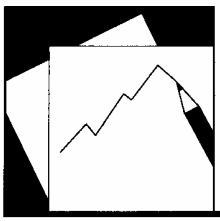

IMF Working Paper

Revenue Forecasting—How is it done? Results from a Survey of Low-Income Countries

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Revenue Forecasting—How is it done? Results from a Survey of Low-Income Countries

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Abstract

This paper takes stock of revenue forecasting practices in low-income countries, and provides a comprehensive and condensed account of the revenue forecasting process. Based on a new dataset on 34 low-income countries, it catalogues forecasting practices and procedures from inception until budget submission, focusing primarily on institutional aspects and processes. The paper also synthesizes three key characteristics of forecasting practices, formality, organizational simplicity, and transparency, and empirically explores their determinants. High levels of country corruption are associated with less formal and less transparent forecasts. Past IMF involvement in a country increases the formality of the process, but does not improve public access to information.

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Keywords: Revenue Forecasting; Budget Preparation

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Contents Page

I. INTRODUCTION

Understanding revenue forecasting practices is essential in assessing budget planning and management processes. Revenue forecasts define the budget envelope and form the basis for effective medium-term planning. They serve as the principal resource constraint and, if integrated in a top-down budget preparation process approach, facilitate the allocation of expenditures across different uses. Furthermore, transparency of forecasting processes is key in creating accountability in the revenue collection process, as manipulation of forecasts can conceal governance problems (Danninger, Cangiano, and Kyobe, 2004).

Surprisingly, little research has been carried out on the determinants of revenue forecasting practices.[2] One possible explanation is that a systematic and comparative analysis requires a wealth of institutional knowledge. Descriptions of budget preparation processes are generally not put down in formal documents, and country practices are often a mix of idiosyncratic budget practices and influences from legacy systems. A systematic analysis of forecasting practices in low-income countries is also needed, since the IMF, and especially its Fiscal Affairs Department (FAD), often give advice on reforms of the budget planning process.

The paper presents new and comparable data on revenue forecasting practices in low-income countries. It gives a descriptive summary of forecasting practices and conducts a systematic cross-country analysis of determinants. The only other comparative source on revenue forecasting practices outside the dataset we present, is a joint effort by the World Bank and the Organization for Economic Cooperation and Development (OECD) (2003) to catalogue budget institutions and processes. The dataset contains various aspects of revenue forecasting practices, but only covers a limited number of countries with little focus on revenue forecasting issues.

The analysis in this study is based on survey results derived from a questionnaire circulated to IMF fiscal economists in early 2003. The questionnaire was designed to capture and condense a number of different aspects of the revenue forecasting process. Among other things, it determines the coverage of the forecast, the forecasting horizon and timetable, which and how many agencies are involved, and the existence of rules and regulations governing the forecasting process. Specific questions also relate to the nature and source of underlying macroeconomic assumptions, the use of forecasting methods, public availability of information, and the scope for discretionary adjustments of forecasts.

The sample comprises 34 countries of which 80 percent are developing economies and the rest are transition economies predominantly from the CIS.[3] Roughly one-third of the developing countries are from sub-Saharan Africa, another 25 percent each from Asia and

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[2] Exceptions are Danninger, Cangiano, and Kyobe (2004); Golosov and King (2002); and Alt (1993).

[3] Country classifications are based on the 2003 *World Economic Outlook* (WEO).

Latin America, and the remainder from the Middle East (18 percent). The average level of per capita income is US$1,504, with broad variation across regions.

The paper describes the main features of forecasting practices and examines whether they differ across regions or per capita income levels. Regional differences should capture the extent that forecasting practices are related to public expenditure management legacy systems. The level of per capita income may be an indicator for differences in forecasting practices as it correlates with available public and human resources. Where relevant, country differences by level of governance are indicated since they may affect forecasting practices through incentives for forecasting manipulation (Lienert and Sarraf 2001; Danninger, Cangiano, and Kyobe, 2004).

Most countries score low on various aspects characterizing the quality of the revenue forecasting process. Forecasting responsibilities are often not well defined and there are few formal rules and regulations governing the forecast. Revenue forecasts, for the most part, are produced late in the budget process, and estimation techniques are rudimentary. The production of forecasts usually involves multiple executive agencies outside the ministry of finance, setting high coordination requirements. As a result, the existence of multiple competing forecasts is quite common. Public accountability, in terms of access to forecast data or through participation of nongovernmental agencies in the forecasting process, is limited.

Surprisingly, these features of the forecasting process do not differ greatly along regional or per capita levels, with a few exceptions. More transparency and rigor is applied in Latin American countries, which also have relatively higher income. On the other hand, low levels of governance, particularly in CIS countries, are related to greater discretionary adjustment of revenue forecasts and indicate less public access to information.

