The Impact of Productivity on Social Well-Being: The Cases of Government Fiscal Balances and Environmental Sustainability

The Impact of Productivity Growth on Government Fiscal Balances

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INTRODUCTION

The task of this paper is to investigate the sensitivity of Canadian government fiscal balances to alternative long-run productivity growth rates. By implication, the larger the incipient fiscal balances, the greater the scope for the financing of social programs. Whether larger incipient fiscal balances would indeed be used for the financing of social programs, or would instead be used for tax reduction or for paying down government debt, is beyond the scope of this paper. But, clearly, determining the sensitivity of fiscal balances to alternative productivity growth rates is at least an initial step in determining whether alternative productivity growth rates would affect the provision of social programs.

Briefly, we examine the sensitivity of fiscal balances using elements of the FOCUS macroeconometric model of the Canadian economy, maintained at the Institute for Policy Analysis of the University of Toronto, and a "base case" projection of the Canadian economy, and of its fiscal detail, through the year 2030. The simulation strategy, the base case, and the many important assumptions and judgements that had to be made in doing the calculations are described in the following section.

The results of the calculations, both for the main alternatives and for selected variations, are presented in the subsequent section. Briefly, we find that even minor changes in long-run productivity growth rates can cumulate over nearly 30 years to form huge differences in the absolute fiscal resources available to governments, but smaller differences result when these fiscal resources are measured as a share of the achieved GDP.

METHOD: MODELLING FISCAL SENSITIVITY TO ALTERNATIVE LONG-RUN PRODUCTIVITY GROWTH RATES

The first part of this section examines the simulation strategy used to measure the sensitivity of fiscal indicators to alternative productivity growth rates. The second part reviews the base case on which the calculations are made, while the third catalogues

the important assumptions and judgements that were required in order to produce the calculations.

The simulation strategy employed here parallels, in part, the technique used by the finance department in recent budgets and fiscal statements in estimating the implicit size of the fiscal dividend — see, for example, the November 2001 *Budget* (Finance Canada 2001) and the November 2000 Fiscal Statement (Finance Canada 2000). For these exercises, the finance department had either three or four macroeconometric modelling groups (of which the Policy and Economic Analysis Program was one) tie their models to a common consensus view of the performance of the economy over a five-year horizon. It then asked the groups to calculate, using their models, federal revenues and endogenous expenditures (that is, those driven by economic indicators, such as employment insurance payouts). In effect, only parts of each macro model were used — namely, the fiscal modules. These were not full-model simulations, as much economic behaviour — for example, the evolution of inflation, real growth, interest rates and the exchange rate — was tied to a common set of numbers.

For the current exercise, we begin with a base-case projection of the Canadian economy through the year 2030 developed by the Policy and Economic Analysis Program at the Institute for Policy Analysis. A projection this far into the future will naturally draw considerable attention, and probably criticism, as discussed in the section immediately below. However, the base case and what it says about the long-term fiscal future of Canada are not the emphasis of this paper. Instead, we are concerned with the *sensitivity* of this projection to alternative productivity growth paths.

Alternative productivity growth paths can occur for wide variety of reasons and can have many different implications.[1] As we explore several of the variations, it seems sensible — indeed necessary — to simplify the exercise and to make some strong assumptions about what alternative productivity growth paths would look like. For example, what is one to assume about the shares of aggregate demand under a lower (or higher) productivity growth path? A higher productivity path might or might not involve higher investment expenditure. In this case, and in many others, we have made a simplifying assumption — that the base-case values will persist. A list of these assumptions and judgements is provided below. The important point here is that much of the macro model has been turned off in developing the alternative productivity growth path — just as in the finance department fiscal dividend exercises. We use only the revenue and expenditure blocks of the FOCUS model.

The Base Case to 2030

The calculations begin with a projection for the Canadian economy through the year 2030. We make no pretence about this projection being the definitive analysis of the long-term future of the Canadian economy. There are many outstanding issues requiring further research — notably, the most likely productivity growth rate and the impact of the aging of the baby boom generation on government revenues and expenditures; much work remains to be done in examining all of these issues (on the issue of demographics and its effect on fiscal balances, see, e.g., King and Jackson 2000). The projection presented and briefly examined here is intended as no more

TABLE 1

Base Case: Selected Economic Indicators, 2000-2030

	2000	2005	2010	2015	2020	2025	2030
Real GDP (billions $2000)	1056	1227	1413	1580	1740	1903	2071
Population (millions)	30.7	32.1	33.3	34.4	35.5	36.5	37.2
Real GDP Per Capita (thousands $2000)	34.3	38.2	42.4	45.9	49.0	52.2	55.7
Real GDP Growth Rate (%)	4.4	3.6	2.6	2.1	1.8	1.8	1.7
Population Growth Rate (%)	0.9	0.8	0.7	0.7	0.6	0.5	0.3
Unemployment Rate (%)	6.8	6.5	6.2	6.2	6.2	6.2	6.2
Employed (millions)	14.9	16.1	16.9	17.3	17.4	17.4	17.3
Employment Growth Rate (%)	2.6	1.6	0.7	0.3	0.0	-0.1	0.0
Real GDP/Employed (thousands $2000)	70.8	76.3	83.5	91.5	100.2	109.7	119.6
Productivity Growth Rate (%)	1.8	1.9	1.8	1.8	1.8	1.8	1.7
CPI Inflation Rate (%)	2.7	1.8	1.8	1.8	1.8	1.8	1.8
Gov't of Canada 10-year Bond Rate (%)	5.9	5.8	6.0	6.0	6.0	6.0	6.0
Compound Growth Rates (%)		2000-2010	2010-2020	2020-2030		2000-2030	
Real GDP		3.0	2.1	1.8		2.3	
Population		0.8	0.6	0.5		0.6	
Employment		1.3	0.3	0.0		0.5	
Productivity		1.7	1.8	1.8		1.8	

than a reasonable starting point for the analysis of fiscal sensitivities.

Basic indicators for the projection are presented in Table 1. Included are actual data for the year 2000 (the latest available at the time the projection was prepared) and snapshots at five-year intervals into the future.

As can be seen from the table, the population increases through 2030 but at an ever-decreasing rate.[2] The story is somewhat different for employment. We project that the unemployment rate will settle in the second half of the current decade at slightly higher than 6 percent. While this figure may seem a trifle low to some and high to others, this matters relatively little for the underlying base case; the main point is that the unemployment rate will *stabilize*, which means that it is labour force growth which determines the number of employed persons. In contrast to total population growth, which will continue to be positive (if only barely) through 2030, employment growth is projected to touch zero, and even to become negative, by about the year 2020. The reason for this projection is, of course, the aging of the baby boom generation and the passing of this large cohort into their retirement years.

The base case features a relatively optimistic assumption about productivity growth over the next three decades. Productivity growth, by the way, is measured in the model in the simplest way possible — as the ratio of real GDP to the number of persons employed.[3] As can be seen, we project that productivity growth, in terms of output per worker, will grow an average of about 1.8 percent per year for the next 30 years. This contrasts with the 1.5-percent rate of growth achieved in the 1990s, and with lower figures still for the

1980s and the latter half of the 1970s. Despite this recent historical performance, however, we anticipate that information technology and its gradual dissemination throughout the economy, together with a more educated workforce and the projected relatively high level of investment, will serve to push the average productivity growth rate higher than it has been in the last 20 years. The validity of this assumption is addressed in other papers in this volume.

