State Revenue Forecasts and Political Acceptance: The Value of Consensus Forecasting in the Budget Process

Concerns about political biases in state revenue forecasts, as well as insufficient evidence that complex forecasts outperform naive algorithms, have resulted in a nearly universal call for depoliticization of forecasting. This article discusses revenue forecasting in the broader context of the political budget process and highlights the importance of a forecast that is politically accepted—forecast accuracy is irrelevant if the budget process does not respect the forecast as a resource constraint. The authors provide a case illustration in Indiana by showing how the politicized process contributed to forecast acceptance in the state budget over several decades. They also present a counterfactual history of forecast errors that would have been produced by naive algorithms. In addition to showing that the Indiana process would have outperformed the naive approaches, the authors demonstrate that the path of naive forecast errors during recessions would be easily ignored by political actors.

Revenue forecasts play a critical role in the development of state budgets because they establish the resource baseline within which expenditure programs must fall if operations are to be executable and sustainable. As a result, many researchers have devoted attention to the revenue forecasting process and its outcomes along two dimensions. The first literature approaches the revenue forecast as a technical problem for which one process might outperform another, either through the use of qualified public employees or increasingly sophisticated methodological models. This literature has typically found little to no relationship between the sophistication of the revenue forecast methodology and its subsequent accuracy. The second dimension of the previous research is a political critique of the actors in the process and tests for corresponding systematic bias. This literature has generally found forecast errors to contain evidence of political bias and risk aversion stemming from political officials and the bureaucrats they influence. These dual findings generally motivate the recommendations for institutional reforms of the forecasting process toward simple “naive” forecast methods that would be no worse than more complex approaches in terms of forecast error but presumably would be free of ideological bias of the actors necessary in causal methods. This article argues that when the forecasting process is viewed in its full institutional context, as one step in a budgetary process devoted to the allocation of revenue, this emphasis on accuracy alone is insufficiently narrow.

Fiscal sustainability requires that state lawmakers have a baseline forecast of the amount of revenue expected during the budget period. The selection of this baseline figure is of direct importance to meeting the goals of the political actors involved, and subsequently, there exists an incentive for these actors to influence the forecast toward producing figures that favor their objectives. Some may wish to restrict the size of state government by choosing the most conservative forecast assumptions; others may select optimistic assumptions that make additional spending programs or tax cuts appear more affordable. In a rational model of the entire budget process, however, these biases should be anticipated and accounted for by the actors whose spending choices are informed by the forecast. For example, members of a legislature could reasonably infer that a governor who wants to cut spending might propose a budget built from more conservative forecast assumptions. Recent examples of these disputes during 2013 include New Jersey and California (Hamilton 2013; Megerian 2013).

An accurate and binding forecast serves fiscal sustainability by providing the hard budget constraint of resources available for allocation across public services without shifting the cost of programs to the future. An inaccurate forecast or a distrusted forecast both represent ways in which the forecast process can contribute to a violation of sustainability. These dueling concerns over accuracy and perceived biases potentially require a forecast process that finds the method of minimizing error that is accepted by the actors, perhaps even managing trade-offs between accuracy and acceptance. For instance, a highly sophisticated forecast model may provide an excellent
fit to the historical data, but it may also afford insiders the opportunity to employ model assumptions that suit a particular ideological preference in the forthcoming budget cycle. By contrast, a simple naive forecast that uses only the previous year’s actual collections is transparent and therefore hard to manipulate, but it also can produce predictable enough errors to generate additional debates over whether certain programs are truly “affordable” or not.

This article is the first to bring the concern for the political acceptance of revenue forecasting to the forefront. It proposes that forecasting must be observed and understood within the broader context of the budgeting deliberation, in which there are multiple points for various actors to resist within the original baseline values. It is conceivable that an independent and depoliticized forecast committee could produce widely accepted revenue projections, but we suggest that this is a hasty recommendation: a depoliticized forecast does not ensure that there are no political gains from criticizing and rejecting the forecast. We similarly argue that naive algorithms for producing forecasts, which may or may not improve upon causal forecasting approaches, are relatively easy for budget actors to reject on the occasions when doing so produces political gains. The absence of a human stakeholder without a reputational or political interest in defending the process causes the forecast to be a politically inexpensive and unresponsive target.

For purposes of concreteness, we demonstrate these points by employing the state of Indiana as a case study. Indiana’s budget process is reasonably representative of other states, involving deliberation within the legislature, between branches of government, and across competing political parties. Indiana is also interesting for the study of forecast acceptance because it has been recognized as having one of the nation’s most accurate forecasts and has a deliberately political consensus process. The next two sections expand our outline of the previous literature of state revenue forecasting and provide the appropriate background on Indiana. To advance the argument for a new research emphasis on political consensus and accuracy in forecasting, some have challenged this conceptualization as not being worth the effort. Kliesen and Thornton (2012) demonstrate that the deficit and debt projections prepared by the federal Congressional Budget Office are simply no better than a random walk forecast, that is, using last year’s actual as a forecast for the next year. At the state level, Thompson and Gates suggest, drawing on the literature of business and finance forecasts, the implementation of a simplified approach to identifying state revenue growth: “the simple average of past growth rates is the best estimator of expected growth rates” (2007, 826). In sum, important parts of the forecasting literature question the value added by attempting complex causal modeling of the variable to be forecast and propose that naive models do just as well, if not better, and are less prone to interference with the forecast result.

Much of the existing literature also reports evidence of systematic bias in revenue forecast errors. One common finding is that state revenue forecasters systematically bias their forecasts downward, and a considerable stock of the existing academic research assumes that forecasters deliberately guard against criticism from governors and legislatures by conservatively underforecasting. Forecasters generally work with a forecasting range (even if they do not provide that range in their presentations), and, as Rodgers and Joyce state, “It is seen as much too foolish to use the high-end forecast, risky to accept the best estimate forecast, and fiscally responsible to endorse the low-end forecast” (1996, 49). This underforecast is their finding for all states from 1975 through 1992. Feenberg et al. (1989) find similar underestimation in New Jersey, Massachusetts, and Maryland over the years from roughly the end of World War II to 1987. Heins (1975) finds a negative bias in forecasts over 58 years in nine states (Alabama, California, Delaware, Illinois, Indiana, New Jersey, New York, Rhode Island, and Wisconsin). Rose and Smith (2012) find underestimation in a 47-state panel over 1986–2007. Williams (2012), looking at the work of five different entities that

Previous Literature: Revenue Forecast Methods and Errors

The academic literature on state revenue forecasting has largely focused on an ex post analysis of forecast errors and the relationship
prepared forecasts for New York City in fiscal years 2003 through 2007, finds underforecasting that increases as the horizon extends further into the future for most revenue categories but overforecasting bias with the property tax. Krause, Lewis, and Douglas (2013) look at distinctions between legislative, executive, and independent commission estimates in states from 1987 to 2008 and find underforecasting in most states that is more pronounced when legislatures are divided on a partisan basis as opposed to unified party government. However, not all state-level studies find general underforecasting. For instance, Mocan and Azad (1995) find no systematic over- or underforecasting bias in legislative forecasts for 20 states over 1986–92. Similarly, Cooke and McIntosh (2011) attribute Idaho’s recent fiscal problems to overly optimistic general fund revenue forecasts. Boylan (2008) finds an important political influence: budgets in year ending right before an election or starting right before an election tend to be based on optimistic forecasts.