A more systematic, multivariate analysis is carried out for three key aspects of the revenue forecasting process. The first is *formality*, a measure of how formal or informal the forecasting procedure is. A second aspect, *simplicity*, addresses how cohesive and centralized the organization of the process is. The last aspect attempts to capture the *transparency* of the budget forecast by focusing on public access to relevant information. This dimension measures whether or not any outside agencies are involved in the forecast, if the information in the budget document is publicly known, and if the macroeconomic assumptions have been made public.

Interestingly, higher formality and transparency can be found in countries with a higher per capita income and smaller central government. Corruption reduces both formality and transparency. Past IMF involvement in a country, through program arrangements, bears no significant relationship to either transparency or organizational simplicity, but is correlated with a more formal forecasting process.

Section I discusses questionnaire design and data issues. Section II proceeds by describing the basic findings in the sample on forecasting practices. Section III summarizes basic

forecasting characteristics. Section IV analyzes the determinants of three main forecasting characteristics, formality, organizational simplicity, and transparency. The final section concludes.

II. THE DATASET

A two-part questionnaire was sent to FAD fiscal economists in early 2003 with a request to provide information on institutional arrangements and quantitative aspects of the revenue forecasting process in the respective countries. The first part contained questions on institutional and procedural characteristics of the revenue forecast, while the second part contained a data request on forecast estimates and outturns. Prior to dissemination, the questionnaire was reviewed within FAD and tested in a small pilot of four countries.

The *institutional component* comprised a total of 36 questions and was divided into five sections.[4] The majority of questions were dichotomous (yes/no) to avoid coding problems at the cost of reduced cross country variation of characteristics. Given the relatively short institutional memory in the Fund due to high turnover, the questionnaire explicitly referred to developments within the last three years. At the end of each section, respondents were also asked to identify if there were any significant institutional changes in the respective areas. An option for "do not know" was omitted, as the pilot showed that respondents viewed that additional research was not required with this option available.

The *quantitative section* required the submission of data on budget revenue forecasts and outturn, and requested information on underlying macroeconomic assumptions and economic characteristics, such as high resource dependence and discrete events, that could affect the revenue outturn in a given year (i.e., unexpected tax policy measures). Respondents were asked to supply information covering the period 1997–2001, but emphasis was given on the last three years.

The sample

Due to the need to draw on detailed institutional knowledge, the selection of eligible countries was determined by the presence of a fiscal economist on the country team. This limitation had the advantage that developments in selected countries were closely and regularly monitored, and responses could be easily followed up within the department. Its main drawback was, however, the exclusive focus on low-income countries, predominantly under a Fund program with significant Fund involvement in the annual revenue forecasts.

[4] (i) Institutional arrangements between revenue administration and fiscal authority; (ii) macroeconomic forecast; (iii) characterization of revenue forecast; (iv) revenue forecasting practices; and (v) data and forecasting methods.

From a total number of 46 countries with a fiscal economist in early 2003, four countries were eliminated due to the postconflict status, and a further four countries due to country specific reasons.[5] This left a final set of 38 countries listed in Table 1.

Complete and partial submissions were received from 34 countries. No input was received from four countries: Côte d'Ivoire, Albania, Kyrgyz Republic, and Peru. The overall completion rate of submitted questionnaires was high, at 95 percent of posed questions. The highest shares of nonresponse was in the section on data and methods (10 percent), which partly reflected too detailed questions in an area where the use of basic methods is still common practice.

The cover memo of the questionnaire encouraged participants to collaborate with resident representative offices, or to directly request information from the authorities. In majority of the cases, the questionnaire was prepared and submitted by the fiscal economist. Two submissions were received directly from the authorities.

III. Description of Survey Results

This section provides a descriptive summary of the main results of the survey and catalogues forecasting practices and procedures from inception until budget submission. The survey contains a diverse group of countries with large differences in per capita income (Table 1). The average income of the most advanced region is more than five times higher than the average income of the poorest region. IMF involvement has been significant. During the last ten years, countries were on average 50 percent of their time under an IMF program. Governance problems vary quite significantly across regions with the highest scores recorded in transition economies. The overall level of corruption is only slightly above the mean score of a broad sample of countries. [6]

[5] These were Venezuela, Djibouti, Tajikistan, and Nigeria.

[6] The mean corruption perception index of countries in the sample, is 1/7 standard deviations higher than the overall sample average from 183 countries. The corruption index is taken from Kaufmann, Kraay, and Mastruzzi (2003) and constructed as an inverted average over the last two available years of their control of corruption index. The control of corruption index measures the perception of corruption, defined as exercise of public power for private gain. It is based on indicators from several sources using an unobserved components methodology, which optimally weights each individual source according to its precision and reliability. Sources are large private enterprises, citizen and expert surveys, as well as nongovernmental institutions and international organizations.

