Revenue Forecasting Practices: Differences across Countries and Consequences for Forecasting Performance

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Abstract

This paper reviews the practice and performance of revenue forecasting in selected OECD countries. While the mean forecast errors are small in most countries, the precision of the forecasts measured by the standard deviation of the forecast error differs substantially across countries. Based on a comparison of forecasting practices we show that these differences can be attributed to a large part to differences in the timing of the forecasts and in the tax structure. In addition, we find some evidence that differences in methods and institutions also matter for the forecasting precision. In particular, we find that the use of macroeconomic models as well as the independence of revenue forecasting are associated with a lower standard deviation of the forecast error.

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Keywords: revenue forecasting, international comparison, OECD countries, forecast error.

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1 Introduction

Revenue forecasting is an essential part of budgeting in the public sector and, hence, all countries make some efforts to obtain reliable figures for the expected revenues. Of course, preparing revenue forecasts is associated with some uncertainties, such as macroeconomic risks or uncertainties about the tax law and its enforcement. Furthermore, there are changes in tax laws and structural changes in the economy that make forecasting even more difficult. Another possible uncertainty lies in repercussions of the revenue developments on public spending and the associated macroeconomic consequences. Although these challenges are faced by forecasters in all countries, there are significant differences in the practice of revenue forecasting. Not only are there differences in methodologies used. The countries also show important differences in the institutional aspects of revenue forecasting. In several countries the government is directly in charge, other countries assign the forecasting task to research institutes, and emphasize the independence of forecasting. This raises the question of whether the forecasting performance is affected by the different practices and methodologies involved. Moreover, given the efforts that some countries devote to ensuring independence from possible government manipulation, it would be interesting to know whether this independence has a noticeable impact on the quality of the forecasts.

The performance of revenue forecasting and its possible determinants including institutional aspects have been explored in the literature in different directions (for a recent survey see Leal, Perez, Tujula, and Vidal, 2008). Revenue forecasting has received most attention in the context of US states' revenue forecasts. Feenberg, Gentry, Gilroy, and Rosen (1989), for instance, provide evidence that state revenue forecasts are biased downwards. More recently, Boylan (2008) finds evidence for biases associated with the electoral cycle. Bretschneider, Gorr, Grizzle, and Klay (1989) focus on the accuracy of revenue forecasts and find that accuracy is higher in US states with competing forecasts from executive and legislative branches. Moreover, Krause, Lewis, and Douglas (2006) provide some evidence that the accuracy of states' revenue fund estimates depend systematically on the staffing of the revenue forecasting teams. As Bretschneider *et al.* note, however, the design of US state governments has specific features such as balanced–budget rules and a rivalry between executive and legislative branches of government which may explain some of these results.

International comparisons have mainly centered around the broader issue of budget and deficit forecasting. Recently, the relative performance of deficit forecasts among the EU countries has been examined in the context of the Stability and Growth Pact. Jonung and Larch (2006), for instance, have discussed the political biases in the output forecasts used for deficit projections. International comparisons concerned with the more narrow issue of revenue forecasting, however, focus on developing countries (*e.g.*, Kyobe and Danninger, 2005) where institutions relevant for revenue forecasting are underdeveloped (Danninger, 2005).

Against this background this paper provides an analysis of the performance of revenue forecasting and its determinants among twelve OECD countries. The selection of countries aims at capturing the seven largest OECD economies (United States, Japan, Germany, Italy, UK, France, and Canada). Some further countries were added where detailed information about revenue forecasting was available. This includes selected countries in Western Europe (Austria, Belgium, Ireland, Netherlands) and New Zealand.

What turns out is that the cross-country differences in the performance of revenue forecasting are to some extent driven by country characteristics such as the tax structure both in terms of the sheer number of taxes as well as with regard to the importance of corporation and income taxes. Also differences in the timing of the forecasts prove important. Controlling for these differences we also find that the precision of revenue forecasting increases with the independence of forecasts from possible government manipulation and if the revenue forecast is embedded in a macroeconomic model.