National government forecasts do not, however, follow the conservative forecast pattern generally claimed for the states. A recent study of official forecasts of real growth rates and budgetary balances among 33 countries finds systematic optimism bias (Frankel 2011). Similarly, Auerbach (1999) finds that forecasting performance by the Congressional Budget Office, the Office of Management and Budget, and a major private forecaster (Data Resources, Inc.) was generally of equal quality and showed no underlying bias in either direction. Blackley and DeBoer (1993) find no evidence of bias in federal Office of Management and Budget economic and revenue forecasts in the 1963–89 period (although underforecasting of outlays), leading to underprediction of deficits. In an investigation of 12 Organisation for Economic Co-operation and Development countries over 10 years in the late 1990s to the late 2000s, Buettner and Kauder (2009) find small errors, most often with slight underestimation. However, the accuracy depended significantly on the sheer number of taxes being levied and on the importance of income and corporate taxes in the total, both influences working to increase the error. Independence of the forecasting entity reduced the error rate.

There has also been great interest in identifying the role of political ideology, or perhaps direct political interference, as a source of forecast error. As stated by Cassidy, Kamlet, and Nagin, “as revenue forecasts are such an integral component of state and local government budgeting processes, any positive theory of resource allocation in this area of government would be seriously incomplete without an accompanying theory of revenue forecast behavior” (1989, 321). Studies find overforecasting in election years, underforecasting by governments from the Right and when there is a provincial antideficit law, and underforecasting when economic conditions are improving (Courture and Imbeau 2009); more accurate forecasts when those doing the forecasts are qualified to do the job (Krause, Lewis, and Douglas 2006); independent legislative forecasts improve accuracy (Breitneider and Gorr 1987); and a more negative forecast error when the state has a budget stabilization fund (Rose and Smith 2012). Shkurti and Winfoerdner (1989) describe an instance in Ohio in the late 1980s in which the competing political parties produced their own forecast estimates and accused one another of producing manipulated numbers that served their own political interests. Jonas, Rest, and Atkinson (1992) find that forecast errors in Virginia were more attributable to economic factors than poor forecasting, although much of the forecast was based on undocumented judgmental inputs. Krause and Douglas (2012) find that forecast error carries a quadratic effect with respect to political diversity on the consensus forecasting panel, suggesting that there can be both too much or too little comprehensive political inclusion involved with forecast accuracy.

In summary, the research record demonstrates evidence of systematically biased forecasting along political dimensions, as well as an absence of convincing proof that sophisticated methods that lack transparency are actually delivering reduced errors. Furthermore, conditional on political actors being involved with the forecast, their biases are attenuated when there are competing political ideologies involved. This article proposes the view that the forecast represents the beginning of a political bargain over what assumptions are to be used in determining the policies that will take place in the near-term budget cycle, and this suggests that the study of revenue forecasting must expand to include an understanding of what elements of the forecast process make its resulting output the accepted baseline from which these determinations are made.

State Revenue Forecasting Processes

This section summarizes, in general terms, the different organizational approaches employed by states to forecast revenue. State revenue forecast processes differ considerably in type and the extent to which they involve political actors in the budget process. Also, some forecast processes are implemented by state statute, while others are structured on the basis of informal agreement. As a matter of necessity, the choice of biennial or annual budgeting cycle directly affects the forecasting process by determining the frequency with which forecasts occur. Furthermore, state revenue forecasts tend to follow one of three general paths, and each is directly related to the overall structure of the corresponding process that the state uses to produce a budget.

1. **Both legislative and executive branch agencies independently prepare revenue forecasts.** Legislative forecasts may come from a legislative research agency or the staff of a legislative committee. Executive forecasts may come from the state budget agency or the state revenue department. Identifying a hard budget constraint for development of a sustainable budget can be complicated when there are multiple forecasts in the process. In Wisconsin, the Department of Revenue prepares a forecast for the governor’s use in developing the budget, and the Legislative Fiscal Bureau prepares a forecast for use by the Joint Committee on Finance as it reviews the budget. These entities cooperate, and there typically is little difference in their numbers. In another example, the New Jersey Department of Treasury and the Office of Legislative Services each does a forecast, and the differences between them have sometimes created considerable political tension.

2. **A state executive agency may prepare the revenue forecast.** For instance, the Idaho Division of Financial Management prepares the forecast of revenue in that state, the Office of Economic Analysis in
Table 1: Features of Consensus State Revenue Forecasting Entities

