Trends and Cycles in Montana Income Tax Data: Implications for Revenue Forecasting

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Introduction and Summary

The Montana income tax forecasting process starts with the population of resident returns for the latest year, applies growth factors to each line item to account for projected growth in per-capita income, calculates tax liability for the population of adjusted returns, and then applies an overall growth factor to account for projected population growth. This implicitly assumes that all subpopulations defined by filing status, number of dependents, or use of a specific income or deduction line item grow in proportion. This assumption has not held true for many subpopulations in the recent past. Twelve items that can be used to define subpopulations were examined, and for ten of the twelve, subpopulations were found to have had different growth rates in the recent past. In one other case, it is not clear whether subpopulations have growth at different rates. For these eleven cases, simulations were run with different subpopulation growth rates, and three cases were identified where this materially affected the revenue forecast.

Section I explains the Montana income tax forecasting process. Section II examines growth rates of various return sub-populations and identifies ones where the assumption of uniform growth appears to have been violated. Section III describes the simulations with different subpopulation growth rates and their results. Section IV discusses the implications for forecasting.

I. The Montana Income Tax Forecasting Process

The Montana income tax forecasting process can be broken down into five steps.

The first step is forecasting growth rates for income and deduction line items, credits, and the population of taxpayers. This is the part of the process that takes the most time, effort, and judgement. The other steps are mostly mechanical. The output of this step is six years of annual per-capita growth factors to apply to each line item on individual returns.

The second step is to run a simulation model that calculates tax liability for each of the next six years for each of the last year's resident returns, with each line item multiplied by the corresponding growth factor for the forecast year. Tax liabilities for individual returns are summed to give a six year forecast of total tax liability for a fixed population of tax returns. At the time the forecast is adopted by the legislature, the six years are the just completed year for which tax returns have not been filed, the current year, and four years into the future.

The third step is to multiply each year's forecast of fixed-population tax liability by the population growth factor for that year and by an adjustment factor for non-residents and part-year residents.

The fourth step is to convert the forecast of calendar year tax liability to a forecast of fiscal year revenue before credits and audit revenue.

The final step is to subtract the sequence of forecasts of credits and add the sequence of forecasts of audit revenue to give a forecast of net revenue by fiscal year.
The process can be expressed using the following formulas:

Let TY_{it} be forecast taxable income for taxpayer *i* in year *t*. Let Y_i, A_i , S_i and D_i be column vectors of line items for federal adjusted gross income, state additions to federal adjusted gross income, state subtractions from federal income, and itemized deductions, and let α_t, β_t, η_t, and δ_t be the corresponding row vectors of growth factors for year *t*. Let E_i be the number of exemptions claimed by taxpayer *i* and π_t be the value of an exemption in year *t*. Montana has a unique standard deduction. It equals 20% of adjusted gross income with maximum and minimum amounts. Let $\sigma_{min,t}$ and $\sigma_{max,t}$ be the minimum and maximum standard deductions for year t, then, to a first approximation,

$$(1) \quad TY_{it} = \alpha_t Y_i + \beta_t A_i - \eta_t S_i - \max\left(\delta_t D_i, min\left(\sigma_{max,t}, \max\left(\sigma_{min,t}, 0.2(\alpha_t Y_i + \beta_t A_i - \eta_t S_i)\right)\right)\right) - \pi_t E_i.$$

This is slightly oversimplified, since some itemized deductions and state subtractions have caps, floors, or other complications.

Montana has seven rate brackets and gives preferential treatment to capital gains income through a non-refundable credit equal to 2% of capital gains. Let CG_i be taxpayer *i*'s capital gains income and let *R* be the function defined by the rate table. Then individual *i*'s tax liability for year *t* is

$$(2) \quad TL_{it} = max(0, R(TY_{it}) - 0.02 * CG_i).$$

Total tax liability for a forecast year is the sum of individual tax liabilities for that year multiplied by a growth factor, γ_t, and an adjustment factor for non-resident and part-year resident taxpayers, ϕ_t:

$$(3) \quad TL_t = \gamma_t \varphi_t \sum_i TL_{it}.$$

This sequence of forecasts of calendar year tax liability is converted to a sequence of growth factors for fiscal year revenue. This has been done in several ways over the years. The most common has been to split tax liability for each calendar year between two fiscal years to give a sequence of fiscal year liability forecasts and then calculate growth factors from the ratios of the forecasts for future fiscal years to actual base year revenue:

$$(4) \quad g_\tau = \frac{FYTL_\tau}{FYTL_0} = \frac{\varepsilon TL_{\tau-1} + (1-\varepsilon) TL_\tau}{FYTL_0}.$$

where $FYTL_0$ is the back-cast of revenue for the most recently completed fiscal year.