The combination of relatively strong productivity growth and rapidly diminishing employment growth yields the real GDP values and growth rates seen in Table 1. Measured in year 2000 dollars, real GDP rises from just over $1 trillion in the year 2000 to slightly over $2 trillion by 2030. In per capita terms there is also a significant increase, with a rise of just over 60 percent over the 30-year span. While not all of this extra output goes to consumption, as the projection features strong investment and net export growth, it is still the foundation of a significant increase in the average standard of living.

Finally, note that the CPI inflation rate stabilizes at just under 2 percent throughout the 30-year horizon. We assume that the Bank of Canada will maintain an inflation target of 2 percent, plus or minus 1 percent, for the next three decades, and that prudent behaviour on the part of the central bank will have the inflation rate fall slightly below the 2-percent target on average. With inflation thus stabilized, it is not surprising that longer-term bond yields are also very stable. Our projection for the 10-year bond rate shows a real rate of 4.2 percent — somewhat high by historical standards but in line with strong productivity growth — and therefore high returns on investment in Canada, the United States and much of the world.

Tables 2 through 4 detail the major fiscal indicators of the base case by level of government, while Table 5 shows all governments combined (and with major intergovernmental transfers netted out). It should be noted at the outset that all figures in these tables are calculated on a National Accounts basis, not the more commonly reported Public Accounts basis. The National Accounts measure is consistent with the other components of National Accounts, like GDP and its components, used throughout the FOCUS macroeconometric model.

TABLE 2

Base Case: Federal Government Fiscal Indicators, 2000-2030 (National Accounts Basis)

Fiscal Indicators	2000	2005	2010	2015	2020	2025	2030
In Billions $2000:							
Revenues	194	199	214	234	252	273	295
Program Expenditures	131	156	176	200	223	247	272
of which: Transfers to Provinces	32	38	45	55	64	73	84
Interest on Debt	44	38	34	30	26	22	20
Balance	19	5	4	4	3	3	3
Debt	544	465	401	346	297	254	217
As a Percentage of GDP:							
Revenues	18.4	16.2	15.2	14.8	14.5	14.3	14.2
Program Expenditures	12.4	12.7	12.5	12.7	12.8	13.0	13.1
of which: Transfers to Provinces	3.0	3.1	3.2	3.5	3.7	3.9	4.0
Interest on Debt	4.2	3.1	2.4	1.9	1.5	1.2	1.0
Balance	1.8	0.4	0.3	0.2	0.2	0.2	0.1
Debt	51.6	37.9	28.4	21.9	17.1	13.4	10.5

Table 2 shows the projected fiscal performance of the federal government. (All figures are in dollars with year 2000 purchasing power — that is, inflation effects have been removed.) As can be seen, in the year 2000 the federal government ran a surplus of about $19 billion — the difference between revenues of $194 billion and program expenditures of $131 billion — with an extra $44 billion for interest payments on the national debt. These revenues amounted to over 18 percent of GDP, while federal debt, again on a National Accounts basis, was just over 50 percent of GDP. Our projection assumes that the federal government will, on average, run surpluses, but not as large as those seen at the end of the last decade. Interest on the debt declines steadily as small amounts are paid off each year, while interest rates remain stable. The debt itself gradually declines as GDP grows steadily; thus as a percentage of GDP it is approximately 10 percent in 2030. After the tax cuts recently put in place, and some further cutting that we project for the second half of the current decade, federal revenues are projected to fall from 18 percent of GDP in 2000 to something close to 14 percent by 2020 and beyond. Program expenditures, however, will actually rise slightly as a share of GDP compared to the year 2000. The primary reason for this, of course, is the declining level and share of interest on the debt, which leaves room for other expenditures even with fixed or falling revenues.

Table 3 shows fiscal indicators for provincial and local governments. On a National Accounts basis, the provinces and territories also ran a surplus in the year 2000, and we project smaller surpluses for most of the years to come. Just as at the federal level, revenues as a share of GDP are projected to decline from 2000 levels during the first half of our projection, largely on the basis of tax cuts already in place or being phased in by a

TABLE 3

Base Case: Provincial, Territorial and Local Government Fiscal Indicators, 2000-2030
(National Accounts Basis)

Provincial/Territorial Governments Fiscal Indicators	2000	2005	2010	2015	2020	2025	2030
In Billions $2000:							
Revenues	230	246	269	292	318	346	376
of which: Federal Transfers	32	38	45	55	64	73	84
Program Expenditures	190	215	242	280	299	329	362
of which: Transfers to Local Governments	32	36	40	45	50	56	63
Interest on Debt	29	26	22	19	16	14	12
Balance	11	5	4	4	4	3	3
As a Percentage of GDP:							
Revenues	21.7	20.0	19.0	18.5	18.3	18.2	18.2
of which: Federal Transfers	3.0	3.1	3.2	3.5	3.7	3.9	4.0
Program Expenditures	18.0	17.5	17.1	17.7	17.2	17.3	17.5
of which: Transfers to Local Governments	3.0	2.9	2.8	2.8	2.9	3.0	3.0
Interest on Debt	2.7	2.1	1.6	1.2	0.9	0.7	0.6
Balance	1.0	0.4	0.3	0.2	0.2	0.2	0.1
Local Governments							
Revenues and Expenditures in billions $2000	79	90	101	113	125	138	151
Revenues and Expenditures as % of GDP	7.5	7.3	7.2	7.2	7.2	7.3	7.3

number of provinces and additional cuts that will be made in the second half of the current decade. However, the reduction in revenues is less pronounced for the provinces than for the federal government. At the same time, increases in expenditures are not as large for the provinces as for the federal government, partly because interest on the debt for the provinces is lower to start with and declines at a slower rate. However, it should be noted that part of the increase in federal expenditures represents increased transfers to the provinces as healthcare and education needs predominate in the decades to come.

Local governments are assumed to run balanced budgets, on average, and their revenues and expenditures are therefore almost identical. As can be seen, we project that the size of local government as a share of GDP will remain largely unchanged over the next three decades.

Finally, Table 4 shows the fiscal indicators of the combined Canada and Quebec Pension Plans. Included in the table is an estimate of the cumulative balance or assets of the two plans. The effects of the large increases in pension plan contribution rates over the last several years can be clearly seen in the projection of pension plan revenues and in the large annual balances racked up by the two plans in the middle years of the three-decade span. From 2005 through 2020 the annual balance of the plans exceeds 1 percent of GDP, and the cumulative balances accumulate rapidly — rising from 5.4 percent of GDP in 2000 to a maximum of around 18 percent by about 2025. As the bulk of the baby boomers retire after 2020, there is a pronounced growth in expenditures relative to revenues, although our projection shows the pension plans still running a modest surplus in 2030.

Naturally, the projections for the pension plan balances and cumulative assets are sensitive to both the underlying economic growth rate (which is the focus of this study) and the payout rate. The latter will depend on the extent of disability and non-retirement payments — partly a political decision — and on the increase in the number of benefit claims by women, as this cohort, which showed an enormous increase in labour force participation in the 1960s and 1970s, reaches retirement age. Each of these elements is difficult to estimate.

Assumptions and Judgements Behind the Simulations

In order to run the alternative productivity growth simulations, we had to make a number of major assumptions and judgements. These are described below.