<table>
<thead>
<tr>
<th>State</th>
<th>Forecast Group</th>
<th>Forecast Committee Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connecticut</td>
<td>Office of Policy and Management and Office of Fiscal Analysis</td>
<td>35 members from academic and business community, executive branch, and legislature Three members from legislature (House, Senate, and joint Legislative Management Committee), one from governor's office</td>
</tr>
<tr>
<td>Delaware</td>
<td>Delaware Economic and Financial Advisory Council Revenue Estimating Conference</td>
<td>Seven members: three appointed by governor, two appointed by president of Senate, two appointed by speaker of the House</td>
</tr>
<tr>
<td>Hawaii</td>
<td>Council on State Revenues</td>
<td>Director of Tax Review from State Budget Agency, majority staff member from House Ways and Means Committee, majority staff member from Senate Finance Committee, minority staff member from House Ways and Means Committee, minority staff member from Senate Finance Committee, tax economist from state university</td>
</tr>
<tr>
<td>Indiana</td>
<td>Revenue Forecast Technical Committee</td>
<td>Governor (or designee), director of Legislative Services Agency, third person agreed to by other two members</td>
</tr>
<tr>
<td>Iowa</td>
<td>Revenue Estimating Conference</td>
<td>Representatives of Division of Budget, Department of Revenue, Legislative Research Department, and one consulting economist each from University of Kansas, Kansas State University, and Wichita State University</td>
</tr>
<tr>
<td>Kansas</td>
<td>Consensus Revenue Estimating Group</td>
<td>Economists (five to seven) jointly appointed by state budget director and Legislative Research Commission</td>
</tr>
<tr>
<td>Kentucky</td>
<td>Consensus Revenue Group</td>
<td>Governor, president of the Senate, speaker of the House, or their respective designees, and a faculty member with revenue forecasting expertise from private or public university in state selected by the other three principal members from a list of as many as five, but not less than three names, submitted to them by the Louisiana Higher Education Executive Advisory Council</td>
</tr>
<tr>
<td>Louisiana</td>
<td>Revenue Estimating Conference</td>
<td>Director of Bureau of Revenue Estimates, Deputy Comptroller, State Treasurer, Department of Budget and Management, Department of Transportation, and Office of Program Analysis of Department of Legislative Services</td>
</tr>
<tr>
<td>Maine</td>
<td>Consensus Economic Forecasting Commission (CEFC) and Revenue Forecasting Committee (RFC)</td>
<td>Governor, state tax assessor, state economist, university economist, director of Fiscal and Program Review Office</td>
</tr>
<tr>
<td>Maryland</td>
<td>Consensus Revenue Monitoring and Forecasting Group</td>
<td>Director of House Fiscal Agency, director of Senate Fiscal Agency, and director of Department of Management and Budget or state Treasurer</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>Secretary of Administration and Finance and House and Senate Committees on Ways and Means Group</td>
<td>Forecasts considered come from Department of Revenue and Massachusetts Taxpayers Foundation (private entity); hearings testimony from other interested parties</td>
</tr>
<tr>
<td>Michigan</td>
<td>Consensus Revenue Estimating Committee</td>
<td>Director of House Fiscal Agency, director of Senate Fiscal Agency, and director of Department of Management and Budget or state Treasurer</td>
</tr>
<tr>
<td>Missouri</td>
<td>Director of Revenue in consultation with Commission of Administration, State Treasurer, House and Senate appropriation staff, Division of Budget and Planning, University of Missouri staff</td>
<td>Five appointed by Legislative Council, four appointed by governor (start with independent forecasts from Department of Revenue and Legislative Fiscal Office). Members to have expertise in tax policy, economics, or economic forecasting</td>
</tr>
<tr>
<td>Nebraska</td>
<td>Nebraska Economic Forecasting Advisory Group</td>
<td>EF includes five members who cannot be state government employees including publicly supported institutions of higher education. Governor appoints all five, with Senate majority leader and speaker of Assembly each nominating one member for appointment. TAC includes Senate Fiscal Analyst, Assembly Fiscal Analyst, Chief of Budget Division of Department of Administration, Chief of Bureau of Research and Analysis in Department of Employment, Training, and Rehabilitation, vice chancellor for finance of university and community college system, state demographer, and chairman of Committee on Local Government Finance</td>
</tr>
<tr>
<td>Nevada</td>
<td>Economic Forum (EF) with Technical Advisory Committee (TAC) on Future State Revenues</td>
<td>Consensus forecast from Senate Finance Committee (majority and minority party representation), Assembly Ways and Means Committee (majority and minority party representation), and Budget Director.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Economists from Taxation and Revenue Department, Department of Finance and Administration, Legislative Finance Committee, Highway and Transportation Department</td>
<td>Budget Officer, Senate Fiscal Advisor, and House Fiscal Advisor One appointment by governor to chair, one appointment by chair of Senate Finance Committee, one appointment by House Ways and Means, and designated representative of Department of Revenue and Taxation</td>
</tr>
<tr>
<td>New York</td>
<td>Division of Budget Office of Fiscal Affairs, Assembly Ways and Means, Senate Finance</td>
<td>RAC includes economists from Office of Planning and Budget, Legislative Fiscal Analyst's Office, State Tax Commission, state agencies, and experts from academia and private sector</td>
</tr>
<tr>
<td>North Dakota</td>
<td>Executive Budget Office with tax and finance legislators, legislative fiscal office.</td>
<td></td>
</tr>
<tr>
<td>Rhode Island</td>
<td>Consensus Revenue Estimating Conference Board of Economic Advisors</td>
<td></td>
</tr>
<tr>
<td>South Carolina</td>
<td>Revenue Assumptions Committee provide inputs to economists in Legislative Fiscal Office, Office of Planning and Budget, and State Tax Commission</td>
<td></td>
</tr>
<tr>
<td>Vermont</td>
<td>Consensus Revenue Forecast adopted by Emergency Board</td>
<td></td>
</tr>
</tbody>
</table>
the Department of Administrative Services prepares the Oregon forecast, and the elected state comptroller prepares the Texas forecast. Rubin, Peters, and Mantell (1999) identify 23 states with single-agency revenue forecasting in their survey of state methods in the late 1990s.

3. A consensus approach of some variety. The National Association of State Budget Officers defines this approach as a “revenue projection developed in agreement through an official forecasting group representing both the executive and the legislative branches” (2008, 105). The underlying objective of the method is to produce a single forecast that emerges from cooperative work between legislative and executive branches, thereby producing a reliable and accepted budget constraint for development and adoption of state expenditure programs. Table 1 shows that some manner of executive–legislative consensus, including use of a formal consensus group in many states, produces the revenue forecast in slightly more than half the states. Qiao observes that states use this approach “in the hope of improved revenue forecast accuracy and providing the executive and legislative branches a common ground about the amount of revenue available for the budget” (2008, 394). However, the table shows great variation in the specifics of the process. The group size ranges from two or three principals in Connecticut and Iowa to 35 in Delaware, while some are indefinitely large in other states. For instance, Louisiana law establishes a Revenue Estimating Conference with voting members that include “the Governor, the president of the Senate, the speaker of the House of Representatives, or their respective representatives, and a faculty member with the revenue forecasting expertise from a public or private university in the state.” Michigan generates its forecast through a conference that includes the state budget director or the state treasurer (recently, the treasurer has been the executive representative), the director of the house fiscal agency, and the director of the senate fiscal agency (Ross 2001). But Kentucky forms its forecasting group entirely with professional economists appointed by the budget director and the Legislative Research Commission, and part of the Nevada structure requires that all appointees be from outside the public sector. The legislative representation comes sometimes from a nonpartisan legislative research organization or its appointees (e.g., Nebraska and Utah) and sometimes from the elected legislative leadership (e.g., Maryland and Maine). Only Indiana, Washington, and New York explicitly recognize potential political party differences by requiring representation from both political parties on the legislative side of the consensus group.

As described in the previous section, the structure of the forecast process has been an important source of exploitable variation for empirical research interested in testing hypothesized sources of forecast error. However, the heterogeneity of the forecast process is likely an emergent feature of the state’s institutional context rather than exogenous random variables and very likely serves as a source of simultaneous causation that could bias regression results.

The Indiana Forecast and Budget Process

According to a recent review by Boyd, Dadayan, and Ward (2011), Indiana managed to achieve a better than average level of forecasting accuracy over the 1987–2009 period, although, like all other states, it suffered considerable inaccuracy during the Great Recession. Indiana levies all three major taxes common to state tax systems (individual and corporate income taxes and retail sales tax), and the Indiana economy generally tracks the same economic cycles as the nation as a whole.