Table 1. Sample Characteristics

WEO Country classification	N	Percent	GDP per capita USD (2002) 1/	IMF involvement 2/	Country corruption 3/
Sub-Saharan Africa	9	26.4	756	74	0.678
Developing Asia	7	20.6	731	41	0.544
Transition CIS & Mongolia	7	20.6	902	82	0.762
Middle East & Turkey	5	14.7	1809	58	0.254
Western Hemisphere	6	17.6	3975	65	0.219
Total	34	100	1504		

Source: Authors' calculations.
1/ Unweighted average.
2/ Percent of years under a fund program during last ten years.
3/ Unweighted average corruption index, Kaufmann, Kraay, and Mastruzzi (2003).

A. Scope and Horizon of Revenue Forecasts

Budget revenue forecasts have a very mixed coverage. In about half of the sampled countries, the forecasts do not extend beyond central government activities. The scope of coverage is related to a country's level of economic development with higher income countries, in particular those in the Western Hemisphere, having more comprehensive public sector coverage. These revenue forecasts include subnational governments (37 percent), extrabudgetary funds (37 percent) and public enterprises (20 percent).[7] A few countries also include forecasts of the social security administration and the annual budget forecast (Table 2).

Table 2. Budget Coverage of Revenue Forecast
(In percent of sample)

	Central government	Central government & other public revenue sources 1/
Total sample	50	50
Subnational government	0	37
Extrabudgetary funds	0	37
Public enterprises	0	20
Social security	0	3

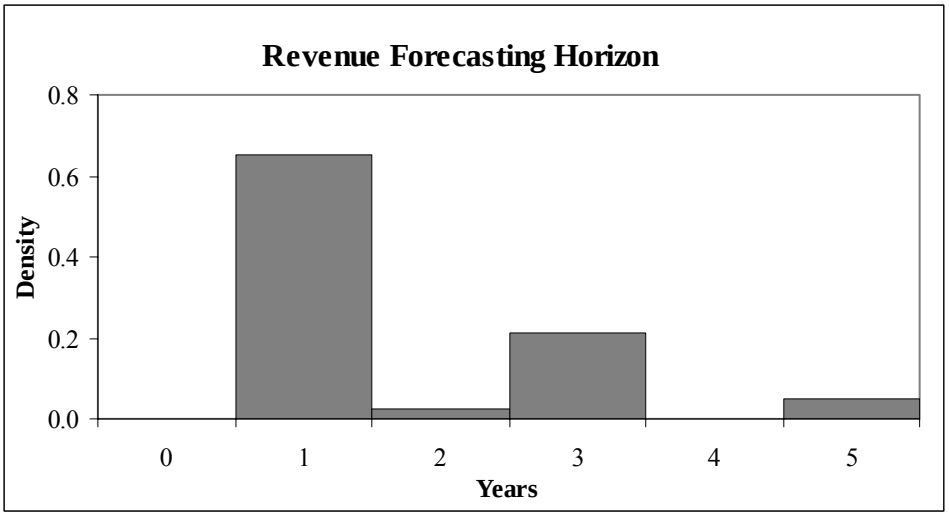
Source: Authors' calculations.
1/ Of which does not add up to the total due to multiple coverage.

[7] Breakdown does not add up to 50 percent due to multiple coverage.

A second dimension of forecast coverage is the time horizon. Most developed countries have shifted to using binding medium-term forecasts as a planning tool. For example, in the EU this requirement is part of the Stability and Growth Pact. Similar initiatives have been proposed for low-income countries.

For the sample as a whole, the time horizon of the revenue forecast is rather short. Roughly two-thirds of the sampled countries only produce one-year ahead estimates (Figure 1). Still, a large minority (33 percent) produces medium-term forecasts. This number may, however, overstate the preponderance of medium-term planning. Often, multiyear forecasts are for illustrative purposes and not well integrated in the annual budget process. Among countries with multiyear forecasts, the most common forecasting horizon is three years. Higher income countries in the sample use this tool more frequently.

Figure 1. Revenue Forecasting Horizon



Source: Authors' calculations.

The other side of the forecasting spectrum relates to within-year forecasts. Effective cash flow and debt management require detailed technical within-year forecasts. In the majority of countries (80 percent), revenue forecasts are broken down into monthly targets. A slightly more aggregated approach is used in 15 percent of the sample, which produces quarterly forecasts. Two countries generate forecasts exclusively on an annual basis.

B. The Macroeconomic Forecast: An Effective Input into the Revenue Forecast?

The number of agencies involved in the macroeconomic and revenue forecasting process varies quite strongly across countries. Only in slightly more than half of the sample, the macroeconomic forecast is produced by a single agency, such as the ministry of finance or the ministry of economy. The involvement of two or more agencies is quite common. This

places high relevance on effective coordination to develop uniform views on the macroeconomic outlook that will underlie the revenue forecast.