Other approaches that have been used are to calculate growth factors directly from the calendar year forecast and ignore the six month timing difference, as in

$$(4') \quad g_\tau = \frac{TL_{\tau-1}}{TL_{-1}},$$

and to forecast future fiscal year revenue growth from a regression of past revenue growth on past calendar year tax liability growth.

However the growth factors are calculated, they are then applied to revenue for the most recently completed fiscal year, adjusted for credits ad audit revenue. Then forecast credits are subtracted and forecast audit revenue is added to give the forecast of net revenue by fiscal year:

$$(5) \quad FYR_\tau = g_\tau(FYR_0 + C_0 - AR_0) - C_\tau + AR_\tau.$$

As equations (1) and (2) show, there is some degree of nonlinearity in the Montana income tax. This nonlinearity can result in an incremental dollar of income yielding a different amount of tax depending on the type of income and who receives it. This is the source of potential bias from assuming uniform growth for all subpopulations.

II. Growth Rates of Subpopulations of Income Tax Filers

As shown in Equation (3), the Montana forecasting process applies a uniform growth factor to all individual returns. This implicitly assumes that, for all ways that the population of tax returns can be divided into subpopulations, each subpopulation has the same growth rate as the population as a whole. Another way to say this is that changes in the total amount of income reported on a line are assumed to be due to changes in the average amount individual taxpayers report on that line rather than to changes in the proportion of taxpayers using that line.

The population of returns can be divided into subpopulations in many ways, such as by filing status, by age, by whether the taxpayer claims dependents, and by whether the taxpayer uses a particular line item. The next three subsections look at one item where the proportional growth assumption appears to be satisfied and two items where it appears to be violated in different ways.[1] These are followed by a partial list of ways the population can be split into subpopulations and whether the proportional growth assumption appears to hold for each.

Subpopulations With and Without Wage and Salary Income

Figure 1, on the next page, shows the proportion of returns with wage and salary income and the proportion of total income from wages and salaries for the years 1998 through 2014.

The assumption of proportional growth appears to be satisfied when the population is divided into returns that report income on the wage and salary line and those who do not. The proportion of returns with income from wages and salaries has been quite stable, varying only between 80.0% and 81.8%. There is no trend over time, and what variation there is does not follow business cycles. The proportion of income from wages and salaries does vary counter-cyclically, increasing in the 2001 and 2007-2009 recessions and decreasing during recoveries and boom periods. This is primarily due to cyclic changes in income reported on other lines rather than to short-term changes in average wage and salary income. As is assumed by the forecasting process, growth in wage and salary income appear to be due to growth in the average amount of wage and salary income, not in the proportion of taxpayers reporting it.