TABLE 4

Base Case: CPP/QPP Fiscal Indicators, 2000-2030 (National Accounts Basis)

Fiscal Indicators	2000	2005	2010	2015	2020	2025	2030
In Billions $2000:							
Revenues	30	43	52	61	69	76	81
Program Expenditures	26	30	35	43	52	64	75
Balance	4	13	17	18	17	12	6
Cumulative Balance (Assets)	57	104	169	238	300	342	353
As a Percentage of GDP:							
Revenues	2.8	3.5	3.7	3.9	4.0	4.0	3.9
Program Expenditures	2.5	2.5	2.5	2.7	3.0	3.3	3.6
Balance	0.4	1.1	1.2	1.1	1.0	0.6	0.3
Cumulative Balance (Assets)	5.4	8.5	11.9	15.1	17.2	18.0	17.0

Source of the change in productivity growth. We assumed that the change in productivity growth originated solely in a different rate of total factor productivity (TFP) growth, not from any contribution of capital. For the moment we leave open the question of whether there is a corresponding increase in the rest of the world or whether the change is confined to Canada.

Components of aggregate demand. A different productivity growth rate may or may not change the underlying shares of aggregate demand — and this, in turn, will have fiscal implications, since some categories of final demand (e.g., consumption) have a greater tax burden than others (e.g., investment or exports). It is difficult to know if a society will translate higher productivity growth into a larger share of consumption or a larger share of investment ("more jam today" or "more jam tomorrow"). A higher productivity growth rate might mean increased competitiveness and higher net exports, but this depends on whether higher productivity growth also occurs in the rest of the world.

In light of these uncertainties it seemed best to assume a neutral stance: in the simulations, all shares of final demand (except government spending) are increased or decreased proportionately to the change in GDP resulting from higher or lower productivity growth.

Unemployment and labour force participation rates. As noted above, the base case has the unemployment rate steady at just above the full-employment rate. Higher or lower productivity growth might conceivably change the latter rate, but the evidence is not compelling either way.[4] In terms of the labour force, both the size of the population and the labour force-participation rate could conceivably change. A higher productivity growth rate, for example, might serve to raise immigration rates, but this is essentially a policy decision. A higher productivity growth rate, and the resultant higher real wage (see below), might increase labour force participation — but it might also decrease it, as some of the higher real-wage returns are taken in the form of leisure or early retirement by households.[5] In the light of all these possibilities, the simplest assumption is to maintain the base-case unemployment and labour force participation — and therefore employment — rates under the alternative productivity growth scenarios.

Prices and exchange rate. While higher or lower productivity growth rates might make the Bank of Canada's job of achieving its inflation targets somewhat easier (or harder), we have little doubt that the net result would be virtually no change in the average inflation rate, since 2 percent is the Bank's inflation target no matter what the underlying productivity growth rate might be. We have therefore not allowed average prices to change from the base case.

As for the exchange rate, changes in Canada's relative competitiveness would depend, as noted above, on whether the productivity growth rate change to be simulated is also occurring in the rest of the world. They would also depend on how Canadians choose to adjust to their own changed productivity path — for example, they might choose to increase their purchases of imported goods, in which case even a higher relative Canadian productivity growth rate would not translate into an appreciation of the Canadian dollar. Once again, the simplest assumption seems to be to keep the exchange rate as it is in the base case.

Real wages. In the FOCUS model, changes in labour productivity show up in changes in

TABLE 5

Base Case: Combined Government[1] Fiscal Indicators, 2000-2030
(National Accounts Basis)

Fiscal Indicators	2000	2005	2010	2015	2020	2025	2030
In Billions $2000:							
Revenues	469	504	551	600	650	703	757
Program Expenditures	362	418	470	536	585	648	714
Interest on Debt (Fed+Prov)	73	64	56	49	42	36	31
Balance	34	22	26	26	24	18	12
As a Percentage of GDP:							
Revenues	44.4	41.0	39.0	37.9	37.4	37.0	36.5
Program Expenditures	34.3	34.0	33.3	33.9	33.6	34.1	34.5
Interest on Debt (Fed+Prov)	6.9	5.2	4.0	3.1	2.4	1.9	1.5
Balance	3.2	1.8	1.8	1.6	1.4	1.0	0.6

[1] Net of intergovernmental transfers.

real wages after a lag of several years. In a long-term simulation the lag becomes unimportant, but we have kept the FOCUS principle that real wages will reflect changes in labour-productivity growth. In the alternative simulations, therefore, the growth rate of real *private-sector* wages is changed by the same amount as the assumed change in labour-productivity growth. The net result of this assumption, and of the assumption of no change in overall employment, means that there is also very little change in the share of wage and salary income in GDP, and in most other income shares, under the alternative productivity growth scenarios.

Nominal interest rates. Nominal interest rates are, of course, simply the sum of real interest rates plus expected future inflation. In the alternative simulations, there is no change in the underlying inflation rate that is anchored by the Bank of Canada's target inflation policy. Whether there would be a change in real interest rates is a more open question. If the productivity growth is assumed to occur in Canada only, it is unlikely that real interest rates would change very much, since these are primarily determined in world capital markets. However, if the alternative productivity growth is assumed to reflect a worldwide phenomenon, there might indeed be a change in the real interest rate — but by exactly how much remains unclear. Of course, the issue of what happens to interest rates is important for determining the fiscal effects of alternative productivity growth rates. Higher interest rates mean higher payouts of interest on government debt too, which can have important effects in long-term simulations. At the same time, however, there could be higher earnings by the public pension plans on their accumulated assets.

Our initial assumption will be that interest rates in Canada do not change — which would reflect either the fact that the alternative productivity growth rate is confined to Canada or the fact that world real rates are insensitive to the relatively small changes in productivity growth rates that we will be examining. We will, however, develop an alternative scenario in which the real interest rate and the nominal interest rate are changed by some relatively arbitrary amount in response to a change in the productivity growth rate.

Government-sector wages. It is generally recognized that productivity growth is extremely

difficult to measure in the public sector and other non-commercial sectors. When goods and services are sold through the market, there is an observable difference between the price at which they are sold and the cost of producing them. National income accountants therefore have at least some chance of determining whether there has been a change in productivity. Government outputs, however, are not sold, and therefore national accounts have no way of determining their market value. According to national accounting conventions, therefore, the value of government output is equal to the value of the inputs — largely labour and government capital stock. Thus productivity growth is unlikely to show up in the public sector under standard national income accounting. If information technology, for example, permits 10 workers in a government office to perform the same functions that previously were performed by a hundred workers, the government output is deemed to have fallen, since the inputs have fallen.

What this all means is that the market competition mechanism that normally passes productivity improvements through to real wages in the private sector is not automatically at work in the public sector. Nonetheless, government still competes for workers with the private sector and, it might be argued, an increase in general labour productivity in the economy will still show up as higher wages in the government sector. On the other side, it might be argued that the greater security of government jobs, and the continual pressure on governments to provide more services and cut taxes, might cause government-sector wages to be much less sensitive than private-sector wages to changes in productivity growth — as has been the case in recent decades.