Table 3. Agencies Involved in the Macroeconomic Forecast
(In percent of sample)

	Single Agency	Collaboration of Multiple Agencies	
		2	3 or more
Percent of survey	55.8	29.4	14.8
Ministry of Finance	29.3	...	...
Ministry of Economy, etc.	20.5	...	...
Other	10.5	...	...

Source: Authors' calculations.

That said, while all countries prepare the macroeconomic forecast prior to their revenue forecast, not all of them use it as an input for the revenue forecast. In about one-fifth of the surveyed countries, revenue forecasting agencies rely on macroeconomic assumptions which differ from the official revenue forecast. This is a worrisome finding, since it effectively rules out a meaningful decomposition of forecast errors, and, thus, hampers the analysis of forecast errors. It also limits accountability and may be an indication of coordination or governance problems within the governments.

Macroeconomic forecasts play a strategic role in signaling the state of the economy, and may therefore reflect political as well as technical considerations. A considerable share of countries (36 percent) explicitly modify the macroeconomic forecast. This is not an uncommon practice in industrialized economies. For instance, in Canada and the Netherlands, prudent economic growth forecasts have been used to minimize the risk of fiscal slippages. It is, however, surprising that about half of the sampled countries have an explicit upward bias in economic growth assumptions (Table 4). An explanation could be that forecasts are used as performance goals and thus are politically biased towards the desired level of output. Such a strategy is likely not conducive to effective budget planning and expenditure prioritization unless coupled with matching appropriations for contingencies.

Table 4. Macroeconomic Forecast: Bias and Uniform Use
(In percent of sample)

Not all agencies use the same macroeconomic forecast	18.2
Macroeconomic forecast has explicit bias	36.4
of which:	
Upwards	18.2
Downwards	18.2

Source: Authors' calculations.

Public access to macroeconomic assumptions in the revenue forecast is quite high. In all but one country, macroeconomic forecasts are made publicly available. Two-thirds of the countries publish the main macroeconomic assumptions as part of the budget document. In 12 percent of the countries, an agency outside the government is involved in the development of the macroeconomic forecast.

C. Who Does What in the Forecasting Process?

Responsibility for delivering the revenue forecasts falls in most countries under the jurisdiction of one single agency. In 95 percent of the sample this is the ministry of finance. Thus, one would assume that forecasting activities are a narrowly defined task, limited to a small number of players with limited outside interaction. This is not quite the case. While the final say on the revenue forecasts may lie with the ministry of finance, the actual forecast often involves a number of government agencies.

In more than one-third of the countries, several other government institutions are actively involved in the forecasting process (Table 5). These may involve bodies outside the ministry of finance, such as customs administrations, the social security administration, or extra budgetary funds (i.e., oil funds). Complex interactions within the government are quite common resulting in a forecast generated by a single agency in only 47 percent of the sample. Only in approximately a quarter of the countries is the number of persons involved in the forecast concentrated to five or less people.

Table 5. Organization of the Revenue Forecasting Process
(In percent of sample)

MOF responsible for revenue forecast	94.1
Forecasting produced by single agency	47.1
Nongovernment agencies participate in forecast	34.4
Five or less people in charge of revenue forecast	23.5
One uniform forecast produced	76.4

Source: Authors' calculations.

The relatively broad engagement of other government institutions is also reflected in the occurrence of multiple parallel revenue forecasts. About three-quarter of countries develop a single revenue forecast, while the remainder reports the existence of parallel or competing forecasts. At the end of the forecasting process, they are reconciled into one official forecast, either through arbitration or dominance by the government institution with the final say.

There is no discernible pattern by per capita income along these characteristics. On the whole, Western Hemisphere countries tend to produce more than one revenue forecasts in the preparation stage, and also involve outside agencies in this process.

How is the final forecast arrived at? In the majority of countries (64 percent), revenue forecasts are achieved through consensus among technical experts. However, a third (36.4 percent) of the surveyed countries report that significant discretionary adjustments are made to the forecast at the final stage. There appears to be no significant relationship between discretionary adjustments and the number of agencies involved in producing a forecast or the number of forecasts produced.

Table 6. Determination of the Final Forecast
(In percent of sample)

Significant discretionary adjustment of technical forecast	36.3
Revenue forecast adjusted due to expenditure pressures	...

Source: Authors' calculations.

Possible explanations for the large amount of interference in the forecasting process are that they help obscure governance problems, or set high performance targets. Another explanation is that forecasts are adjusted to make them compatible with otherwise inconsistent expenditure plans. Episodes of expenditure pressures have been reported for 22 percent of the countries. A systematic analysis of what determines forecasting interference is carried out in Danninger, Cangiano, and Kyobe (2004).

In sum, forecasting processes tend to be organizationally complex and quite frequently open to interference. The empirical section in Section IV condenses some of the organizational aspects of the forecasting process into an index of organizational simplicity and explores in more detail its determinants.