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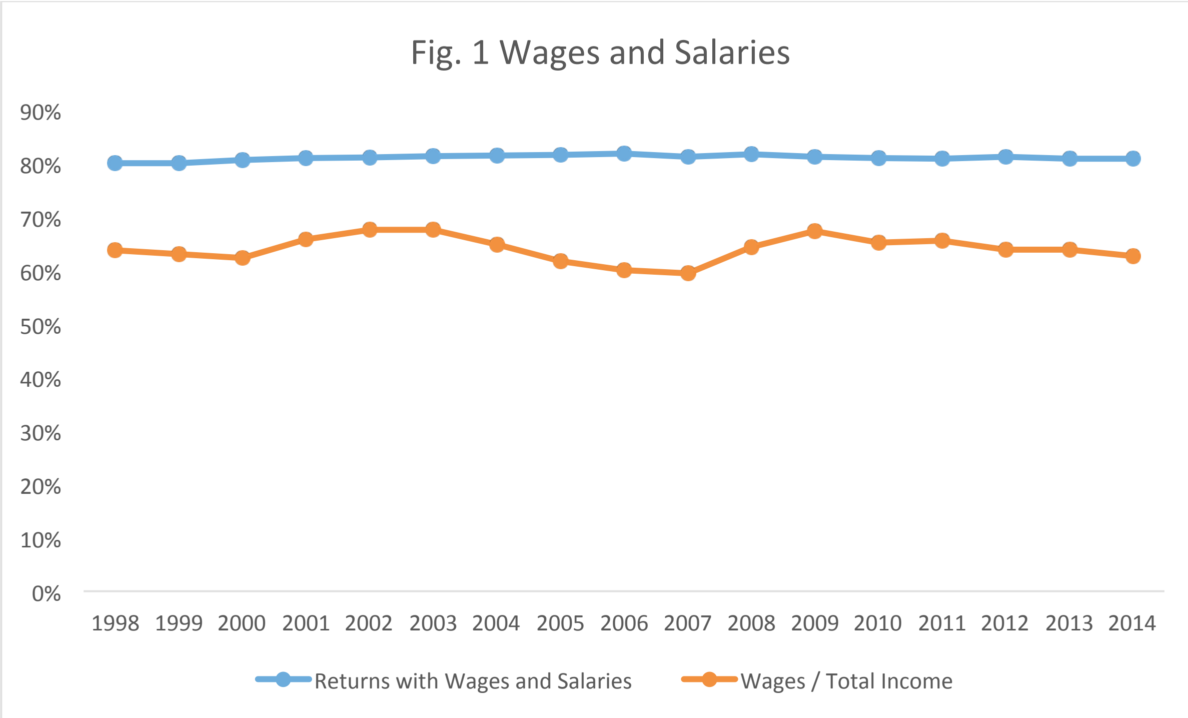
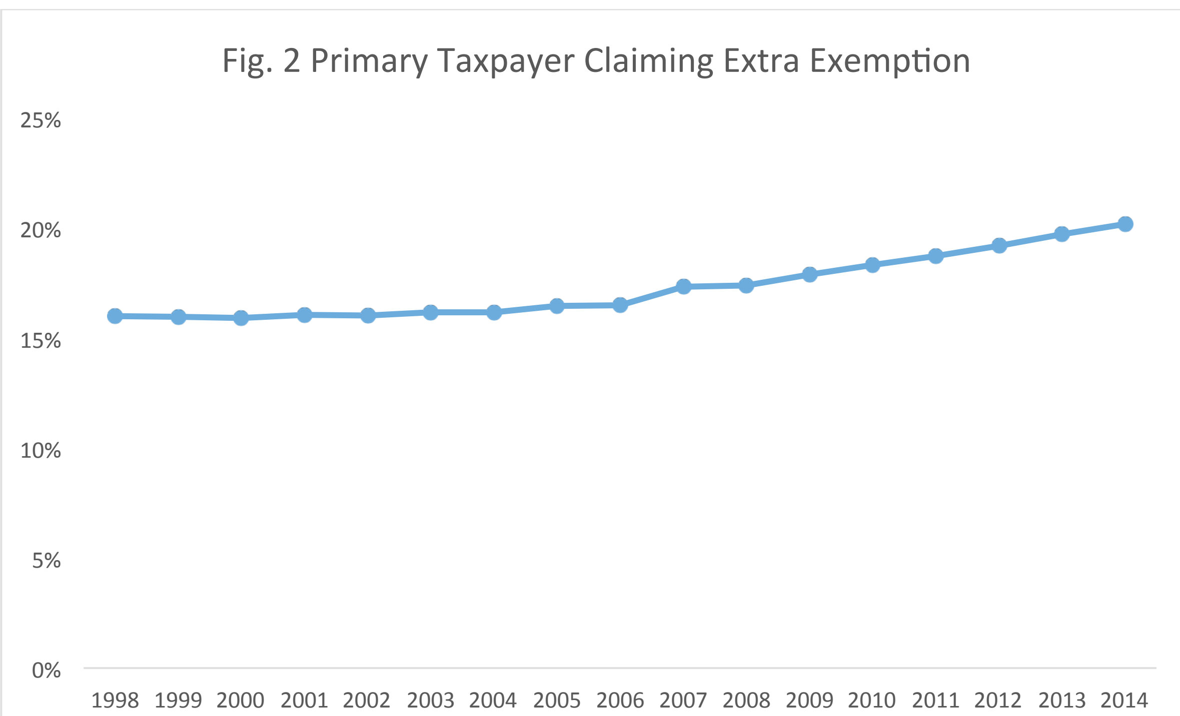
[1]No rigorous statistical tests are reported here because the goal of this paper is to examine whether the forecasting process is sensitive to violations of the proportional growth assumption, not to determine definitively which subpopulations do and do not grow proportionally.