Our initial assumption in the simulations below is that government wages do indeed change to the same extent as private-sector wages. That is, if we assume a higher productivity growth rate we must also assume a higher rate of wage growth in the public sector — which can add significantly to government-sector costs and blunt the fiscal impact of stronger productivity. (Note that currently approximately 75 percent of government spending on goods and services is wage-based, and this type of spending is just under half of all government spending, which also includes transfers and interest on the public debt.) We will also conduct an alternative simulation in which the pass-through of changes in productivity to government wages does not occur, but this is an extreme alternative. If government wages do not follow the private sector fully, then most likely they will follow it at least partially — but we have no way of knowing by how much. We therefore present a polar case with the caution that government wages are unlikely to be completely unaffected by productivity-based changes in private-sector real wages.

Government spending and taxation. One of the last specifications for the simulations to be conducted is perhaps the most important: what will be the spending or taxation reaction of the government sector? Borrowing on the experience gained during the "fiscal dividend" exercises for the finance department, we make three assumptions. First, government real spending on goods and services is set the same as in the base case. It is true that a scenario of higher or lower productivity growth may very well cause a change in the growth path of government spending, but there are no agreed-upon rules by which this change might occur. We intend to measure the growth or decline in fiscal "room

to manoeuvre" that a change in productivity might yield, instead of prejudging how that room to manoeuvre will be used up. Second, we similarly assume that tax rates are unchanged from the base case. Once again, to do otherwise would be to prejudge what governments will do as the room to manoeuvre on the fiscal side becomes smaller or larger. Third, and this might seem unusual, we assume also that governments will pursue the same fiscal balances as they do in the base case. In other words, surpluses or deficits are assumed to be unchanged from the base case. Behind this last assumption is the notion that, in the longer term, governments will avoid deficits, but also that they will see little political gain in running anything above modest surpluses. Should spending needs or taxation change, rather than balances adjusting, corresponding adjustments will be made in other categories of spending or taxation.

Nonetheless, under alternative productivity growth rates, there will clearly be changes in tax revenues, transfer payments and endogenous spending components. Where, then, do these go? Again using the experience of the "fiscal dividend" exercise, it is assumed that they go into *non-taxable* transfers to persons — or, equivalently, a lump-sum change in personal income taxes.

This assumption turns out to be the most neutral in terms of effects on the rest of the economy. To assume that the endogenous responses in taxation, transfers and spending would show up in changes in current spending on goods and services distorts the shares of GDP. Worse still, to assume that they would show up in the fiscal balance is in fact not neutral, because a change in the fiscal balance causes a change in government debt and therefore interest payments on the debt. Because this effect can accumulate rapidly over a long-term simulation, it gives a false picture of the change in the fiscal room to manoeuvre available to governments. In a high-productivity scenario, for example, government revenues would increase. If these were devoted to debt paydown, interest on the debt would be lower in future years and the fiscal room to manoeuvre would be larger still. However, part of this increase in fiscal room to manoeuvre would simply be the result of the decision to use the initial productivity increase and its effect on revenues to pay down the debt, instead of making some other change in policy. In a scenario of lower productivity growth, it might be expected that fiscal balances would be smaller and debt higher, and therefore that interest payments on the debt would be higher. But again, if governments responded by raising taxes or reducing spending elsewhere, and leaving the fiscal balance unchanged, there would be no change in debt or in interest payments on the debt, and the fiscal room to manoeuvre, while still negative, would be lower than in a case of reduced surpluses and increased debt.[6]

In sum, therefore, the lesson of the fiscal-dividend exercise is that it is better to put incipient changes in fiscal balances into non-taxable transfers to persons rather than into debt paydown or changes in tax rates or government spending — and that is the practice followed here. When the tables for the various simulations report on the fiscal impact by level of government, what they are reporting is this calculation of what would need to be changed in transfers to persons in order to keep the fiscal balance from deviating from the base case.

There is one exception to this rule. For the public pension plans, a change in the productivity growth rate is permitted to change the fiscal balance — and it likely will, since contributions are based on wages that will

change with productivity, while payouts are based on inflation, which we assume will not change. Over the next 30 years, higher or lower collections or earnings by the pension plans likely will not significantly alter the currently legislated contribution or payout rates (unless disaster appears imminent). However, the accumulated surplus of the plans likely will vary, and this does, of course, have implications for earnings and balances later in the simulation period.

Intergovernmental transfers. In the wild and wonderful Canadian federal system, large sums of money flow between levels of government. As can be seen in Tables 2 and 3, the federal government transferred about $32 billion to the provinces in 2000, and the provinces transferred almost an equal amount to local governments. While the treatment of intergovernmental transfers does not affect the calculation of the fiscal impact of alternative productivity growth rates for the combined government sector, clearly it does affect the measure of fiscal impacts by different levels of government.

Most of the simulations assume that federal transfers to the provinces will change in proportion to any change in the productivity growth rate — that is, if the economy improves and the federal government collects higher taxes, political pressures will push it in the direction of increasing transfers to the provinces by a proportional amount. However, other outcomes are possible, and one simulation that assumes no change in federal transfers will be presented to gauge the sensitivity of this issue.

Local governments are assumed to balance their budgets on average, with the balancing factor being transfers from the provinces. A change from the base case that tends to increase local spending will therefore cause increased transfers from the provinces to the municipalities, while a rise in local tax collections, all else being equal, will tend to reduce provincial transfers. In this way, the fiscal impact on local governments of alternative productivity growth rates generally ends up as a fiscal impact on the provinces.

RESULTS: FISCAL IMPACTS UNDER HIGH AND LOW PRODUCTIVITY GROWTH RATES

A total of five simulations are presented in this section. The first, and principal, simulation shows the impact of assuming a relatively modest addition of 0.3 percent to the annual productivity growth rate from 2004 through 2030. For this simulation it is assumed: first, that public-sector real wages follow productivity-based increases in real wages in the private sector; second, that federal transfers to the provinces are increased at the same rate as productivity growth; and third, that the interest rates of the base case do not change under the higher assumed productivity growth.

The second simulation follows the first but simply reverses the assumed productivity change to a reduction of 0.3 percent per year (or to a level of roughly 1.5 percent per year through the simulation period). All other assumptions follow Simulation 1.

Simulation 3 assumes an increase in productivity identical to Simulation 1 but assumes no response in public-sector real wages. Simulation 4 again follows Simulation 1, but assumes no response of federal transfers to the provinces. Finally, Simulation 5 also follows Simulation 1 but assumes that interest rates rise an (arbitrary) 0.3 percent in line with higher productivity.

Simulation 1: 0.3-Percent Increase in Productivity Growth

Results for Simulation 1 are displayed in Table 6. The results are depicted in several forms: some — for example, the Productivity Growth Rate or Federal Government Revenues — are the solution levels for this simulation. Note again that all dollar values are expressed in terms of year 2000 dollars, to remove inflation distortion. Other results show the change from the base-case projection described in the second section of the paper. For example, line 2 of the table reminds us that in this simulation the productivity growth rate is 0.3 percentage points above that in the base projection. These changes are sometimes shown in levels (as for the productivity growth rate) and sometimes as a percentage of the base-case projection. Finally, the fiscal impact of the change in productivity growth is shown not only in levels form (in $2000) but also as a percentage of the relevant government expenditures in the base case. The table offers snapshots of the results at five-year intervals from 2005 through 2030, but most of the discussion will focus on results for the last year shown.

The first panel of Table 6 shows the impact of an assumed 0.3-percentage-point higher productivity growth on real GDP and GDP per capita. As can be seen, a relatively small change in productivity growth, if sustained for a long interval, can have large cumulative effects in terms of outcomes. With productivity growth increasing by 0.3 percent between 2004 and 2030, by the year 2030 real GDP would be higher by $171 billion, or a little over 8 percent higher than in the base case, while real GDP per capita would be just over $60,000, and $4,600 above the base-case projection.