The following section presents some descriptive statistics on the performance of revenue forecasting in the sample of OECD countries. Section 3 provides a brief overview on the different conditions that forecasters face in these countries. Section 4 gives a short account of the forecasting methodologies used in the various countries. Section 5 provides an overview of the institutional aspects of the forecasting task among the selected OECD countries and sets up a simple indicator of the independence of revenue forecasting. Section 6 presents empirical evidence on the determinants of forecasting performance. Section 7 provides our conclusions.

2 Forecasting Performance

A common way to assess the quality of revenue forecasts is to consider the prediction error, that is the difference between predicted and realized revenues. A smaller prediction error is then usually regarded as a better forecast quality. However, it should be noted that revenue forecasts are basically used to indicate the revenue constraint that needs to be taken into account in the preparation of the public budget. Often, the budget will include expenditures that have a direct or indirect effect on tax revenues. While foreseeing these implications might result in a smaller forecast error, it is not clear whether this constitutes an improvement of a forecast that basically aims at providing the policy maker with information about the revenue constraint. In the discussion of the revisions of US revenue forecasts, therefore, policy changes are distinguished from (macro-)economic and so-called technical sources (Auerbach, 1999) of forecast errors, where the latter may refer to tax administration or evasion, for instance. However, for most countries a decomposition is not available. Therefore, the quantitative analysis presented below is based on the overall forecast error.

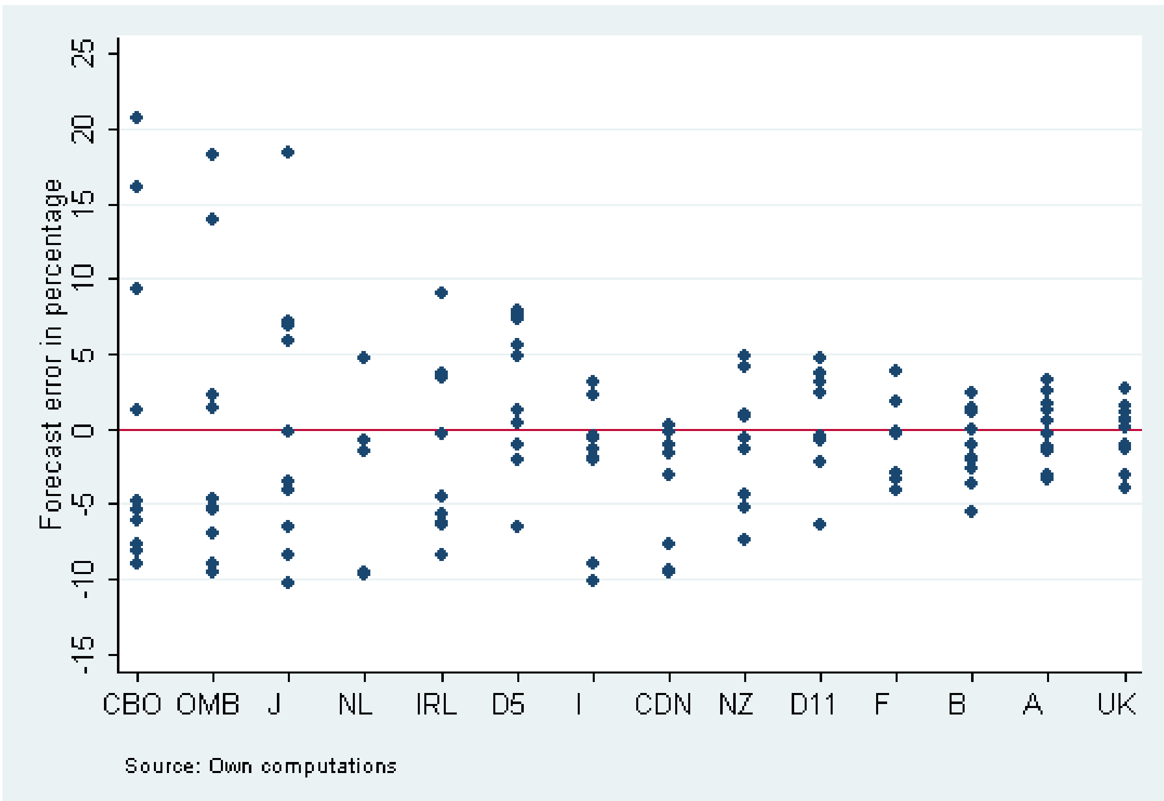
The one-year-ahead forecast errors for total revenues observed over the last ten years[1] are graphically depicted in Figure 1, where each point represents a single forecast error. Note that the forecasts are arranged in this figure in descending order of the respective standard deviation of the forecast error. At first sight the figure seems to suggest that in most cases there is some underestimation going on. But there are also instances of large overestimations.