Subpopulations Over and Under Age 65

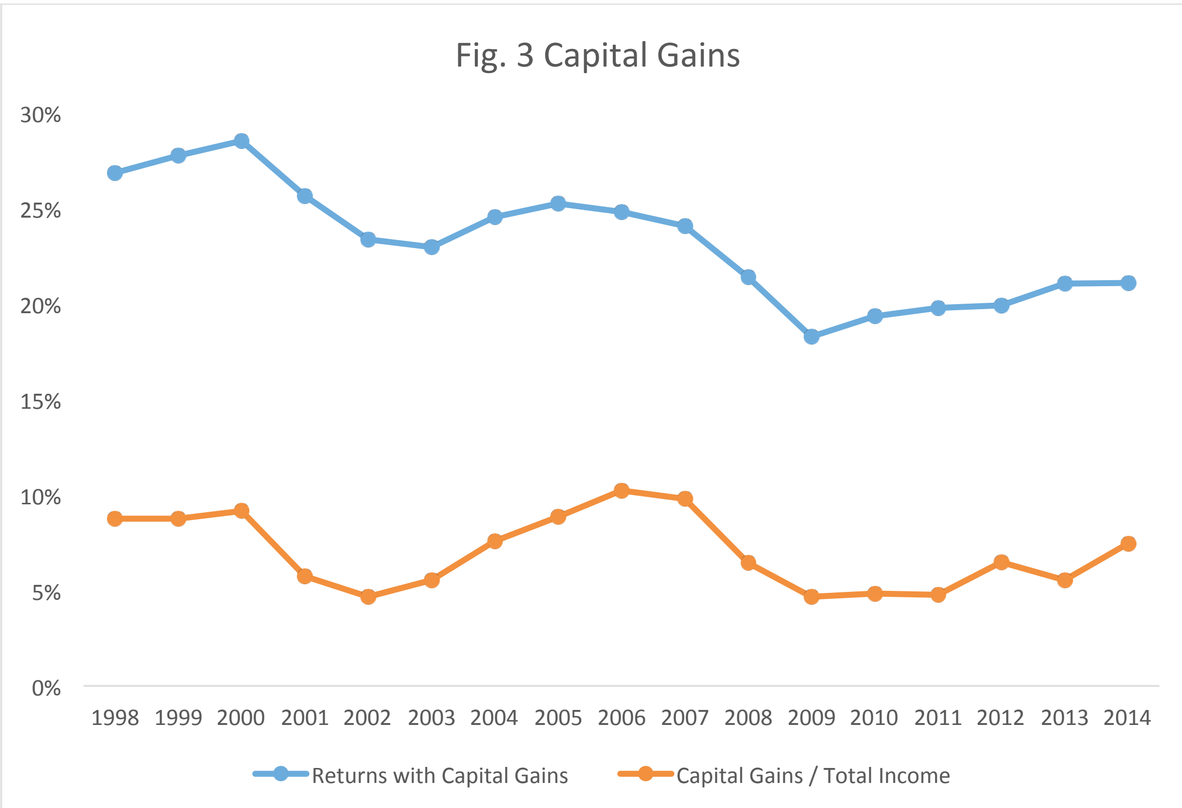
Montana allows taxpayers age 65 or older to claim an extra personal exemption. This is one source of non-linearity in the Montana income tax. Figure 2 shows the proportion of returns claiming an extra exemption for the primary taxpayer.