Figure 1 outlines the basic structure of the forecast process, and figure 2 demonstrates the position that the revenue forecast occupies in the larger budgeting system. For additional context, figure 3 merges certain elements of these first two figures to demonstrate the actors’ relationships in the overall budgeting process. The budget process in Indiana (figure 2), as it is in all states except Texas, consists of numerous exchanges between political parties and branches of government. The method of forecasting also follows a standard pattern for creating the revenue forecast: a national economic forecast drives a state economic forecast (figure 1). The state economic forecast then drives the forecast for individual state taxes, based on an econometrically derived relationship between elements of the state economy and each tax. These relationships are delivered
to the Indiana State Budget Committee, which produces the final numbers for all financial resources and produces a set of recommendations on spending that is informed by the State Budget Agency's review and analysis of programs that were requested by the various state agencies. The recommendations are delivered to the governor, but they are only recommendations, and the governor is under no obligation to accept any aspect of this initial budget report. The governor then delivers both a final budget report along with a proposed budget bill to the General Assembly, the items and appropriations of which are taken as the basis of debate in the House of Representatives. The House version of the bill is passed to the Senate for further debate and deliberation. After passing the Senate, the bill goes to a conference committee to reconcile differences between the House and Senate versions of the bill. Behind all legislative deliberations lurks the revenue forecast as a constraint on expenditures. The final bill is returned to the governor, who must either sign or veto the bill in its entirety. The initial revenue forecast that was originally produced by the forecast committee may be disregarded by any actor at any point in the budget deliberation process.
The RFTC is not a product of state statute, which is not especially unusual, considering that there are 15 states without a statutory assignment of forecasting responsibilities. Indiana state code (IC 2-5-1.1–8) requires only that the budget committee of the State Budget Agency be able to provide the legislative council an estimate of revenues and “any other data which will enhance an understanding of the fiscal affairs of the state.” Because the RFTC is an informal institution, there are no formal rules to the membership of the RFTC, but the practiced norm has been to include a representative from the State Budget Agency (the head of the Tax Review Office), House Republicans, House Democrats, Senate Republicans, and Senate Democrats, plus a tax economist from a state university as a completely neutral expert. This process for forecasting has been in place for about 35 years without significant change.

The affiliations of the members are representative of the groups that will be involved in writing the budget as it progresses through the legislative process. The tax economist, having been on the RFTC for more than three decades, serves to maintain consistency of process and anchor it to the most relevant academic evidence on tax systems and their forecasting. The members of the committee do not admit to any desire to manipulate the forecast, and they subsequently do not view the tax economist as a check on the process for that purpose. When originally formed, the appeal of having a university tax economist was that it granted them access to a computer that could be used to conduct the econometric analysis. More recently, the tax economist’s role shifted to suggesting alternatives for the budget agency to explore and then assisting the committee in selecting the final methodology to be adopted. Representatives from the legislature are staff of the Senate Finance and House Ways

The first element in the revenue forecast is an economic forecast. Originally, selected elements of the state and national macroeconomy were forecast by a group called the Economic Forecast Committee (EFC). The EFC was an ad hoc group of volunteers from private sector businesses and academic economists from around the state that prepared forecasts of key macroeconomic variables (gross domestic product, inflation, personal income, state personal income) for the upcoming two budget years. After many years of service, however, the regular contributors to the group retired, and no replacements were found. Since 2007, the economic forecast has been purchased from an outside consulting firm (IHS Global Insight). With that shift, many more macroeconomic variables have become available and are employed for driving the revenue equation. No formal rules, however, dictate that the macroeconomic forecast is separately produced from the Indiana revenue forecast, but that is the practiced norm. The budget for this purchase comes from the State Budget Agency.

The second and more critical component of the system is the Revenue Forecast Technical Committee (RFTC). The RFTC creates a methodology that translates the macroeconomic forecast into the revenue baseline in a transparent manner, and the RFTC operates under no constraints in regard to how it manages that process. The RFTC forecasts several tax components, including the general sales tax, individual income tax, corporate income tax, and revenues from gaming, to produce the total revenue forecast. The sales and individual income taxes are the most significant revenue contributors, representing more than 70 percent to 80 percent of the total revenues being forecasted.

Note: Solid arrows depict the same process relationship as in figure 2. Dashed arrows depict the source of appointed members (e.g., State Budget Committee members are appointed by the governor and each party within each chamber of the General Assembly).
and Means committees. This allows turnover of committee membership to be low because a change in political control of one house of the General Assembly does not mean that representation on the RFTC will change (four of the six members in 2013 had five or more years experience on the committee). The committee is also assisted by tax experts from the Legislative Services Agency and the Department of Revenue on an as-needed basis. The committee is expected to produce a methodology report that will provide step-by-step instructions for converting the macroeconomic forecasts into a revenue baseline for each major tax and for total general fund revenue.

The forecast is based on current law, but it also includes the estimated impact of any changes to law that will go into effect during the forecast period, even though the effect is not yet in the historical revenue stream. In the preparation of the methodology, the RFTC reviews the forecasting equations employed for the year and analyzes errors to determine to what extent they emerged because of problems with the revenue forecast model as opposed to random fluctuations from the macroeconomic forecast. The methodology is always reviewed, models are always reestimated, and macroeconomic drive variables are often changed. The methodology is expected to be agreed upon before the RFTC knows the macroeconomic forecast, further establishing independence between the two elements. The RFTC is not known for voting on anything, except sometimes the scheduling of future meetings.

Table 1 provides a brief summary of the revenue forecasting structure used by every state that employs a consensus forecast process. The Indiana process differs from that in most other states in two important respects. First, the RFTC, in addition to bringing executive and legislative branches together to create the forecast, directly guarantees that members of both the Republican and Democratic parties will be involved. Most states include representatives from both the executive and legislative branches in a consensus committee, but party only differs when there is division of control by the parties. After the 2012 elections, in 38 states, the same political party controlled both houses of the legislature as well as the governorship (Nelson 2012). In that environment, it is not hard to imagine that a legislative-executive consensus could be tinged with the political agenda of one party, which may be furthered by an artificially high or low forecast in the manner supported by the research of Krause, Lewis, and Douglas (2013). Second, the forecasting group does not merely bring together competing forecasts developed by the representatives on the committee but also involves the forecasting group in developing the methodology employed to create the forecast. In contrast, for instance, the Michigan process produces a consensus from alternative economic and revenue forecasts from the House Fiscal Agency, the Senate Fiscal Agency, and the state treasurer, with each independently developed. In Kentucky, the Governor’s Office of Policy Management applies its forecasting model to national and state economic forecasts and presents the results to a consensus group of economic advisors for review and revision. These approaches are considerably different from the development process of the Indiana system. Formally, it is the method employed to create the forecast that is the consensus reached by the Indiana RFTC rather than the value.

The methodology (the final equations developed to translate the macroeconomy into revenue flows) and the IHS Global Insight macroeconomic variables are provided on the State Budget Agency Web site, and a forecast accuracy report is published monthly. The RFTC faces no restrictions in regard to how it prepares its forecast, using any approach and/or variables to drive the forecast. The RFTC has a huge array of options at its disposal: economic variables used to drive the forecast, functional forms used for forecasting equations, lags in the link between economic and revenue variables in equations, number of years to use in developing the estimating equations, even whether to use extrapolation approaches rather than economic drive variables in the forecast. The sole expectation is that the forecast methodology will be presented to the State Budget Committee in a transparent fashion so that any interested party could replicate the methodology employed to produce the forecast.

Indiana is one of 19 states that operate on a biennial budget cycle (Snell 2011). In the legislative session of each odd-numbered year, a budget is adopted for the next two fiscal years. Therefore, in December of each even-numbered year, the RFTC prepares a revenue forecast for each of the next two fiscal years starting the next July—that is, the fiscal year that begins roughly six months ahead and the fiscal year beginning roughly 18 months ahead. This is the critical revenue forecast because it is the one on which the budget for both years is going to be developed, and hence it provides the hard budget constraint that is necessary for fiscal sustainability. There is an April update prepared in odd years, to provide the legislature one last view of revenue prospects for the budget biennium before appropriations are final, but the December forecast is the critical one because, by April, the General Assembly has completed most of the political bargaining, and major adjustments are not likely.