D. How and When Are Revenue Forecasts Done?

A budget circular is employed in the majority of countries (69 percent) as formal initiation of the revenue forecast. Only 50 percent of the countries in the sample follow up by formally documenting the initiated budget planning process. Even though formal rules and clear procedures could enhance the effectiveness and accuracy of the forecasting process, only higher income countries (37 percent), the majority of which are in the Western Hemisphere, outline the roles and responsibilities of various agents and agencies involved in the forecast.

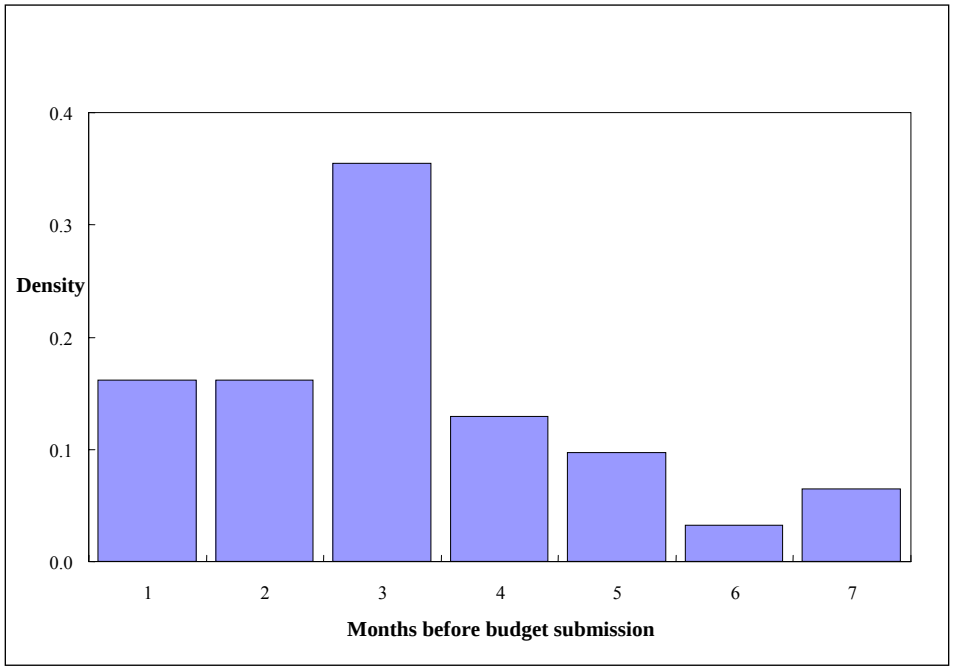
About 13 percent of the sample countries have neither a formal forecasting document, a formal initiation of the actual process, nor a formal documentation and revision of the forecast;[8] and 25 percent have only one formality aspect. Only one-fifth of the countries have all three of these components.

The lack of rigor in the forecasting process is reflected in the relatively delayed production schedule for the revenue forecast. In the majority of countries a first draft of the revenue forecast is only available three or less months before budget submission (Figure 2). This allows relatively little time for budget discussions, in particular if difficult decisions on prioritization of expenditures have to be taken. While an earlier budget envelope is thus desirable to allow meaningful budget negotiations, early forecasts are more likely to be error prone. The OECD has recommended a lead time for 6–8 months in transition countries to balance these rivaling objectives. In the sample of low-income countries, Western Hemisphere countries tend to have a longer lead time in the budget preparation process.[9]

[8] Lebanon, Armenia, Bangladesh, and Ghana.

[9] For a detailed analysis see Danninger, Cangiano, and Kyobe (2004).

Figure 2. Time When First Revenue Forecast Is Available



Source: Authors' calculations.

The formality of rules and regulations governing the revenue forecast differ widely across countries, though not by income differences, perhaps instead reflecting the mix of different legal systems, political ideologies and administrative needs (Table 7). Possible factors affecting formality are discussed at length in Section IV of this paper.

Table 7. Formality of the Forecast
(In percent of sample)

Forecasting responsibilities formally defined	36.6
Forecasting formally imitated	68.7
Formal revisions	64.7
Formal documentation	51.6

Source: Authors' calculations.

E. What Does the Public Know About the Revenue Forecast?

In the majority of countries very little information is available on the forecasting process. The availability of information or transparency of a revenue forecast is measured by the information content published in the budget: whether macroeconomic assumptions are published, whether or not outside agencies are involved in the process, and lastly, whether

there is supplementary information on forecasts outside the budget document (i.e., official gazette), and other aspects.

Revenue related information in the budget document is highly aggregated, most countries (82 percent) report an aggregate forecast for the most part, broken down into tax types. About 60 percent give information on past revenue outturns, with only 20 percent providing an analysis. Equally few countries provide a decomposition of revenue forecast into different sources. Macroeconomic assumptions are available in 55 percent of the sample. A small proportion of countries (34 percent) involve agencies outside the executive branch in the revenue forecast, with Western Hemisphere countries taking the lead. Only 28 percent of countries publish a formal and final revenue forecast outside the budget.