Table 1 provides the corresponding figures for the mean forecast error and its standard deviation. A positive sign indicates an overestimation of revenues, a negative sign an underestimation. In all cases, except for Germany, Japan, and the CBO forecast in the United States, there is a slight underestimation of revenues. The largest mean is found for the Canadian forecast which shows an underestimation of 4.4 % on average. However, given the large standard deviations this is the only case where the mean shows a statistically significant difference from zero at reasonable levels of significance.

As a measure of the precision of forecasts we rely on the standard deviation of the forecast error.

[1] In the case of Italy there are just nine years, in the case of France eight years, and for the Netherlands due to structural breaks just five out of the last seven years considered.

Figure 1: Forecast Errors



CBO: US Congressional Budet Office, OMB: US Office of Management and Budget, J: Japan, NL: Netherlands, IRL: Ireland, D5: Germany May Forecast, I: Italy, CDN: Canada, NZ: New Zealand, D11: Germany November Forecast, F: France, B: Belgium, A: Austria, UK: United Kingdom.

Figure displays the one-year-ahead forecast errors for total tax revenues in percentage for up to ten years in each country, each point representing one forecast. A positive (negative) value denotes overestimation (underestimation). The forecasts are arranged in descending order of the standard deviation of the respective forecast errors. The two US forecasts only refer to federal taxes.

Table 1: Descriptive Statistics of Forecast Errors

Country	Mean (1)	Std.dev. (2)	Obs. (3)
Austria	-0.037	2.279	10
Belgium	-1.193	2.478	10
Canada	-4.363	4.163	10
France	-1.025	2.808	8
Germany: May	2.496	4.859	10
Germany: Nov	0.498	3.485	10
Ireland	-2.133	5.759	10
Italy	-2.249	4.538	9
Japan	0.516	8.911	10
Netherlands	-3.403	6.203	5
New Zealand	-1.291	4.063	10
United Kingdom	-0.286	2.069	10
USA: CBO	0.609	10.879	10
USA: OMB	-0.522	9.613	10
Average	-0.777	5.812	132

The first column shows the mean of the one-year-ahead forecast error for total revenues in percentage. A positive (negative) value denotes overestimation (underestimation). The second column depicts the standard deviation of the forecast error in percentage. The last column reports the number of observations.

The most precise forecast would then show the smallest standard deviation of the forecast error. Taking into account that in most cases no significant bias is found, this forecast would also be the most efficient one. As can be seen in Column (2) of Table 1 the highest precision is achieved in the United Kingdom and Austria, while we find the lowest precision in the United States and Japan.

3 Conditions Faced by Forecasters

An assessment of the considerable differences in the precision of forecasts needs to take account of the different conditions faced by the forecaster. First of all this is an issue of the point of time when the forecast is made. This can be illustrated by the two German forecasts that take place in May and November while the budget period starts in January. The standard deviation decreases in the latter by about a quarter presumably due to the decreasing degree of uncertainty, which is naturally lower in November than in March. But also across countries there are important differences in the time span between the forecast and the beginning of the forecasted period (see Column (1) of Table 2). Actually, this time span varies between less than one and 9.5 months.