The RFTC also prepares a biennial forecast review in December of odd-numbered years. In this review, the committee considers execution of the biennial revenue forecast five months into the biennium. It adjusts its forecast if that seems appropriate, including reestimation of its forecasting equations, and presents the results of that execution review to the State Budget Committee. Usually, no actions are taken as a result of this report because appropriations for the full biennium are already in place.

To track forecast accuracy, the annual forecast is broken into monthly segments based on historical monthly flow profiles, and there is a monthly comparison of year-to-date actual revenues against revenue levels that would be consistent with meeting the annual forecast. The report is posted on the budget agency Web site, a news release is provided, and the news media report on the results when there are significant errors.

**Forecast Committee versus the Naive Approaches: Forecast Error as a Barrier to Acceptance**

One of the common recommendations from the literature on forecast accuracy emerges from the finding that, on average, “naive” forecast methods produce similarly accurate estimates as human-based committees. This section begins by comparing realized errors from the Indiana forecast committee with naive alternates and then maps out the evolution of the errors over business cycles for both approaches. It is argued that the predictability of the errors made by naive approaches represents a reasonable basis for political actors to ignore and disregard forecasts during the peaks and troughs of the business cycle.

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**State Revenue Forecasts and Political Acceptance: The Value of Consensus Forecasting in the Budget Process**

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In a review of all state revenue forecast errors by Boyd, Dadayan, and Ward (2011), the Indiana state forecast was found to be among the most accurate in the nation as measured by single-year forecast errors. As the authors of the study note, it is difficult to truly compare the accuracy of forecasts across states because states levy different taxes and operate in different economies. For the purpose of this article, we propose to infer the “value added” of the revenue forecast process in Indiana by comparing it against four alternative naive forecast models that can be created on simple decision rules. These models are often suggested by critics of contemporary forecast approaches using causal models and forecast committees.21

The analysis compares the actual Indiana forecasts against the forecasts that would have been produced from these alternative models, using exactly the data that would have been available when the revenue baseline would have been developed to guide the adoption of budgets. Because Indiana uses a biennial budget system, the primary test involves forecasts done for two budget years, one starting roughly six months after the date when the forecast is presented and one starting roughly 18 months after. This forecast date—December of even-numbered years—is just before the legislative session in which the biennial budget that would be based on that revenue would begin. This is the critical forecast time because this is the point at which the revenue baseline establishes the hard budget constraint for developing an executable budget and consideration of both the one-year-ahead and two-year-ahead forecasts prepared at that date provides the appropriate evaluation of the forecast for utility in the budget process. Reviewing a series of one-year-ahead forecasts, the standard approach used in the revenue forecast literature does not provide the appropriate test for biennial budget states.

Using $F$ to refer to the forecasted value, $A$ the actual value, and $t$ a time indicator, these four alternative models include the following:

1. Simple lag: the forecast is the most recently observed value.22
   \[ F_t = A_{t-1} \]

2. Trend: The forecast is based on a simple trend of the historically observed values.
   \[ F_t = \beta_0 + \beta_t t \]

3. Autoregressive model: The forecast is based on a time-series regression with an intercept and lagged dependent variable as the determining indicators.
   \[ F_t = \delta + \rho A_{t-1} \]

4. Exponential smoothing with trend: An exponential smoothing model that adjusts for a trend in the data. Here, $\alpha$ and $\beta$ represent smoothing parameters for the forecast error and trend estimate in the previous period.
   \[ F_t = FE_t + T_t \]
   \[ FE_t = \alpha A_{t-1} + (1 - \alpha)(F_{t-1} - A_{t-1}) \]
   \[ T_t = \beta (FE_t - FE_{t-1}) + (1 - \beta)(T_{t-1}) \]

In the autoregressive and trend forecast models, the coefficients ($\beta_0$, $\beta$, $\rho$, $\delta$) are estimated using linear regression techniques based on the historical data that were available at the time the state’s revenue forecast was performed. Likewise, the $\alpha$ and $\beta$ parameters in the exponential smoothing approach result from a calibration exercise in which all possible combinations from zero to one are used to predict over the contemporaneously appropriate historical data, and the parameters that provide the best historical fit are used to generate the forecast values.

The analysis compares the actual Indiana forecasts against the forecasts that would have been produced from these alternative models, using exactly the data that would have been available when the revenue baseline would have been developed to guide the adoption of budgets.

The analysis compares the actual Indiana forecasts against the forecasts that would have produced from these alternative models, using exactly the data that would have been available when the revenue baseline would have been developed to guide the adoption of budgets.

### Table 2

<table>
<thead>
<tr>
<th>Number of Forecasts</th>
<th>Forecast Outlook Length</th>
<th>State Forecast</th>
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<th>Trend</th>
<th>AR(1)</th>
<th>Exp Smooth w/Trend</th>
<th>Simple</th>
<th>Trend</th>
<th>AR(1)</th>
<th>Exp Smooth w/Trend</th>
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<td>6.3%</td>
<td>8.8%</td>
<td>0.9%</td>
<td>2.0%</td>
<td>1.8%</td>
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</tbody>
</table>

Note: “State Value Added over Naive” is calculated as $\text{MAPE}_{\text{State}} - \text{MAPE}_{\text{Naive}}$. 

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The tests that follow work with the first official biennium Indiana state forecast, which predicted fiscal years 1989 and 1990 using data from fiscal years 1978 to 1988.\(^{23}\) The forecast generates estimates for the future values of tax revenues from personal income, corporate income, sales, other revenues, and, by aggregation, it produces the total tax revenue. The forecast was extended to include the newly introduced revenues from gaming starting in fiscal year 2004. In each period, all methods have their parameter estimates updated with any new information that would have been available to the Indiana forecast committee at that time so that the information set is held constant in evaluating the error.

**Comparison of Forecast Accuracy**

The common measure of forecast error is the mean absolute percentage error (MAPE), computed for both one and two periods ahead:

\[
\text{MAPE} = \sum_{t=1}^{T} \left| \frac{F_t - A_t}{A_t} \right|
\]

Using actual observed revenues allows for all of the MAPE estimates to have the same denominator in all forecast methods.\(^{24}\) The one- and two-year MAPE statistics are calculated for the six revenue estimates for the five forecasts, for a total of 60 results reported in table 2. Also provided in table 2 is the difference in error of the naive method against the state forecast, (MAPE\text{naive} - MAPE\text{state}), which is referred to as the “value added” comparison. This calculation takes a positive value when the state’s MAPE is smaller than the naive alternative, giving rise to our normative interpretation of "positive value added."

First examining the absolute performances, one would expect forecasts for the second year of the biennium to tend to have larger MAPEs than their shorter, one-year counterpart. Among total revenues, all of the forecast methods have a MAPE under 10 percent for the one-year forecast, and only the simple forecast breaks above that level in the two-year forecast. The poorest-performing method is the simple look-back, whose MAPE is 9.5 percent for the one-year forecast and 13.3 percent for the two-year forecast. Within the different types of revenue sources, it is the sales tax that is broadly the easiest to predict, at least in terms of achieving low errors. Among the major broad-based taxes, the corporate income tax has the largest errors across all forecast approaches.