To summarize, out of the three indicators of transparency—informational content of the budget, whether macroeconomic assumptions are published outside the budget, and if outside agencies are involved—in two-thirds of the sampled countries, none or only one of these transparency criteria are met. The overall transparency of the revenue forecast is relatively poor with the exception of a small group of countries, mostly in the Western hemisphere that score very high on transparency, reflecting a regional emphasis on good budget management practices.

Table 8. Transparency of the Forecast
(In percent of sample)

Nongovernment agencies participate in forecast	34.4
Information published outside budget document	36.3

Source: Authors' calculations.

F. Data and Methods

Data and human capital constraints in a large number of countries result in the use of rudimentary and qualitative estimation techniques. About 85 percent of the sampled countries use subjective assessments and simple extrapolation techniques as the main methods for deriving budget revenue forecasts. Since econometric techniques require a wealth of reliable and relatively detailed data, they are only applied in a few countries (12.9 percent). The majority of countries with higher income also report that forecasts, are not adjusted in a discretionary manner.

Table 9. Data and Forecasting Methods
(In percent of sample)

Basic extrapolations main forecasting method	83.9
Use of econometric methods	12.9
Use of disaggregate data	20

Source: Authors' calculations.

There is little regional variation in the types of forecasting data and methods used. Tax revenue forecasts are primarily made on an aggregate basis (75–80 percent of countries). The majority of higher income countries use disaggregated data, as well as aggregate data, in forecasting tax base developments.

Data issues aside, using a qualitative approach is not necessarily suboptimal when economic conditions are volatile or frequent policy changes prevent the estimation of stable relationships between economic variables. In this case, a qualitative approach, for instance, through "expert briefings" of experienced staff, may lead to more reliable and accurate forecasts. That said, a qualitative forecast is also more vulnerable to discretionary adjustments, and can more easily be manipulated without being detected. This use of forecasting interference as a means to conceal governance problems has been explored in Danninger, Cangiano, and Kyobe (2004).

IV. THREE INDICES OF FORECASTING PRACTICES

The paper identifies and singles out three key elements of paramount importance to the revenue forecasting process: transparency, formality and organizational simplicity. Various aspects of these elements are investigated in the questionnaire through a series of questions. Responses are quantified and merged into an index that discerns between different levels of transparency, formality and simplicity.

The first index addresses the formality of the revenue forecasting process and more explicitly answers questions as to whether the forecast is formally defined, initiated, regularly reviewed, and documented. In addition, it looks at whether any formal forecasting methods are employed. Formality may be a function of different country ideologies—legal systems and administrative needs—reflected in regional or per capita income differences.

A second core aspect identified as being important is the simplicity of the forecasting process—how cohesive and centralized the organization of the forecasting process is. This aspect refers to the number of agencies involved in producing the revenue and macroforecasts and the number of competing forecasts produced. These aspects together have been condensed into an index that captures the organizational structure, ranging from simple to complex systems. A more complex system of forecasting involving multiple agencies or multiple forecasts may require the support of a formal system that puts in place rules and regulations that allow for effective coordination. Consequently, one would expect that there will be a positive correlation between simplicity and formality.

The last identified aspect of revenue forecasting is transparency. It measures whether or not any outside agencies are involved in the forecast, if macroeconomic assumptions have been made public, and the level of detail in the budget document. More detailed information could potentially bring about increased quality in data, and accountability in the budget forecasting process, putting a mechanism in place, which provides assurances for the public and other interested parties of revenue forecasting credibility. Transparency should result in increased accuracy and possibly a reduction in ad hoc or discretionary adjustments.

This section proceeds by discussing the definition and sample characteristics of these three indices.

A. Index of Formality

Formality is defined as the unweighted sum of four binary variables: (i) whether forecasting responsibility is formally defined; (ii) whether forecasting is formally initiated; (iii) formally revised; and (iv) formally documented. The index is linear additive and scores can range between 0 and 4.

Average sample responses are summarized in Table 10. A formal definition of responsibilities exists only in 36 percent of the countries. About two-thirds of countries formally initiate the annual budget revenue forecasting exercises (i.e., through circular). The forecasting process is formally documented in only half the sample. Within-year revisions of the revenue forecast (64 percent) are mostly carried out on an "as needed" basis (50 percent). And only about half of the countries revise the budget forecast (one-year ahead) in the course of the budget preparation.

B. Index of Organizational Simplicity

The index of simplicity is defined as the unweighted sum of three binary variables: (i) whether a single agency is responsible for the revenue forecast; (ii) whether a single agency is responsible for the macroeconomic forecast; and (iii) whether only one forecast is produced. The index is linear additive and scores can range between 0 and 3.