A second important difference lies in the tax structure of the countries. In particular, the degree of differentiation of the tax system might matter. Rather than relying on few large taxes a country might employ a variety of smaller tax instruments and, thereby, reduce the revenue risks associated with the tax system. Therefore, forecasting the revenues of a large variety of small taxes might be easier than predicting the revenues in a system that relies on a small number of large taxes. To capture the differentiation of the tax structure we use an indicator of the number of taxes. For the calculation we rely on the OECD Revenue Statistics. More specifically, we employ the most

Table 2: Forecasting Conditions

Country	Time Span (1)	No. of Taxes (2)
Austria	3.5	71
Belgium	2.5	58
Canada	1.5	37
France	3	106
Germany: May	7.5	40
Germany: Nov	1.5	
Ireland	0.5	23
Italy	6	50
Japan	3.5	40
Netherlands	9.5	43
New Zealand	1.5	23
United Kingdom	0	43
US: CBO	8.5	26
US: OMB	8	
Average	4.1	45

The time span in the first column measures the period between the forecast and the beginning of the forecasted period in months. In the second column the number of taxes existing in the respective country is shown based on the OECD Revenue Statistics.

detailed classification of taxes and count all items with positive revenues. This is, of course, just an approximation, as the OECD classification meets the various tax systems to a different extent. However, as documented in Column (2) there are large differences across countries/forecasts.

Some taxes might be more difficult to predict than others. For instance, we might expect that there are significant differences in the precision when forecasting corporation or income taxes as compared to sales and value added taxes. This calls for a separate analysis of forecast errors according to the type of tax considered (see below).

4 Forecasting Methodology

The forecasting methodology used by the fourteen regular revenue forecasts that are surveyed in this paper shows several similarities. In all countries, the forecasts are prepared in a disaggregated fashion for a number of single taxes, whereby often individual taxes are aggregated into groups especially if they share the same source or tax payer. This partly reflects the need to employ up-to-date information on current revenues, which is available usually only on a cash basis.

A typical feature of revenue forecasting is that taxes which are strongly driven by macroeconomic developments such as corporation taxes or wage and income taxes are forecasted with indirect methods. In these cases revenue estimation relies on information about macroeconomic variables such as GDP, or components of the national accounts, like income from entrepreneurial activity and capital or the wage bill. Predominantly, the elasticity method is employed where some previously estimated elasticity is used to predict revenue growth based on the predicted development of the macroeconomic indicators. Some forecasts (United Kingdom, Netherlands, New Zealand, and Japan) reportedly make use of econometric models where the relationship between revenues and economic indicators is directly estimated using regression analysis.

In some cases the use of micro-simulation methods is reported which are focusing on individual tax payers such as households or corporations and where the accrued taxes for each individual are calculated and aggregated afterwards. This approach is used in the Netherlands and the United States in forecasting income taxes, in the United Kingdom and the United States for predicting corporation tax revenues.

While the macroeconomic forecasts are used as exogenous variables in countries such as Germany and Belgium, repercussions of revenue forecasts on the macroeconomic forecast over the budget are taken into account in some other countries. In particular, revenue forecasts that are embedded in a macroeconomic model (United Kingdom and Netherlands) produce a consistent set of macroeconomic and revenue forecasts. Other countries such as Ireland, New Zealand, and the United States (CBO) report the mutual verification and acknowledgement of macroeconomic and revenue forecasts.

For less important taxes – in terms of revenues – like excise taxes, but also for taxes with just a weak relation to macroeconomic variables usually direct methods are employed. These methods, like trend-extrapolation or more formal time-series analysis, use revenue data of the respective tax from previous years to predict the expected development. Also the usage of vector-autoregressive methods for groups of taxes is reported.