Our proposal is to consider the value added of the state revenue forecast committee in its ability to outperform the other naive methods. In terms of total revenue, the state forecast value added score for total revenue is positive against all other methods for both time horizons. The difference between the state revenue forecast and these naive approaches would imply that the value added of official forecast committee is in the neighborhood of 2.3 percent to 6 percent for the one-year forecast and 0.9 percent to 8.8 percent for the two-year forecast.

The total revenue forecast is arguably the most critical component because it represents the bottom line in terms of total available resources, but because revenues can be earmarked according to particular uses, it is worthwhile to examine the value added of these instruments as well. Among these different instruments, the state revenue forecast beats all other methods universally in predicting sales taxes. In the personal income tax, the revenue forecast only has a negative value added when compared to the trend’s forecast for two years ahead. For the corporate income tax, the revenue forecast is only outperformed by the simple and autoregressive forecasts in the two-year-ahead outlook. The simple forecast at two years ahead is the only instance in which the state forecast provided negative value added for gaming revenue, although this is a relatively new revenue instrument. For the remaining miscellaneous revenues agglomerated into the “Other” revenue category, both the one- and two-year state revenue forecasts hold the median MAPEs in the middle of the road relative to the other approaches.

In summary, an ex post evaluation of the MAPE statistics does not indicate that any other naive forecast approach would systematically outperform, or even match the performance of, that of the state revenue forecast committee. By this metric, the committee adds value in technical accuracy to the budget process beyond what a naive approach could provide state legislators.

**Forecast Bias**

The previous literature has suggested that particular biases may exist that incentivize forecast committees to over- or underforecast revenues and that this may be attributable to risk aversion arising from a principal–agent problem or from ideological bias. It is worthwhile, once again, to consider the official revenue forecast in this dimension and compare it to the naive approaches. A state that presumably had unexpected good or bad fortune relative to their historical performance may arbitrarily imply a positive or negative forecast bias, so, once again, comparison against the naive approaches provides a reasonable basis for value added. To evaluate this consideration, the mean percentage error (MPE) is computed for each of the two forecast periods to depict the level of bias:

\[
\text{MPE} = \sum_{t=1}^{T} \frac{F_t - A_t}{A_t}
\]

If revenues are routinely underforecasted, then the actual realized revenues will be greater than the forecasted values, and the MPE will become negative.\(^{25}\) Routinely overforecasting revenues would imply positive MPE statistics, with a bias-free forecast being one that approaches zero. For the state forecast’s value added, we calculate the difference of the MPE’s absolute value from that of the naive method.\(^{26}\) A positive value added outcome under this calculation occurs when the state’s forecast carries a MPE that is closer to zero than the naive counterpart, and, as a result, it embeds a normative assumption that overforecasting is no better, or worse, than underforecasting.

Table 3 indicates that the one-year forecast of the state was nearly zero in the MPE for the one-year forecast and slightly underforecasted revenues at two years with an MPE of –0.6 percent.\(^{27}\) In addition to the MPE values, the individual forecast values tend to be as likely to be positive as they are negative. The individual total revenue forecast errors by the state were nearly evenly split between over- and underestimates, with 12 of the 23 periods forecasting less revenue than actually realized (not shown in the table). The simple look-back forecast was the only one-year MPE that underforecasted, whereas underforecasting was
behavior of the forecasters or an artifact of the state’s recent history of business cycles. Looking at total revenues, the ability to provide a relatively unbiased forecast is indicated by a positive value added against the naive alternatives, with the lone exception being the AR(1) model’s two year-forecast, which was relatively less biased by –0.2 percentage points. The pattern generally holds out across the subcategories, as there does not seem to be any approach on any particular revenue source that can provide relatively less bias than that of the state’s forecast.

Accepting Naive Models

The analysis of Table 3 shows no evidence of a systematic bias in the state revenue forecast, nor is a bias reliably produced in any of the naive methods. Figure 4 provides a graphical comparison of the best-performing naive forecast (the autoregressive model) against the RFTC forecast and the actual collections, providing a more comprehensive look at the nature of the forecast errors than what might be ascertained from the MAPE. During the expansionary period of the mid- to late 1990s, the RFTC tended to slightly underestimate the actual revenue collected, while it tended to overestimate collections in contractionary periods surrounding recessions. While both forecasts miss the recessions and subsequently produce large errors, the naive approaches tend to follow these dips and spread them into future periods, whereas the technical committee accommodates them into their statistical model for the recovery period. This is likely a significant aspect of forecast adoption into the budget constraint, as a naive lag model would be predictably low in the aftermath of a recession, and it would be reasonable for elected representatives to ignore it for their own individual estimates of what revenues will actually exist. In other words, it is reasonable in volatile times for the participants in the budget process to distrust the forecasts produced by naive methods.

Figure 4 Total Indiana Tax Revenue: Comparison of Forecasts vs. Actuals

One of the advantages of these comparisons in Table 3 is that they should be indicative of whether systematic biases are the result of the behavior of the forecasters or an artifact of the state’s recent history of business cycles. Looking at total revenues, the ability to provide a relatively unbiased forecast is indicated by a positive value added against the naive alternatives, with the lone exception being the AR(1) model’s two year-forecast, which was relatively less biased by –0.2 percentage points. The pattern generally holds out across the subcategories, as there does not seem to be any approach on any particular revenue source that can provide relatively less bias than that of the state’s forecast.

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Table 3 MPE by Revenue Source and Forecast Method

<table>
<thead>
<tr>
<th>Number of Forecast</th>
<th>Forecast Outlook</th>
<th>State Forecast</th>
<th>Mean Percent Error</th>
<th>State Value-Added Over Naïve</th>
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<tr>
<td></td>
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<td>Trend</td>
</tr>
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</tr>
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<td>12 One-Year</td>
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<td>–14.9%</td>
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<td>–13.3%</td>
<td>–2.5%</td>
<td>–0.4%</td>
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</tbody>
</table>

Note: State value added is calculated as |MAPE_{state} – |MAPE_{naive} |.
Accuracy of the forecast matters for development of a fiscally sustainable budget and is a test of the forecast itself. However, acceptance of the fiscal baseline is the test of the forecast process, just as accuracy is critical for the fiscal baseline.

The Role of Politics in Producing Acceptable Forecasts

The “acceptance” of the revenue forecast is somewhat more difficult to gauge than the value added measures already proposed, but we consider it here to mean that the budget debates do not include a debate over the available resources through the interjection of competing forecasts. Exploring the political history of the RFTC, both in the immediate lead-up to its founding and during the challenges to its legitimacy, provides some evidence of the importance of forecast acceptance and the role that politics may play in obtaining this acceptance.28

The Indiana process emerged in the mid-1970s after a legislative session in which the governor and the General Assembly could not agree on a revenue baseline and, as a result, spent much of the legislative session arguing about how much revenue the state might collect during the budget biennium rather than making decisions about policies and resource allocation. The governor used one revenue baseline, the Republicans in the General Assembly used a different one, and the Democrats used yet another. Indeed, there were even disagreements between the houses of the same party. After the session ended, all parties to the process came to the realization that the forecast should not be a policy question and that policy discussions would be improved if all budget participants worked from a single forecast.