For the federal government, the higher productivity growth rate increases revenues by $28 billion by 2030. This is an increase of approximately 9.5 percent above the base case, which is slightly above the 8.3-percent increase in GDP in the simulation. Not surprisingly, the revenue elasticity of the federal government in the model is somewhat greater than one.

Since the federal balance is assumed not to change from base in the simulation, the increase in revenue must be exactly matched by changes in expenditure. Two increases occur automatically, given the assumptions behind this particular simulation: "Other Induced Changes in Expenditures" amount to $6 billion in 2030 and are largely the result of increased payments to federal employees as the federal government must match the real-wage increases gained by private-sector workers under the higher productivity gains. A further $7 billion goes in increased transfers to the provinces, under the assumption that these will move in proportion to higher productivity growth and increased GDP.

What remains, about $15 billion in 2030, is the true fiscal impact of the higher productivity growth — an amount equalling about 5.5 percent of total federal expenditures in the base case. This is the amount that could be used for further tax cuts, new or expanded expenditure programs, or more aggressive debt reduction. (If debt reduction were to be selected, there would, of course, be a compound effect on the fiscal impact, as interest payments on the debt would also be reduced over time — as discussed in the second section.) Note that, because some of the increased federal revenue from higher productivity growth is diverted to higher real wages and higher transfers to the provinces,

TABLE 6

Simulation 1: Productivity Growth 0.3-Percent Increase Per Year — Public-Sector Real Wages Respond (Federal Transfers Respond; Base Interest Rates)

Economic and Fiscal Indicators	2005	2010	2015	2020	2025	2030
Productivity Growth Rate (%)	2.2	2.1	2.1	2.1	2.1	2.0
Change from Base	0.3	0.3	0.3	0.3	0.3	0.3
Real GDP (billions $2000)	1235	1443	1637	1830	2030	2242
Change from Base	7	29	57	89	127	171
% Change from Base	0.6	2.1	3.6	5.1	6.7	8.3
Real GDP Per Capita (thousands $2000)	38.5	43.3	47.5	51.5	55.7	60.3
Change from Base	0.2	0.9	1.6	2.5	3.5	4.6
Federal Government						
Revenues (billions $2000)	200	219	244	267	294	323
Change from Base	1	5	10	15	21	28
Fiscal Impact of Prod'ty Change (billions $2000) (after change in transfers to provinces)	1	3	6	9	12	15
Fiscal Impact as % of Base Expenditures	0.6	1.9	3.0	3.9	4.8	5.5
Change in Transfers to Provinces (billions $2000)	0	1	2	3	5	7
Other Induced Changes in Expenditures (billions $2000)	0	1	2	3	5	6
Provincial/Territorial Governments						
Revenues (billions $2000)	248	276	306	339	375	415
Change from Base	2	7	13	21	29	39
Fiscal Impact of Prod'ty Change (billions $2000) (after changes in federal and local transfers)	1	4	7	10	14	18
Fiscal Impact as % of Base Expenditures	0.4	1.4	2.3	3.2	4.0	4.7
Change in Transfers to Local Gov't (billions $2000)	0	1	2	3	4	6
Other Induced Changes in Expenditures (billions $2000)	1	2	5	7	11	15
Local Governments						
Revenues (billions $2000)	90	103	116	129	144	159
Change from Base	0	1	3	4	6	8
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in provincial transfers)	0	0	1	1	1	2
Fiscal Impact as % of Base Expenditures	0.1	0.3	0.6	0.8	1.1	1.3
Induced Changes in Expenditures (billions $2000)	0	1	3	4	6	8
Canada and Quebec Pension Plans						
Revenues (billions $2000)	44	53	63	73	82	90
Change from Base	0	1	2	4	6	9
Fiscal Impact of Prod'ty Change (billions $2000)	0	1	2	4	6	9
Fiscal Impact as % of Base Expenditures	0.5	2.6	4.9	7.2	9.6	12.3
Combined Government (Net of Intergovernmental Transfers)						
Revenues (billions $2000)	508	566	628	694	765	840
Change from Base	3	13	24	37	53	71
Fiscal Impact of Prod'ty Change (billions $2000)	2	8	15	23	32	42
Fiscal Impact as % of Base Expenditures	0	2	3	4	5	6
Induced Changes in Expenditures (billions $2000)	1	5	9	15	21	29

the federal fiscal impact, as a percentage of base expenditures, rises *less* than in proportion to the increase in GDP.

For the provincial governments, the increase in revenues by 2030 is about $39 billion — or slightly more than 10 percent above

base revenues — again, in excess of the 8.3-percent increase in GDP. Of course, these revenue increases include the $7 billion in transfers from the federal government that rose fully with the productivity increase. Again, since provincial balances are assumed not to change, the revenue increase is fully matched by increases in expenditures. First, induced expenditures resulting from higher real wages rise by $15 billion — significantly more than for the federal government, as at the provincial level a larger share of expenditure is allocated to wages. A further $6 billion is transferred to local governments to keep their balances from moving into deficit — on which more immediately below. This leaves $18 billion as the final fiscal impact of the productivity increase, which, at about 4.7 percent of base expenditures, represents a slightly smaller proportional impact than that for the federal government. Again, these funds could be used to cut taxes further, to increase real expenditures or to reduce public debt (with the last having a further compounding effect through reduced interest charges).

Local governments, with a relatively inelastic tax base, show a much smaller proportional revenue increase than the federal or provincial governments. Of the $8 billion in extra revenue in 2030, fully $6 billion results from increased transfers from the provinces and only $2 billion from higher productivity growth. This is the fiscal impact at the local level, and it amounts to only a little over 1 percent of base local expenditures by 2030. However, local governments are also major employers, and we have assumed that public-sector wages will increase in line with productivity improvements in the private sector. Local governments therefore need to pay out an additional $8 billion by 2030 in induced wage expenditures. To do this, they must, in effect, use up their own $2 billion of fiscal impact and obtain an additional $6 billion in transfers from the provincial governments.

For the Canada and Quebec Pension Plans, the dynamics and results differ somewhat from those of the three levels of government. First, the pension plans have no change in induced expenditures to speak of, since they employ few workers of their own and since pension payouts are calibrated on inflation (which has not changed), not on current real wages — although this situation could change with significant real-wage variation in the economy. Second, the balance of the pension plans is not assumed to be fixed, as it is for the three levels of government. Higher productivity growth serves to increase revenues much more than expenditures and leads to larger surpluses and more asset accumulation — and these extra assets themselves also contribute to earnings. By 2030, revenues are above base by $9 billion, or over 12 percent of base expenditures of the pension plans. The percentage increase in revenues is greater than that in GDP, because the higher contributions from wages earlier in the simulation increase the assets of the pension plans and so compound into higher earnings on assets. As can be seen in Table 6, the percentage improvement in fiscal impact steadily widens relative to the percentage change in GDP, reflecting compounding through investment earnings of the pension plans.

Finally, the last panel in Table 6 aggregates the levels of government and nets out intergovernmental transfers. It is estimated that by 2030 aggregate government revenues will have increased by $71 billion, of which $29 billion goes to induced wage expenditures in the public sector and $42 billion, or

roughly 6 percent of government expenditures in the base case, are available for tax cuts, expenditure enhancement or debt reduction.