A subtle issue for revenue forecasting is how to deal with changes in the tax law, in particular, if changes are planned but have not yet been enacted as a law. In some countries, it is common practice to include changes that are agreed within the government (Austria, Netherlands) or noted in the budget plan (Ireland). Even if tax law changes that are just planned are not directly taken into account in the forecast, their expected macroeconomic impact sometimes leads to an indirect influence on the forecast.

5 Institutions and Independence

A basic institutional aspect of revenue forecasting is the assignment of the forecasting task to specific institutions. Interestingly, forecasting is not always assigned to a department of the government or, more precisely, to the executive branch of the government. Only in about half of the fourteen forecasts surveyed in this paper it is the Ministry of Finance (Belgium, France, Italy, Ireland, Japan) or the Treasury (United Kingdom, New Zealand) that is responsible. In most other cases forecasting is assigned to a group representing different institutions, not only from the government. Some countries even assign the primary responsibility for revenue forecasting to independent research institutes (Netherlands) and limit the influence of government to merely consult forecasters. In the other countries, even if the Ministry of Finance or another part of the government is responsible, often external experts from academia or forecasting agencies are included in the forecasting group.

The efforts to involve institutions that are not part of the government or other external experts are usually justified as a means to raise the independence of the revenue forecasting from possible manipulation and strategic influences by the government. Several countries explicitly produce *consensus forecasts*, where all institutions and experts involved have to agree on the forecast (*e.g.*, Germany and Austria). However, the extent to which forecasting is independent from government manipulation is not only depending on the assignment of the forecasting responsibility but also on whether revenue forecasting is based on some official predictions for the macroeconomic development, as is the case with the German forecast.

Table 3 presents information about how revenue forecasting differs with respect to these issues. The first column indicates whether the government (=0), research institutes (=1) or both jointly (=0.5) are responsible for the forecast. In some cases there are no research institutes involved, but in order to preserve a certain degree of independence there are external experts consulted (see Column (2)). This is the case for the US forecasts of the Congressional Budget Office (CBO) and the Office of Management and Budget (OMB). In the case of the United Kingdom a value of 0.5 is entered, in order to take account of the reported partial consultation of experts. Also for Germany a figure 0.5 is entered in order to account for the additional participation of the German central bank. For the Netherlands a figure of -1 is entered to take account of the consulting participation of the ministry of finance that may tend to reduce independence. Even if the revenue forecast is done with collaboration of the government, in some countries an external, non-government macroeconomic forecast is used. Therefore, the third column provides information about the source of the macroeconomic forecast. A value of one indicates that an external forecast is used.

By summing across the first three columns we obtain a simple indicator of the independence of revenue forecasting. The first column is weighted with unity, the second and the third columns are weighted with 0.25. The rational behind this weighting is the following: a revenue forecast that is conducted by a research institute without any government experts involved would display the maximum level of independence (=1). A government forecast that includes external experts and employs an external macroeconomic forecast would obtain a medium level of independence (=0.5). A government forecast without any external experts and without an external macroeconomic forecast would be assigned the lowest level of independence (=0).

While the indicator varies from zero (=no independence) to unity (=full independence), in our sample of countries the highest degree of independence is 0.75. As can be seen, the indicator is highest for the Netherlands and Austria, followed by Germany. A small, but positive level of independence can be found in Canada, New Zealand, Belgium and the United Kingdom. The United States case is somewhat special since here two separate forecasts exist. One is conducted by the Office of Management and Budget (OMB) that assists the executive branch, the other is conducted by the Congressional Budget Office (CBO) that is assigned to the legislative branch. While their incentives to strategically manipulate forecasts might differ, our indicator of independence, which is simply assessing the institutional conditions, assigns a low value of independence to both of them.[2]

The general composition of the index with its emphasis on research institutes, external experts, and the source of the macroeconomic forecast reflects the main institutional characteristics of revenue forecasting. Yet the weights, used to aggregate the information about these institutional aspects, are somewhat arbitrary. Therefore, we conducted some robustness checks where the weights for external experts and external macroeconomic forecasts were increased or lowered. With regard to the ranking, however, only minor changes were found. We will come back to this issue below, where we explore whether the index of independence has sufficient informational content in order to help explaining the observed performance.