The proportion of returns with the primary taxpayer claiming an extra exemption has increased from 15.9% to 20.2%, with most of the increase coming after 2006. The assumption of proportional growth appears not to hold for subpopulations defined by whether they are age 65 or older.

Subpopulations With and Without Capital Gains or Losses

Montana law provides preferential taxation of capital gains, which is another source of non-linearity in the Montana income tax. Figure 3 shows the proportion of returns with capital gains or losses and the proportion of total income from capital gains.



The proportion of returns with capital gains has varied from a high of 28.5% in 2000 to a low of 18.3% in 2009. There is strong cyclic variation, and there may be a downward trend, but the apparent trend could just be from the starting and ending points being at different points in the business cycle and from the severe 2007-2009 recession having produced a larger drop than the milder 2001 recession.

The proportion of income from capital gains shows a similar pattern, and the variation in capital gains income is partly from changes in the average gain reported by taxpayers reporting a capital gain or loss and partly from changes in the proportion of taxpayers reporting a capital gain or loss.

The assumption of proportional growth appears not to hold for subpopulations defined by whether taxpayers reported capital gains.

Which Subpopulations Have Grown Proportionally?

Table 1, on the next page shows twelve items on which the population of returns may be divided into subpopulations and whether the assumption of proportional growth appears to be satisfied for the long term and over the business cycle when the population is divided along this dimension. The items include whether the taxpayer reports each of the major items of income, whether the primary taxpayer is age 65 or over, and whether the taxpayer claimed dependents. Graphs showing the history for these items are in Appendix 1. Eight of the items have trends that appear to violate the assumption of proportional growth and at least two have variations over the business cycle that appear to violate the assumption. For one item it is not clear.

Table 1. Applicability of Proportional Growth Assumption		
item	trend	cycle
Wage and salary income	Applies: Proportion of returns with wages and salaries approximately constant. Ratio of highest to lowest is 1.02.	Applies: Cyclic variation is primarily due to change in wages per capita rather than in proportion with wages.
Taxable interest	Does not apply: Long term downward trend in proportion of returns with interest. Ratio of highest to lowest is 1.81.	Maybe: Cyclic variation is a combination of changes in proportion with interest and in per capita interest.
Dividends	Does not apply: Long term downward trend in proportion of returns with dividends. Ratio of highest to lowest is 1.46.	Applies: Cyclic variation is primarily due to changes in dividends per capita.
Sole proprietor income (Sched C)	Does not apply: Long term downward trend in proportion of returns with Schedule C income. Ratio of highest to lowest is 1.17	Maybe: Cyclic variation is relatively small.
Capital gains	Hard to tell: Large changes, but it is not clear whether there is trend or just data starting and ending at different points in the cycle.	Does not apply: Cyclic variation is a combination of changes in the proportion with capital gains and in per capita gains.
Pass-through and passive income (Sched E)	May apply: There is variation but no obvious long-term trend. Ratio of highest to lowest proportions is only 1.09	Probably applies: Strong cyclic variation in per capita Sched E. Small changes in proportion do not seem to follow business cycles.
Taxable Social Security	Does not apply: Long term upward trend in proportion of returns with social security. Ratio of latest year to earliest year is 2.02	Probably applies: Cyclic variation in both proportion of returns with social security and per capita social security, but both small.
Taxable IRA distributions	Does not apply: Long term upward trend in proportion of returns with taxable IRA distributions. Ratio of latest year to earliest year is 1.55	Maybe not: Cyclic variations in both proportion of returns with IRA income and in mean IRA income.
Taxable pensions and annuities	Does not apply: Long term upward trend in proportion of returns with social security. Ratio of latest year to earliest year is 1.13	Probably not: Cyclic variation is almost all in proportion of returns with retirement income, not in per capita amount.
Dependents	Does not apply: Long term downward trend in proportion of returns with dependents. Ratio of earliest year to latest year is 1.16	Maybe not: Some cyclic change in proportion of returns with dependents.
Age 65+ checked for primary taxpayer	Does not apply: Long term upward trend in proportion. Ratio of latest year to earliest is 1.27. Almost all of increase since 2004.	Probably: Little cyclic variation in proportion of returns with age 65+ checked.
Filing Status	Does not apply: Single filers growing twice as fast as separate returns on same form and seven times as fast as joint returns.	Maybe not: Some cyclic movement between joint (single income) and separate on same form (two incomes)