Simulation 2: 0.3-Percent Decrease in Productivity Growth

Simulation 2 is simply Simulation 1 in reverse — productivity growth is assumed to be 0.3 percent lower than in the base case, which is about the average attained by the Canadian economy in the 1990s. The most important thing to note about the simulation is that the results are not simply those of Simulation 1 with changed signs (see Table 7). Compounding matters: 0.3 percent less growth per year does not reduce GDP over 30 years as much as 0.3 percent more growth enhances it. After 30 years, GDP is 7.6 percent below base, while in Simulation 1, with 0.3 percent extra growth, GDP is 8.3 percent above base. There are corresponding proportional effects through the remainder of the results.

While we need not go through the results in detail, one item to note is that the factor of "induced expenditures" works to mitigate the negative impacts of lower productivity growth. For the combined government sector, a 0.3-percent reduction in the productivity growth rate means $66 billion less revenue by 2030, but of this amount $27 billion is "saved" in the form of lower wage expenditures. Nonetheless, there is still a fiscal-impact shortfall of $39 billion, which will have to made up in the form of higher taxes, lower expenditures or less debt paydown. And, as noted in Simulation 1, there is no "induced" effect on the public pension side. Table 7 shows that pension plan revenue would be reduced by $9 billion in 2030 under the assumed lower productivity growth rate. In the base case (see Table 4), the pension plan surplus is only $6 billion in 2030. This would translate into a deficit of $3 billion under the assumed lower productivity growth rate. While this picture does not indicate insolvency — since the pension plans still have large accumulated assets at this point — it does indicate the relative sensitivity of the pension plan system to the underlying productivity growth rate.

Simulation 3: 0.3-Percent Increase in Productivity Growth — No Response of Public-Sector Wages

Simulation 3 assumes the same increase in productivity growth as Simulation 1, but with no response of public-sector wages. As can be seen in Table 8, induced expenditures, aside from the wage response, are very small; therefore, in this simulation virtually all of the increased revenue from higher productivity growth translates into fiscal impact at the combined government level.

Of the government levels, the chief beneficiary of assuming a low wage response is the provincial level. Under the assumptions for this simulation, the federal government is still obliged to increase transfers to the provinces when productivity growth improves, and the federal government — due to transfers and interest payments on the debt — has a smaller share of wage expenditure. Thus, the federal fiscal impact in this simulation increases from $15 to $20 billion — a substantial improvement but much smaller than that at the provincial level, where the impact increases from $18 to $41 billion. Not only do the provinces "save" the expenditure they would have had to make

TABLE 7

Simulation 2: Productivity Growth 0.3-Percent Decrease Per Year — Public-Sector Real Wages Respond (Federal Transfers Respond; Base Interest Rates)

Economic and Fiscal Indicators	2005	2010	2015	2020	2025	2030
Productivity Growth Rate (%)	1.6	1.5	1.5	1.5	1.5	1.4
Change from Base	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Real GDP (billions $2000)	1220	1384	1525	1655	1784	1912
Change from Base	-7	-29	-55	-85	-119	-158
% Change from Base	-0.6	-2.0	-3.5	-4.9	-6.3	-7.6
Real GDP Per Capita (thousands $2000)	38.0	41.6	44.3	46.6	48.9	51.4
Change from Base	-0.2	-0.9	-1.6	-2.4	-3.3	-4.3
Federal Government						
Revenues (billions $2000)	198	209	224	238	253	269
Change from Base	-1	-5	-10	-14	-20	-26
Fiscal Impact of Prod'ty Change (billions $2000) (after change in transfers to provinces)	-1	-3	-6	-8	-11	-14
Fiscal Impact as % of Base Expenditures	-0.6	-1.9	-2.9	-3.7	-4.5	-5.1
Change in Transfers to Provinces (billions $2000)	0	-1	-2	-3	-5	-6
Other Induced Changes in Expenditures (billions $2000)	0	-1	-2	-3	-4	-6
Provincial/Territorial Governments						
Revenues (billions $2000)	244	262	279	299	319	340
Change from Base	-2	-7	-13	-20	-27	-36
Fiscal Impact of Prod'ty Change (billions $2000) (after changes in federal and local transfers)	-1	-4	-7	-10	-13	-16
Fiscal Impact as % of Base Expenditures	-0.4	-1.4	-2.2	-3.0	-3.7	-4.4
Change in Transfers to Local Gov't (billions $2000)	0	-1	-2	-3	-4	-6
Other Induced Changes in Expenditures (billions $2000)	-1	-2	-5	-7	-10	-14
Local Governments						
Revenues (billions $2000)	89	100	111	121	132	144
Change from Base	0	-1	-2	-4	-6	-7
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in provincial transfers)	0	0	-1	-1	-1	-2
Fiscal Impact as % of Base Expenditures	-0.1	-0.3	-0.6	-0.8	-1.0	-1.2
Induced Changes in Expenditures (billions $2000)	0	-1	-2	-4	-6	-7
Canada and Quebec Pension Plans						
Revenues (billions $2000)	43	51	59	65	70	72
Change from Base	0	-1	-2	-4	-6	-9
Fiscal Impact of Prod'ty Change (billions $2000)	0	-1	-2	-4	-6	-9
Fiscal Impact as % of Base Expenditures	-0.5	-2.6	-4.8	-7.0	-9.1	-11.6
Combined Government (Net of Intergovernmental Transfers)						
Revenues (billions $2000)	500	537	573	609	645	679
Change from Base	-3	-13	-23	-36	-50	-66
Fiscal Impact of Prod'ty Change (billions $2000)	-2	-8	-14	-22	-30	-39
Fiscal Impact as % of Base Expenditures	0	-2	-3	-4	-5	-5
Induced Changes in Expenditures (billions $2000)	-1	-5	-9	-14	-20	-27

on their own employees but, because local governments do not have to increase their wage payments (relative to Simulation 1), the provinces need not increase their transfers to the local level. In fact, because the local governments gain some additional revenue and

TABLE 8

Simulation 3: Productivity Growth 0.3-Percent Increase Per Year — No Response of Public-Sector Wages (Federal Transfers Respond; Base Interest Rates)