[2]Bretschneider *et al.* (1989) argue that the existence of two separate forecasts by the legislative and the executive branch exerts a positive effect on forecasting accuracy, in particular, when both forecasts are forced into a consensus. This is, however, not the case with the OMB and CBO.

Table 3: Institutional Characteristics and Independence

Country	Research institutes	Ext./Gov. experts	Macroecon. forecast	Independence
Netherlands	1	-1	0	0.75
Austria	.5	0	1	0.75
Germany: May	.5	.5	0	0.625
Germany: Nov	.5	.5	0	0.625
USA: OMB	0	1	0	0.25
USA: CBO	0	1	0	0.25
Canada	0	0	1	0.25
New Zealand	0	1	0	0.25
Belgium	0	0	1	0.25
United Kingdom	0	.5	0	0.125
Japan	0	0	0	0.00
France	0	0	0	0.00
Italy	0	0	0	0.00
Ireland	0	0	0	0.00

First column indicates whether the government (=0), research institutes (=1) or both jointly are responsible for the forecast (=0.5). Second column indicates whether external (=1) or government experts (=-1) are involved. For the United Kingdom a value of 0.5 is entered, in order to take account of the reported partial consultation of experts. In Germany a figure 0.5 is entered in order to account for the participation of the central bank. Third column provides information about whether an external, non-government macroeconomic forecast is used. The degree of independence in the last column is obtained as a weighted sum of the first three columns. The first column is weighted with unity, the second and the third columns are weighted with 0.25 (see text).

6 Determinants of Forecasting Performance

Having outlined differences in forecasting conditions and practices let us finally turn to the question as to what extent they are associated with the large differences in forecasting performance noted above. Since in most cases the mean forecast error does not point at significant biases, we focus on the precision of forecasting as documented by the standard deviation of forecast errors. More specifically, we analyze the precision of the forecasts for total revenues as well as for revenues grouped using a broad classification of the sources of taxation.

The first two regressions in Table 4 explore whether differences in forecasting conditions show some significant relation with the standard deviation of the forecast error for total tax revenues. Column (1) just includes the time span between the forecast and forecasted period and indicates that the uncertainty increases considerably with the time span: every additional month increases the standard deviation by a half percentage point. In Column (2) we have included the number of individual taxes as a measure of the differentiation of the tax system. Accordingly, forecasting is more accurate in countries where the number of taxes is large. The coefficient of determination indicates that about two thirds of the variation in the forecasting accuracy are associated with differences in the time span and the number of taxes involved.

Columns (3) and (4) show the same specifications augmented with our indicator of independence of revenue forecasting. While the results from Columns (1) and (2) are confirmed, we find that the precision of the forecast is positively associated with independence. As the indicator of independence rests on a weighted sum of three institutional characteristics we conducted some robustness tests using different weights. However, the results do not show major differences. If the weights for

Table 4: Determinants of Forecasting Precision

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	5.25 ⋆	18.39 ⋆	6.58 ⋆	18.03 ⋆	5.44 ⋆	18.30 ⋆	17.98 ⋆
	(.624)	(4.35)	(.854)	(3.77)	(.676)	(4.40)	(3.86)
Time span	.573 ⋆	.533 ⋆	.694 ⋆	.634 ⋆	.570 ⋆	.532 ⋆	.628 ⋆
	(.205)	(.159)	(.191)	(.145)	(.208)	(.161)	(.149)
log No. of taxes		-3.57 ⋆		-3.18 ⋆		-3.50 ⋆	-3.14 ⋆
		(1.17)		(1.03)		(1.19)	(1.06)
Independence			-4.55 ⋆	-3.65 ⋆			-3.49 ⋆
			(2.21)	(1.68)			(1.74)
Macro model					-1.56	-1.27	-.951
					(1.91)	(1.47)	(1.30)
R^2	0.393	0.671	0.562	0.776	0.428	0.694	0.788
Observations	14	14	14	14	14	14	14