Sample responses of the three components are reported in Table 10. Roughly half (47.1 percent) of the countries put only one government agency in charge of the revenue forecast. This figure is slightly smaller for the macroeconomic forecast (44.1 percent). In most cases (76.5 percent), the government only produces one forecast and thus forgoes the option of competing forecasts.

The index of simplicity measures the number of agencies involved in the revenue and macroeconomic forecast, and the number of competing forecasts. The average score of the simplicity indicator is low, and none of the sampled countries receives a maximum score of three. About two-thirds of the sample meet only one characteristic and about 10 percent meet no simplicity aspect at all. Scores of the indicator do not differ significantly across regions or country income levels.[10]

[10] Based on F-test for group mean differences and t-test for spearman correlation coefficients.

Table 10. Sample Revenue Forecasting Characteristics

Variable description	Sample mean (In percent)	Significant regional variation /1	Significant variation by per capita income 2/
General			
One agency responsible for forecast	91.1	--	--
Macroeconomic forecast by one agency	44.1	--	--
Forecasting horizon one year	64.7	--	--
Budget forecast only covers central government	47.0	--	
Five or less people in charge of forecast	23.5	--	--
Methods			
Main forecasting method: basic extrapolations	83.9	--	--
Use of econometric methods	12.9	--	--
Use of disaggregate data	20.0	--	--
Formality			
Forecasting responsibilities formally defined	36.6	Yes 3/	--
Forecasting formally initiated	68.7	--	--
Formal revisions	64.7	Yes 3/	--
Formal documentation	51.6	--	--
Organization			
Forecasting produced by single agency	47.1	--	--
Only one uniform forecast produced	76.4	--	Positive
Macroforecast produced by single agency	44.1	--	--
Transparency			
Nongovernment agencies participate in forecast	34.4	--	Positive
Information published outside budget document	36.3	--	--
Informational content in budget document *of which*			
Aggregate revenue forecast	82.3	--	--
Breakdown of forecast into revenue types	85.3	--	--
Data on past revenue outturns	58.8	--	--
Analysis of past developments and forecasts	17.6	--	--
Summary of macroassumptions	55.9	--	--
Decomposition of forecast into various effects	20.6	--	--
Interference			
Significant discretionary adjustment of technical forecast	36.3	--	--

Source: Authors' calculations.
1/ F-test for group mean differences (10 percent significance).
2/ T-test for spearman correlation coefficient.
3/ High scores in Western Hemisphere countries.

C. Transparency Index of the Forecasting Process

Transparency is defined as a weighted sum of eight binary variables: (i) whether the macroeconomic assumptions are published outside budget; (ii) whether outside agencies participate in revenue forecast; and (iii)–(viii) what different revenue forecast related information was published in the budget document. Items (iii–viii) were given weights of one-sixth to give the aggregate information content in the budget document the same weight as the information items (i) and (ii).

A summary of results cataloguing the informational content of the budget can be found in Table 9. Most countries in the sample (82 percent) provide an aggregate breakdown of the revenue forecast into revenue types. Historical data on past revenue outturns is published in 59 percent of the sample, a summary of macroeconomic assumptions used is available in 60 percent of the sample, more analytic work is restricted to a few countries (18 percent) that provide an analysis of past forecasts and 20 percent that decompose the forecast into various effects. Surprisingly, these countries are not high income, thus there is no significant income or regional variation.

D. Determinants of Forecasting Practices

Linear regression analysis was used to identify factors that influence revenue forecasting practices. The analysis focused on several country characteristics: the level of corruption, the size of government measured by expenditures relative to GDP, per capita GDP, and population size. A high level of corruption may potentially reduce transparency and possibly limit formality. The size of the government may be indicative of a more developed government apparatus with higher incentives to effectively plan and formulate revenue forecasts. Conversely, a larger government may simply be the reflection of an inefficient bureaucracy reflected in a complex and intransparent revenue forecasting system, with multiple forecasts and agencies. Higher per capita income could be synonymous for greater human resources and technical capacities leading to more transparency, formality and complexity within a revenue forecasting system. Finally, particular characteristics of a revenue forecasting system could also be the result of specific regional differences in legacy systems of public expenditure management systems. Both a linear and convex functional form of the independent variable indices were tested. The findings are robust to this change in specification.

Results of these regressions are presented in Table 11. All reported results are robust to the inclusion of regional dummy variables. Not surprisingly, country corruption is found to have a negative effect on transparency consistent with its expected effect on accountability, in addition, it is negatively related to formality and simplicity.