Economic and Fiscal Indicators	2005	2010	2015	2020	2025	2030
Productivity Growth Rate (%)	2.2	2.1	2.1	2.1	2.1	2.0
Change from Base	0.3	0.3	0.3	0.3	0.3	0.3
Real GDP (billions $2000)	1235	1443	1637	1830	2030	2242
Change from Base	7	29	57	89	127	171
% Change from Base	0.6	2.1	3.6	5.1	6.7	8.3
Federal Government						
Revenues (billions $2000)	201	219	244	268	294	323
Change from Base	1	5	10	15	21	28
Fiscal Impact of Prod'ty Change (billions $2000) (after changes in federal and local transfers)	1	4	8	12	16	20
Fiscal Impact as % of Base Expenditures	0.7	2.4	3.9	5.2	6.4	7.4
Change in Transfers to Provinces (billions $2000)	0	1	2	3	5	7
Other Induced Changes in Expenditures (billions $2000)	0	0	0	1	1	1
Provincial/Territorial Governments						
Revenues (billions $2000)	248	276	306	339	376	415
Change from Base	2	7	14	21	30	39
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in federal transfers)	2	8	14	22	31	41
Fiscal Impact as % of Base Expenditures	0.8	2.8	4.9	6.9	8.9	11.0
Change in Transfers to Local Gov't (billions $2000)	0	0	-1	-1	-1	-2
Other Induced Changes in Expenditures (billions $2000)	0	0	0	0	0	0
Local Governments						
Revenues (billions $2000)	90	101	113	125	138	151
Change from Base	0	0	0	0	0	0
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in provincial transfers)	0	0	1	1	1	2
Fiscal Impact as % of Base Expenditures	0.1	0.3	0.6	0.8	1.0	1.2
Induced Changes in Expenditures (billions $2000)	0	0	0	0	0	0
Canada and Quebec Pension Plans						
Revenues (billions $2000)	44	53	63	73	82	90
Change from Base	0	1	2	4	6	9
Fiscal Impact of Prod'ty Change (billions $2000)	0	1	2	4	6	9
Fiscal Impact as % of Base Expenditures	0.5	2.6	4.8	7.1	9.4	12.0
Combined Government (Net of Intergovernmental Transfers)						
Revenues (billions $2000)	507	565	625	690	760	833
Change from Base	3	13	24	38	54	72
Fiscal Impact of Prod'ty Change (billions $2000)	3	13	24	37	53	70
Fiscal Impact as % of Base Expenditures	1	3	4	6	8	10
Induced Changes in Expenditures (billions $2000)		0	0	0	1	1

the provinces are committed to keeping the local governments in balance, the provinces are actually able to slightly reduce their transfers to the local level. Of course, the huge fiscal impact for the provinces could well end up in increased transfers to local governments, which might be used to increase expenditures (or lower taxes) at the

local level, but this would be a discretionary change.

Finally, note that for the public pension plans the results of this simulation are almost identical to those of Simulation 1. The smaller wage payouts at the government level lead to somewhat reduced pension-plan contributions, but the difference in the fiscal dividend as a percentage of expenditures in 2030 is only 0.3 percent.

Simulation 4: 0.3-Percent Increase in Productivity Growth — No Change in Federal Transfers

Simulation 4 is identical to Simulation 1 except that federal transfers to the provinces are not increased in proportion to the assumed higher growth rate. The net result is a change only in the outcomes for the federal government and the provinces (see Table 9). The results for the combined government, local governments and pension plans are the same as in Simulation 1.

In Simulation 1, the fiscal impacts for the federal and provincial governments are very close as a percentage of base-case expenditures (5.5 percent for the federal government vs. 4.7 for the provinces). In Simulation 4 the balance changes dramatically in favour of the federal government. With no change in transfers to the provinces, the extra 0.3-percent productivity growth results in a fiscal impact equal to 8 percent of base expenditures in 2030, versus an impact of only 2.9 percent at the provincial level.

Simulation 5: 0.3-Percent Increase in Productivity Growth — Interest Rates +0.3 Percent

The final simulation assumes that higher productivity growth is a worldwide phenomenon that increases real interest rates. An arbitrary 0.3-percent increase has been chosen. There is no change in the impact on GDP, compared to Simulation 1, but the results (see Table 10) show a varied impact by level of government.

Since it holds the largest debt at the starting point, the federal government is the most negatively affected. The larger interest payments resulting from the higher interest rates serve to increase induced expenditures and make the fiscal impact of the higher productivity growth path slightly negative in 2005. However, as time passes, the higher cumulative output caused by higher productivity growth generates more and more additional revenue, while the effect of higher interest rates on debt payments actually decreases (since debt is gradually reduced in the base case). By 2030 the fiscal impact on the federal government is 5 percent of base expenditures, instead of the 5.5 percent when interest rates did not change. The primary impact of higher interest rates, therefore, is "up front" and fades over time.

The provinces also have public debt charges that are increased by higher interest rates, but, compared to the federal government, these are smaller in proportion to revenues and expenditures. The fiscal impact of higher productivity growth is reduced from 0.4 to 0.2 percent of base expenditures in 2005, and thereafter fades further. By 2030 the assumed higher interest rates have reduced the fiscal impact as a share of base expenditures from 4.7 to 4.6 percent.

As the local governments have little debt, higher rates make almost no difference to their fiscal profile. To the extent there is

TABLE 9

Simulation 4: Productivity Growth 0.3-Percent Increase Per Year — No Change in Federal Transfers (Public-Sector Real Wages Respond; Base Interest Rates)

Economic and Fiscal Indicators	2005	2010	2015	2020	2025	2030
Productivity Growth Rate (%)	2.2	2.1	2.1	2.1	2.1	2.0
Change from Base	0.3	0.3	0.3	0.3	0.3	0.3
Real GDP (billions $2000)	1235	1443	1637	1830	2030	2242
Change from Base	7	29	57	89	127	171
% Change from Base	0.6	2.1	3.6	5.1	6.7	8.3
Federal Government						
Revenues (billions $2000)	200	219	244	267	294	323
Change from Base	1	5	10	15	21	28
Fiscal Impact of Prod'ty Change (billions $2000) (after changes in federal and local transfers)	1	4	8	12	17	22
Fiscal Impact as % of Base Expenditures	0.7	2.4	3.9	5.4	6.7	8.0
Change in Transfers to Provinces (billions $2000)	0	0	0	0	0	0
Other Induced Changes in Expenditures (billions $2000)	0	1	2	3	5	6
Provincial/Territorial Governments						
Revenues (billions $2000)	248	276	306	339	375	415
Change from Base	2	7	13	21	29	39
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in federal transfers)	1	3	5	7	9	11
Fiscal Impact as % of Base Expenditures	0.3	1.0	1.7	2.2	2.6	2.9
Change in Transfers to Local Gov't (billions $2000)	0	1	2	3	4	6
Other Induced Changes in Expenditures (billions $2000)	1	3	7	11	16	21
Local Governments						
Revenues (billions $2000)	90	103	116	129	144	159
Change from Base	0	1	3	4	6	8
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in provincial transfers)	0	0	1	1	1	2
Fiscal Impact as % of Base Expenditures	0.1	0.3	0.6	0.8	1.1	1.3
Induced Changes in Expenditures (billions $2000)	0	1	3	4	6	8
Canada and Quebec Pension Plans						
Revenues (billions $2000)	44	53	63	73	82	90
Change from Base	0	1	2	4	6	9
Fiscal Impact of Prod'ty Change (billions $2000)	0	1	2	4	6	9
Fiscal Impact as % of Base Expenditures	0.5	2.6	4.9	7.2	9.6	12.3
Combined Government (Net of Intergovernmental Transfers)						
Revenues (billions $2000)	508	566	628	694	765	840
Change from Base	3	14	26	41	58	78
Fiscal Impact of Prod'ty Change (billions $2000)	2	8	15	23	32	42
Fiscal Impact as % of Base Expenditures	0	2	3	4	5	6
Induced Changes in Expenditures (billions $2000)	1	6	11	18	26	36

any change at all, it is positive, as interest earnings rise slightly.