Dependent variable: Standard deviation of one-year-ahead forecast error for total tax revenues. Weighted least squares estimates taking account of the number of forecasts considered in the computation of the standard deviation. Standard errors in parentheses. A star denotes significance at the 10 % level.

external experts or external macroeconomic forecasts are increased or lowered by 0.1, for instance, all effects are confirmed while the coefficient of determination is slightly lower with these alternative weights. The specification in Column (4) indicates that about three fourth of the variation in the precision can be attributed to the time span, the number of taxes involved, and the degree of independence.

The results presented in Columns (5) to (7) indicate that embedding revenue forecasts into a macroeconomic model is associated with a higher precision. However, this effect is not significant. In further experiments (not shown) we tested for an association with the country size but did not find any significance.

Table 5 provides results for the precision of forecasts decomposed into four different types of taxes: (personal) income taxes, corporation taxes, sales taxes and other taxes. Thus, for each group of taxes we compute a separate standard deviation of the forecast error.[3] A first specification uses a similar set of variables as Column (4) of Table 4. In addition, it includes dummy variables for each group of taxes. The coefficients of these variables point at strong differences in forecasting accuracy: income taxes and, in particular, corporation taxes show a much larger standard deviation of the forecast error. While the dummy variables point at an important role of the tax structure, the number of taxes in each group does not show a significant effect (see Column 1). However, further inspection revealed that the number of taxes is particularly high among sales and other taxes. Hence, the negative significant effect of the number of taxes obtained in the above analysis of the total forecast error is now picked up by the dummy variables for the groups of taxes. We, therefore, exclude the number of taxes in the subsequent analysis and focus on the dummy vari-

[3]Missing values are encountered since detailed information was not available for all countries.

Table 5: Determinants of Forecasting Precision by Type of Tax

	(1)	(2)	(3)	(4)	(5)
Time span	.868 *	.860 *	.636 *	-.037	-.050
	(.241)	(.240)	(.243)	(.253)	(.235)
Time span × Tax type 1				.550	.405
				(.332)	(.324)
Time span × Tax type 2				2.06 *	2.06 *
				(.354)	(.278)
Time span × Tax type 3				.286	.286
				(.314)	(.287)
Micro-simulation			6.17 *	6.63 *	7.71 *
			(2.99)	(1.39)	(1.06)
Independence	-4.76 *	-4.60 *	-3.25 *	-3.25 *	-2.86 *
	(1.89)	(1.79)	(1.63)	(1.31)	(1.32)
Macro model			-2.26 *	-2.35 *	-.612
			(1.34)	(1.10)	(2.56)
Macro model × Tax type 1					-2.61
					(3.40)
Macro model × Tax type 2					-5.80 *
					(2.74)
Macro model × Tax type 3					.271
					(2.87)
log No. of taxes by category	.351				
	(.945)				
Tax type 1 (Income taxes)	7.54 *	7.94 *	6.48 *	6.43 *	6.12 *
	(1.48)	(1.19)	(1.21)	(.974)	(1.03)
Tax type 2 (Corporation taxes)	15.44 *	15.77 *	14.56 *	14.88 *	15.17 *
	(1.88)	(1.95)	(1.85)	(1.09)	(1.09)
Tax type 3 (Sales taxes)	4.93	5.97 *	5.83 *	5.80 *	5.41 *
	(3.03)	(.989)	(.927)	(.754)	(.772)
Tax type 4 (Others)	5.19 *	5.88 *	5.74 *	5.68 *	5.33 *
	(2.58)	(1.36)	(1.27)	(.857)	(.893)
R^2	0.849	0.849	0.879	0.944	0.952
Observations	50	50	50	50	50

Dependent variable: Standard deviation of forecast error for tax revenues grouped into four types of taxes. Weighted least squares estimates taking account of the number of forecasts considered in the computation of the standard deviation. Robust standard errors in parentheses. An asterisk indicates significance at the 10 % level.

ables for the types of taxes. As documented by the coefficient of determination in Column (2), nevertheless, about 85% of the differences in the precision can be assigned to tax structure, timing, and independence.