The process installed then, by agreement and not by statute, seeks to produce an accepted forecast that neutralizes political influences (both real and accused) on the forecast result by involving all branches and both political parties. This creates checks and balances in the system and incentivizes the forecast to be as accurate as possible. It is a scheme designed for maximum internal control over the forecast and, as it has turned out, rather than engendering a climate of suspicion and eternal vigilance for transgressions by other committee members, it has arguably produced a common quest for accuracy. Furthermore, any lawmaker inclined to use a revenue baseline other than the one coming from the RFTC would be confronted by a member of his or her own party because representation from the party was involved in the forecast process. As a process originating from political mistrust, the RFTC’s structure manages a balanced process that strives toward both forecast accuracy and acceptance in the budget process. No branch of state government nor any political party (should one party control all branches of government) can easily manipulate the forecast for political gain. The process as initially created hinges on balancing all countervailing interests to produce an untainted forecast.

Acceptance of the forecast as a hard budget constraint, even when it turns out to be inaccurate, is an important juncture in the budgeting process. The business of making policy choices among public programs cannot easily proceed if the legislature cannot initially agree on the baseline fiscal constraint. Accuracy of the forecast matters for development of a fiscally sustainable budget and is a test of the forecast itself. However, acceptance of the fiscal baseline is the test of the forecast process, just as accuracy is critical for the fiscal baseline.

But there have been two episodes when forecast acceptance was threatened. In the first years of the twenty-first century, an auditor of state became exasperated with the official forecast (she was responsible for presenting a cash budget for the state and used a forecast in that work but was not part of the process of preparing or adopting the state budget) and threatened to do her own forecast. While she did issue an independent statement of monthly revenues, she did not carry through with generating her own forecasts and instead continued to use the RFTC forecast.

The more significant challenge to the constraint of the consensus forecast came during the depths of the recent Great Recession, and it reveals an important advantage of political appointments involved with the process. Year-to-date actual collections lagged far behind forecasted collections through 2008 and 2009, requiring that the governor make significant impoundments of state appropriations. As the appropriations for a new biennium were being considered during the spring of 2009, there was continuing concern about the accuracy of the revenue forecast because of the recent history. As the session continued, the governor began preparations to produce his own forecast (much lower than the forecast prepared by the RFTC), using advisors outside the consensus process and without any input from the legislature (or from the State Budget Agency representative on the RFTC). Ultimately, the governor and legislative leaders “agreed on commissioning the new ‘realistic’ forecast [from the RFTC] as part of a broader special budget process preceding the special session [held because the upcoming biennial budget had not been adopted before the legally required end to the legislative session]” (Feigenbaum 2009a). In practice, the RFTC continued with its methodology but changed the macroeconomic indicators from Global Insight being employed as the basis of the economic forecast. Because many of these variables are highly correlated with one another, this change was largely superficial but apparently politically satisfying, as the new forecasted values were once again incorporated into the state budget as developed in the special session.

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The composition of the RFTC was critical in this preservation of the forecast process during the governor’s challenge. Not only did legislative and executive branch appointees argue for the process with those who had appointed them, they also worked through the channels of the two political parties to maintain support. Thus, it was not just through the organizational structure of government that the forecast process was maintained, it was also through the political parties.29 Much of the case invoked the need to avoid the deliberative anarchy that had prevailed prior to the existing process. Even if a naive forecast approach had produced identical numbers and history of accuracy to that of the RFTC, it would lack any institutional stakeholder to support it through the political parties, and it would not seem likely to have been effective if it were to have come from a nonpartisan research office or consulting group.

During the Great Recession, the governor continued to use these RFTC’s monthly reports as the basis for expenditure impoundments across state government. Since the errors of the Great Recession, the RFTC has also conducted a quarterly review of its forecasts, focusing on economic developments that might require a formal revision of its methodology and its forecast. However, there have been no significant revisions from these reviews.

In sum, the process develops a consensus forecast from a scheme involving all fiscal parties. The process institutionalizes countervailing interests—between legislative and executive branches and between the two political parties in Indiana state government—to prevent organized manipulation of the forecast. By forestalling manipulation, the strongest incentive among the actors in the process is the pursuit of accuracy, the first test of revenue forecasting. But the process, by ensuring inclusion of all these interests, creates the basis for acceptance of the forecast as the binding baseline for the budget process.

Evidence from business forecasting shows that what is called “team-based forecasting,” a rough equivalent of Indiana consensus forecasting, in addition to improving forecast accuracy, also leaves managers more satisfied with the forecasts (Kahn and Mentzer 1994). As more actors are satisfied with a forecast, the more likely it is that the actors will operate within that forecast. In public sector terms, the actors are more likely to regard the forecast as binding. Evidence shows that the naive forecasts proved no more accurate than those from the RFTC. Indeed, most such approaches were less accurate. However, the big question for the alternative approaches is whether naive forecasts would be accepted as a hard budget constraint, given that they would be destined for similar periodic inaccuracy without the benefit of political stakeholders to ensure acceptance during the budget process.

Conclusion and Directions for Further Research

The literature on public revenue forecasting has a diversity of results on the role of political incentives that might explain forecast error and bias. This article has argued the forecast should be viewed in the context of the entire public budget deliberation process, with the recognition of potential for political manipulation and political gains for accusing the forecast of bias. In this broader view, it becomes clear that the organization of forecast committees and the methods they employ must be understood for their ability to gain acceptance. In doing so, this article redirects the literature to understanding the forecast acceptance as an important institutional objective that can be as significant as the forecast outcome. An accurate forecast is of no value in the budget process if process participants ignore it as they develop the expenditure program. Policy recommendations that have emerged from the research on political bias in the forecasting process treat the structure of forecast committees as exogenous variation and universally recommend approaches to depoliticization. For instance, Boyd, Dadayan, and Ward summarize the literature in stating that consensus forecasting processes seek “to remove politics from the estimating process as much as possible to limit lawmakers’ attempts, especially in election years, to present a rosier view of revenue” (2011, 974). These recommendations may produce gains in accuracy but also may forgo acceptance by the budget actors by neglecting the broader political budgeting process.

To demonstrate the importance of forecast acceptability, this article examined the forecast errors and political history of revenue forecasting in Indiana. Indiana is particularly interesting because its forecasts have been recognized as generally accurate, and the process is explicitly politicized. In stark contrast to the recommendations to depoliticize, the Indiana process explicitly brings political differences into the forecasting methodology. Interestingly, this is different from the “consensus” forecasts generated by more than one branch of state government that has been the focus of previous research. The legislature is not represented in the process by a nonpartisan research body, as is the case in some consensus states, but rather by majority party and minority party staff from the fiscal committees of each house. In an era of single-party statehouses, such explicit politicization and guaranteed representation from both political parties may be the best approach to inducing forecast accuracy, considerably more relevant than the standard legislative–executive consensus, and will be more likely to produce a controlling revenue forecast. Such an observation would be consistent with other recent empirical work by Krause and Melusky (2012), which demonstrates that unilateral executive authority over revenue forecasts or budget formulation results in fiscal spending growth patterns that are consistent with the respective party’s political ideology.