Table 11. Characteristics of the Revenue Forecasting Process

	Formality	Simplicity	Transparency
Log(pop)	0.279	-0.184	0.486
	(0.58)	(1.11)	(2.38)*
Log GDP/pop	0.231	-0.004	0.135
	(0.57)	(0.03)	(0.92)
Corrupt 1/	-0.287	-0.327	-0.673
	(2.80)*	(0.90)	(2.21)*
Constant	-1.327	2.764	-2.911
	(0.34)	(1.99)	(1.87)
Observations	28	33	31
R-squared	0.06	0.09	0.36
	Formality	Simplicity	Transparency
Log(pop)	0.052	-0.218	0.440
	(0.10)	(1.02)	(1.62)
Log GDP/pop	0.421	0.072	0.306
	(1.31)	(0.59)	(2.25)*
EXP/GDP 2/	-0.069	0.003	-0.000
	(1.34)	(0.15)	(0.02)
Constant	0.549	2.240	-4.101
	(0.12)	(1.20)	(1.82)
Observations	24	28	26
R-squared	0.14	0.08	0.32
	Formality	Simplicity	Transparency
Log(pop)	0.381	-0.230	0.409
	(0.91)	(1.33)	(1.98)
Log GDP/pop	0.437	0.053	0.296
	(1.62)	(0.50)	(2.51)*
IMF10 year 3/	1.848	-0.078	0.077
	(2.22)*	(0.23)	(0.20)
Constant	-4.813	2.594	-3.837
	(1.35)	(1.72)	(2.28)*
Observations	29	34	32
R-squared	0.21	0.06	0.32

Source: Authors' calculations.
Absolute value of *t* statistics in parentheses.
* significant at 5 percent; ** significant at 1 percent.
1/ Corruption index, Kaufmann, Kraay, and Mastruzzi (2002).
2/ Government expenditure over GDP.
3/ Number of years country has been under IMF program during past five and ten years.

Per capita income has a positive, though not statistically significant relationship with all three variables. When using an exponential specification (not shown) of the independent variables, the significance level improves, with richer countries having a more formal (rule-based) and complex organizational structure. There is also some regional variation with countries from the Western Hemisphere exhibiting more formality (not shown). The size of the central government and the position of fiscal and debt sustainability measured by central government and interest expenditures to GDP respectively, are shown to have a slight negative, though not statistically significant effect on all three indicators, resulting in the tentative result that larger governments do not tend to be more accountable in budget planning.

Intensive IMF involvement in a country could also have an effect on the design of revenue forecasting practices. Technical assistance, as well as structural fiscal reforms, are often intensified during IMF programs. Program conditionality can relate to budget preparation and management practices, and thus influence the design of revenue forecasting processes. To gauge this effect, as well as to determine other factors that may help determine transparency, formality and simplicity, regressions have been run on all three indicators including an indicator for IMF involvement. The IMF program indicator measures the fraction of years a country has been under an IMF program during the last five and ten years respectively. To investigate this conjecture, a series of ordinary least squares (OLS) regressions on the three independent variables—transparency, formality, simplicity—controlling for the size of the population, GDP per capita, size of government, and level of corruption are ran.

The only statistically significant effect of the IMF involvement variable can be detected for formality, but when using the exponential form of the formality index this significance is reduced. Similarly, controlling for size of government and corruption this result is weakened. Thus tentatively, countries with longer IMF involvement have a more formalized forecasting process. Neither transparency, nor simplicity are affected by the IMF engagement variable.

V. CONCLUSIONS

The objective of this paper is to fill the information gap on comparable cross country data of the revenue forecasting process. Most countries score low on the quality of revenue forecasting practices if judged by basic standards. Very few countries have formal rules and regulations dictating the forecasting process, agencies' responsibilities are not well defined and for the most part estimation techniques are simple. In most countries forecasting involves several agencies with the lead being taken by the ministry of finance. Budget coverage is mixed, with the majority of countries focusing on central government activities and covering a one-year budgeting horizon. The public and other interested parties often know very little about the revenue forecasting process, and the overall level of transparency in the sample is low.

The paper more systematically identified and investigated three important characteristics of a revenue forecasting process: (i) formality, (ii) transparency, and (iii) organizational simplicity. This was done by synthesizing three indicator variables, which were then analyzed for possible determinants in a multivariate analysis framework .

Notably, the level of formality, transparency, and organizational simplicity of a revenue forecasting process do not differ significantly across regions or by income per capita, with the exception of a few countries in the Western Hemisphere, that have a high level of formality in their revenue forecasting process. High levels of corruption reduce both formality and transparency. Intensive IMF involvement in the past does not contribute to making revenue forecasting practices more transparent, but it does seem to increase the formality of a given revenue forecasting system.

Based on these findings a few preliminary conclusions can be drawn. Conditions for a desirable top-down budget preparation process do not seem in place in many low-income countries. The cross country evidence seems to indicate that streamlined procedures and greater transparency in the forecasting process may be important preconditions for an efficient budget planning process. In particular, broad political support for budget management reforms, as witnessed in several Latin American countries, are key however for establishing efficient revenue forecasting practices.

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