Column (3) includes controls for micro-simulation models used in the respective group and for embedding the revenue forecast into a macroeconomic model. While the integration of revenue forecasting into a macroeconomic model is found to improve the quality of the forecast, micro-simulations seem to be associated with a reduced precision. However, the latter finding might well reflect a selection effect, since micro-simulation methods might be implemented for those taxes where the forecaster faces a substantial complexity.

In the fourth specification we control for possible differences in the effect of the timing among the different groups of taxes. As can be seen, the time span is relevant, particularly for corporation taxes, but also for income taxes. Probably, the precision of the GDP forecast is very important for these taxes; and this precision is very likely to decrease with the time span. In Column (5) also the effect of embedding the forecast into a macroeconomic model is allowed to differ between the various groups of taxes. Since the standard deviation of the forecast error is significantly lower, macroeconomic models are found to be particularly helpful in predicting corporation taxes. This points at the importance of macroeconomic repercussions for those taxes.

7 Conclusions

In this paper we have compared revenue forecasting practice and performance across selected OECD countries. While the mean one-year-ahead forecast error is small in most countries, the precision of the forecasts measured by the standard deviation of the forecast error differs substantially across countries. This raises the question of whether differences in the performance are associated with the practice of revenue forecasting in these countries.

A consideration of methodological aspects shows fairly similar approaches among all countries. Taxes being sensitive to the business cycle (such as income and corporation taxes) are mainly forecasted with indirect methods that are based on macroeconomic indicators. For other taxes, direct methods are employed, where the forecast is a function of the revenues from previous years. Methodological differences are found with regard to macroeconomic models and micro-simulation models. In some countries revenue forecasts are directly embedded in a macroeconomic model, where budgetary repercussions are directly taken into account. Micro-simulations are used in some countries to predict revenues for specific taxes such as income taxes.

Institutional arrangements vary between countries. While in some countries the ministry of finance or the treasury is responsible, other countries assign the forecasting task to research institutes. Further differences arise with regard to the inclusion of external experts and with regard to the source of macroeconomic forecasts. To summarize these differences we come up with an index of the independence from possible government manipulation. According to this index the revenue forecasts are most independent in the Netherlands and in Austria.

The quantitative analysis shows that the cross-country differences in the performance of revenue forecasting are to some extent driven by country characteristics such as the tax structure with regard to the number of taxes and the importance of income and corporation taxes. Also differences in the timing of the forecasts prove important. Controlling for these differences we also find that the precision of revenue forecasting increases with the independence of forecasts. About three quarters of the differences in accuracy concerning the total revenues can be explained by differences in the tax structure, the time span, and the degree of independence.

These results are confirmed when distinguishing between four groups of taxes, *i.e.* income taxes, corporation taxes, sales taxes, and a residual category. This analysis further shows that the forecasting accuracy is particularly low for corporation taxes. For these taxes we find that the precision depends strongly on the time-span between the forecast and the beginning of the forecasted period. With regard to methods, we see that the precision turns out to be rather low where micro-simulation methods are applied. Embedding the forecast in a macroeconomic model, however, is associated with a lower standard deviation of the forecast error in particular for the corporation taxes.

Appendix: Sources of Information

A.1 Austria

The revenue forecast for Austria is documented/discussed in:

- Bundesministerium für Finanzen (2007): Budget 2007-2008, Zahlen – Hintergründe – Zusammenhänge. Online: www.bmf.gv.at
- Homepage of the Ministry of Finance: www.bmf.gv.at
- Homepage of the Wifo (Österreichisches Institut für Wirtschaftsforschung): www.wifo.ac.at

- Leibrecht (2004)

A.2 Belgium

The revenue forecast of the federal government is documented/discussed in:

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