The Indiana consensus forecast record emerges from its utilization of countervailing interests that balance to make accuracy a primary objective and contribute to making the forecast, right or wrong, accepted in the budget process. The process puts executive and legislative branches and political parties in countervailing positions. Neither the legislative nor the executive branch can implement a fiscal strategy of constraint or expansion by intentionally over- or underforecasting revenue in the forecast deliberations because both branches are in the process. The legislature is represented in the consensus process by fiscal staff from the two political parties. In sum, the countervailing process balances executive and legislative bias, as well as political party bias, to create a common objective of forecast accuracy. All parties—political, legislative, and executive—have been included in producing the forecast and, accordingly, have a stake in its acceptance. A naive forecast structure (and there are multiple possible naive methods,
with no a priori way of selected from among them) has no way of marshaling countervailing forces into the forecasting process and creates no environment in which budget participants might feel allegiance to the forecast that is expected to be binding.

We do not suggest that the outcomes of the Indiana forecasting process necessarily translate to other states, but we do suggest that observing the Indiana history is illustrative of a broader need to shift the emphasis of the academic literature on revenue forecasting. In particular, an emphasis that views the forecast as a stage of the budget facing the public administration problem of institutional trust is necessary. It may be the case that adding political diversity not only improves forecast quality, as has been found in previous research, but also systematically facilitates forecast acceptance. It is also possible that political diversity is not the only mechanism that can result in acceptability. The point is that acceptance is a vital component of the forecasting process, and future research should relate how differences in the structure of the budgeting process inform which revenue forecast processes become politically acceptable, as well as how they induce forecast acceptance. This article drew on an analytical narrative from media reports around the forecasting process and interviews with forecast members to determine the extent to which the forecast numbers were accepted. Alternative approaches, particularly ones that determine forecast acceptability using a quantitative approach, would be of considerable interest.

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Notes
1. A recent review of this literature on state revenue forecasting techniques and accuracy is found in Boyd, Dadayan, and Ward (2011).
2. Our judgment is that most of this literature is found in economics and finance journals, but political science and public administration have long articulated a larger and more nuanced view of the interactions between political actors and public bureaucrats (e.g., Falaschetti and Miller 2001; Lewis 2003; Moe 1989). This latter, albeit smaller, literature that has been applied to state revenue forecasts generally finds that, conditional on having politics involved with the revenue forecast process, it is better to be politically diverse (e.g., Deschamps 2004; Klay 1985; Krause, Lewis, and Douglas 2006, 2013; Smith 2007; Voorhees 2004).
3. Grizzle and Klay (1994) raised the issue of the relative utility of different quantitative methods, in regard to the cost of econometric causal modeling and its relative accuracy, in state revenue forecasts in the mid-1990s. Lower costs of data management and analytic technology make some of this of lesser concern now.
4. For examples, see Makridakis and Hibon (1979).
5. General macroeconomic forecasting is not without its challenges as well. Faust and Wright (2007) test the accuracy of gross domestic product (GDP) forecasts and find that a simple univariate autoregressive forecast (forecasting GDP growth by regressing growth against four lagged periods of growth) is as accurate as substantially more complicated models.
6. This observation is somewhat confounded by the fact that the Congressional Budget Office is charged with forecasting revenues under the existing baseline, and that baseline may deviate on the basis of expenditure decisions made by Congress and the president.
7. Danninger, Cangiano, and Kyobe (2005) suggest that interference to reduce revenue forecasts provides governments of low-income countries greater capacity to extract resources (i.e., steal them) without being noticed. That is not likely an issue for American states.
8. Revenue forecasting (or preparing the revenue baseline) is distinct from revenue estimating or scoring the impact of proposed changes in the revenue system (Mikesell 2012). The revenue estimators may be in either the executive (budget agency, department of revenue, etc.) or the legislative (legislative service agency) branch of government.
9. Pennsylvania follows a different path from the other states: its revenue forecasts are prepared in its Independent Fiscal Office, an entity not connected with either the legislative or executive branch of government.
10. For instance, the California Legislative Analyst’s Office forecast $5 billion less for fiscal 2013 than did the governor—out of a $92.5 billion budget (Buchanan 2012). In such a case, it is not simple to know what amount is available for appropriation.
11. The forecasts are developed independently, but they usually have proven to produce similar totals (Niederjohn 2004).
12. The governor described the legislature’s analyst as “Dr. Kevorkian” for producing forecasts not to his liking (Hamilton 2013).
13. Louisiana Revised Statutes (Title 39:26).
14. The Indiana approach is described in greater detail in Mikesell (2008).
15. Manufacturing is the largest single contributor to gross domestic product in Indiana, and the state economy has historically been extremely sensitive to fluctuations in national economic activity.
16. The states without a binding revenue forecast process covered by state statute include Alaska, Arizona, Colorado, Delaware, Georgia, Indiana, Montana, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Texas, Utah, Vermont, West Virginia, and Wyoming.
17. This summary is according to comments from the tax economist.
18. For example, when the RFTC prepared its forecast for the 2014–16 budget biennium in December 2012, it included the impact of a use tax collection agreement reached with Amazon.com that would take effect in calendar year 2014.
19. Of course, it is almost certain that the members of the committee are aware of what the approved method implies for the forecasted amount of revenue.
20. Research that ignores the distinction between biennial and annual budget processes by using only the revenue forecast prepared just before the start of each budget year in judging the accuracy of the revenue forecast misses an important detail of the budget process. In biennial budget states, it is the two-year revenue forecast prepared before the budget adoption session that matters for development of a useful hard budget constraint.
21. According to Medetsky (2012), the Russian Federation collects half its revenue from oil exports and recently sought a “precise mathematical formula” to estimate oil prices. The Ministry of Finance proposes to use the median price of oil for the past 10 years to “avoid personal judgment … and make it more solid.” The 2013 budget would be based on five years, and the horizon would increase by one year each year until it reaches 10 years.
22. Although a frequently suggested naïve model, the simple lag can be a limited operational option because budgets get developed, considered, and enacted before actual revenue for the prior year is known.
23. The Indiana official forecast predates this time period, but the data for prior years seem to be lost. Data used in this analysis were generously provided by the state Department of Revenue (for earlier years) and from postings to the
24. In the computation of MPE and MAPE, it is important that $A_j$ rather than $F_j$ be used in the denominator. Although some previous research has reversed this scaling of the error, this causes these two measures to become nonlinear functions of the forecast, which can be seen by taking the partial derivative of the formulas with respect to $F_j$.

25. This is not equivalent in nature to the previous value added statistic that was the difference in the mean absolute percentage errors. For any two functions, $f$ and $g$, there are only special circumstances in which $f(g(x))$ is equal to $g(f(x))$.

26. To be clear, it is not the case that the time trend or the AR(1) regression–based forecasting would necessarily produce a mean error of zero because each forecast is an out-of-sample prediction based on the historical data available at the time the forecast would have occurred.

28. This section is primarily based on discussions the authors had with current and past members of the RFTC.

29. According to the university tax economist serving on the RFTC, he may have played some role in assisting with the accuracy of the forecast, but he played no role in preserving the acceptance of the forecast process in delivering a hard budget constraint.

References