Finally, the public pension plans gain from higher real rates as their accumulated surpluses earn higher returns. By 2030, the fiscal impact of higher productivity with higher interest rates is 12 percent of base expenditures, as opposed to

TABLE 10

Simulation 5: Productivity Growth 0.3-Percent Increase Per Year — Interest Rates 0.3-Percent Increase (Public-Sector Real Wages Respond; Federal Transfers Respond)

Economic and Fiscal Indicators	2005	2010	2015	2020	2025	2030
Productivity Growth Rate (%)	2.2	2.1	2.1	2.1	2.1	2.0
Change from Base	0.3	0.3	0.3	0.3	0.3	0.3
Real GDP (billions $2000)	1235	1443	1637	1830	2030	2242
Change from Base	7	29	57	89	127	171
% Change from Base	0.6	2.1	3.6	5.1	6.7	8.3
Federal Government						
Revenues (billions $2000)	201	220	244	267	294	322
Change from Base	2	6	10	15	21	27
Fiscal Impact of Prod'ty Change (billions $2000) (after changes in federal and local transfers)	0	2	5	7	10	13
Fiscal Impact as % of Base Expenditures	-0.3	1.1	2.3	3.3	4.2	5.0
Change in Transfers to Provinces (billions $2000)	0	1	2	3	5	7
Other Induced Changes in Expenditures (billions $2000)	2	3	4	5	6	7
Provincial/Territorial Governments						
Revenues (billions $2000)	248	276	306	339	375	415
Change from Base	3	8	14	21	29	39
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in federal transfers)	0	3	6	10	13	17
Fiscal Impact as % of Base Expenditures	0.2	1.2	2.1	3.0	3.8	4.6
Change in Transfers to Local Gov't (billions $2000)	0	1	2	3	4	6
Other Induced Changes in Expenditures (billions $2000)	2	4	6	8	11	15
Local Governments						
Revenues ($2000 Bill)	90	103	116	129	144	159
Change from Base	0	1	3	4	6	8
Fiscal Impact of Prod'ty Change (billions $2000) (excluding change in provincial transfers)	0	0	1	1	1	2
Fiscal Impact as % of Base Expenditures	0.2	0.4	0.6	0.9	1.1	1.3
Induced Changes in Expenditures (billions $2000)	0	1	3	4	6	8
Canada and Quebec Pension Plans						
Revenues (billions $2000)	44	54	64	74	84	93
Change from Base	0	1	3	5	8	12
Fiscal Impact of Prod'ty Change (billions $2000)	0	1	3	5	8	12
Fiscal Impact as % of Base Expenditures	0.7	3.6	6.6	9.6	12.5	15.7
Combined Government (Net of Intergovernmental Transfers)						
Revenues (billions $2000)	509	567	629	696	767	843
Change from Base	5	14	26	39	55	73
Fiscal Impact of Prod'ty Change (billions $2000)	0	7	14	22	32	43
Fiscal Impact as % of Base Expenditures	0	1	3	4	5	6
Induced Changes in Expenditures (billions $2000)	5	8	12	17	23	30

only 9 percent when real rates did not change. In 2030 also, the positive impact on the pension plans is actually slightly greater than the negative impact of higher interest charges at the federal and provincial levels, and the combined government account shows a slight increase in the overall fiscal impact.

CONCLUDING OBSERVATIONS — AND WORK TO BE DONE

The simulations described above indicate that even relatively small changes in productivity growth rates can cumulate over several decades into large changes in GDP and living standards, and can significantly alter the fiscal room to manoeuvre of the federal and provincial governments and the public pension plans. This is true whether we are contemplating higher productivity growth rates or lower ones.

Of the sensitivities tested, the most important one turned out to be the response of government-sector wages to changes in private-sector real wages that would likely occur under alternative productivity growth rates. If higher productivity growth passes through to higher public-sector wages (as would seem likely), then the fiscal impact of higher productivity growth is muted. Under higher productivity growth, some of the increased government revenues simply go to pay higher public-sector wages. If, on the other hand, productivity growth is lower than thought, then the negative impact on government is partly offset by a reduction in government-wage rates. This effect is important for the provincial level of government, somewhat less so for the federal level and barely discernable for the public pension plans.

If real interest rates move with higher or lower productivity growth rates, the fiscal impact is on average very small. An interest-rate response mutes the impact of changes in productivity growth for the federal and provincial governments, primarily in the near term. On the other hand, the fiscal impact on the public pension plans is amplified by an interest-rate response.

This study is only the beginning of an inquiry into the interconnections between productivity and fiscal policy. At least two groups of issues remain to be addressed.[7]

First, we have discussed only how productivity growth affects the fiscal room to manoeuvre. Undoubtedly fiscal policy also has important feedbacks for productivity growth. How the fiscal room to manoeuvre is used can make a significant difference: some tax cuts or expenditure increases could raise productivity growth, through either improved technology or capital accumulation, while some badly designed new social programs could serve to reduce incentives and productivity growth. Also, feedback from fiscal policy to productivity becomes more important the further out the projections go. The possibilities are too numerous, and the connections to productivity too imprecise, to be included in a macroeconometric model, but the problem is an important one. The question also arises: What is the best use of fiscal room in order to further raise productivity growth? Clearly, though, this represents a large and separate research agenda.

Second, the issue of whether a productivity change is confined to Canada or is universal also has implications that cannot be modelled. In particular, a general increase in productivity could lead to extended fiscal room to manoeuvre in many countries, some of which would likely be used — especially in the United States — to lower tax rates. Canada might well be obliged to devote some of its fiscal room to manoeuvre to matching such tax cuts, thereby reducing the amount of the extra room to manoeuvre that is truly discretionary and that could be devoted to social programs.[8]

NOTES

I would like to thank Andrew Sharpe and an anonymous referee for extremely useful comments on an earlier draft. Any remaining errors are my own.

1 For a discussion of some of these issues about future alternative productivity growth paths, see Dungan and Wilson (2002) and other papers in the same volume.

2 The projection was prepared before the release of census 2001 data; while the population figures may seem high compared to the census figures released in early 2002, it must be kept in mind that the latter will eventually be inflated by an under-reporting factor by Statistics Canada before they become the official population figures.

3 Output per hour is a superior productivity measure when available, but reliable and consistent long-term time series data have been difficult to obtain for the model.

4 The argument is sometimes made that higher productivity growth pushed down the full-employment unemployment rate in the second half of the 1990s, especially in the United States. However, it could be that we simply did not know what the rate was before then, after the early 1990s recession and recovery, and that it had been lower than we thought all along. This is certainly the author's opinion about the Canadian full-employment rate, which, to the extent that it did decline, did so for reasons of an aging work force and a stiffening of Employment Insurance qualifications and reduced payout rates.

5 Theoretical macroeconomics makes labour supply a function of the real wage, but the empirical evidence is slim. In the FOCUS macroeconometric model, labour force participation is a function of employment availability, and, for some age/sex groups, leniency of EI regulations and relative cohort size, but it is not a function of the real wage.

6 The discussion here is the proper measure of the fiscal room to manoeuvre, not how to make use of it. The compounding effect of early debt paydown is a strong argument in favour of using some fiscal room to manoeuvre for this purpose. There is, however, a re-entry problem to be kept in mind: the more rapidly one approaches an "optimal" debt/GDP level (whatever it might be), the more rapidly fiscal policy must be switched to tax cuts or expenditure increases, with potentially wrenching effects on the industrial make-up and skills set of the economy.

7 I am indebted to an anonymous referee for much of what follows.

8 The dilemma, of course, is greater still if the productivity increase occurs in other countries and not in Canada, leading to pressures to cut taxes with no compensating additional fiscal room.

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