III. Does Non-Proportional Growth of Subpopulations Affect the Forecast?

The second and third steps of the forecasting process take the latest year's tax returns, apply growth factors to each line item, calculate tax liability for each return with the changed line items, and then calculate a weighted sum of the individual tax liabilities, where each return's weight is the growth factor for the forecast year. This assumes that the populations of returns in future years will look like the population in the latest year, in terms of the proportions of returns using each filing status, the proportions with different numbers of dependents, the proportions over and under age 65, and the proportions reporting an amount on each income or deduction line. The only differences are that future years' populations are larger and that the amounts on various line items are all increased or decreased.

This assumption of proportional growth is violated to a greater or lesser degree for a number of subpopulations. Does this bias the forecasting process? In other words, would replacing equation (3), and its uniform weights, with

$$(3') \quad TL_t = \varphi_t \sum_i \gamma_{it} TL_{it},$$

where different growth factor weights are applied to different sub-populations, result in a significantly different forecast?

If the income tax applied the same perfectly linear tax structure to all taxpayers, the answer would be "no." If there were no non-linearities in the determination of taxable income and there was a single rate, an extra dollar of income would result in the same amount of revenue regardless of who received it or which line it was reported on. For Montana, the calculation of taxable income, as embodied in Equation (1), contains some non-linearities, and the tax calculation, as embodied in Equation (2) is non-linear because of the multiple rates and the preferential treatment of capital gains.

Whether these non-linearities have a significant effect on the forecast can be explored by dividing the base year returns into subpopulations and applying different growth weights to different subpopulations. This section reports the results of eleven such experiments.

In the base case, a uniform growth rate of 0.96% was applied to the entire population. This is the average annual rate of growth of resident returns from 2006 to 2014.

A change case was constructed for each scenario with different subpopulation growth rates. The procedures used for setting subpopulation growth rates are not the result of an attempt to develop optimal forecasts. The goal here is to try to identify whether ignoring differences in subpopulation growth rates might be a problem, not to provide a solution. To that end, the various scenarios were constructed so as to differ from the base case as little as possible in ways other than by having different subpopulation.

For eight of the change cases, where two subpopulations have different growth trends, the following procedure was followed. The population of returns was divided into two subpopulations. Each subpopulation was grown at its average annual growth rate from 2006 to 2014. The resulting proportions of the population in each subgroup were calculated for each year. These proportions were applied to the baseline forecast of the total population to give forecasts of the subpopulations that are consistent with the baseline forecast of the total population. The resulting subpopulation forecasts were then converted to annual growth factors. This two step process of forecasting subpopulation numbers was followed to ensure that any differences from the baseline forecast are due to different subpopulation proportions rather than to a change in the forecast of total population.

The per-capita growth rates for the line item defining the subpopulations was adjusted to keep the totals for that line item the same as in the base case. Then the simulation program was run on each subpopulation of base-year returns to forecast fixed-population tax liability for each sub-population. These were weighted by the subpopulation growth factors and summed to give a forecast of total tax liability.

This procedure was used for cases that divided the population into subpopulations that did and did not have interest income, dividend income, income from a sole proprietor business, taxable social security benefits, taxable IRA distributions, and pension income. It also was used for cases with subpopulations defined by whether the taxpayer claimed dependents and whether the taxpayer claimed an extra exemption for being age 65 or older.

In two cases, essentially the same procedure was followed, but with more subpopulations. In one, the population was divided into three subpopulations depending on whether the return had a positive amount, a negative amount, or zero on the line for income from a pass-through entity or passive investments (Schedule E). In the other, case, the population was divided into five subpopulations based on filing status: single, joint (generally chosen by single-income couples), separate on the same form (generally chosen by two-income couples), separate not on the same form (chosen by less than 2% of taxpayers), and head of household.

Table 2 shows the subpopulation growth rates for these cases.

Table 2. Subpopulation Growth Rates

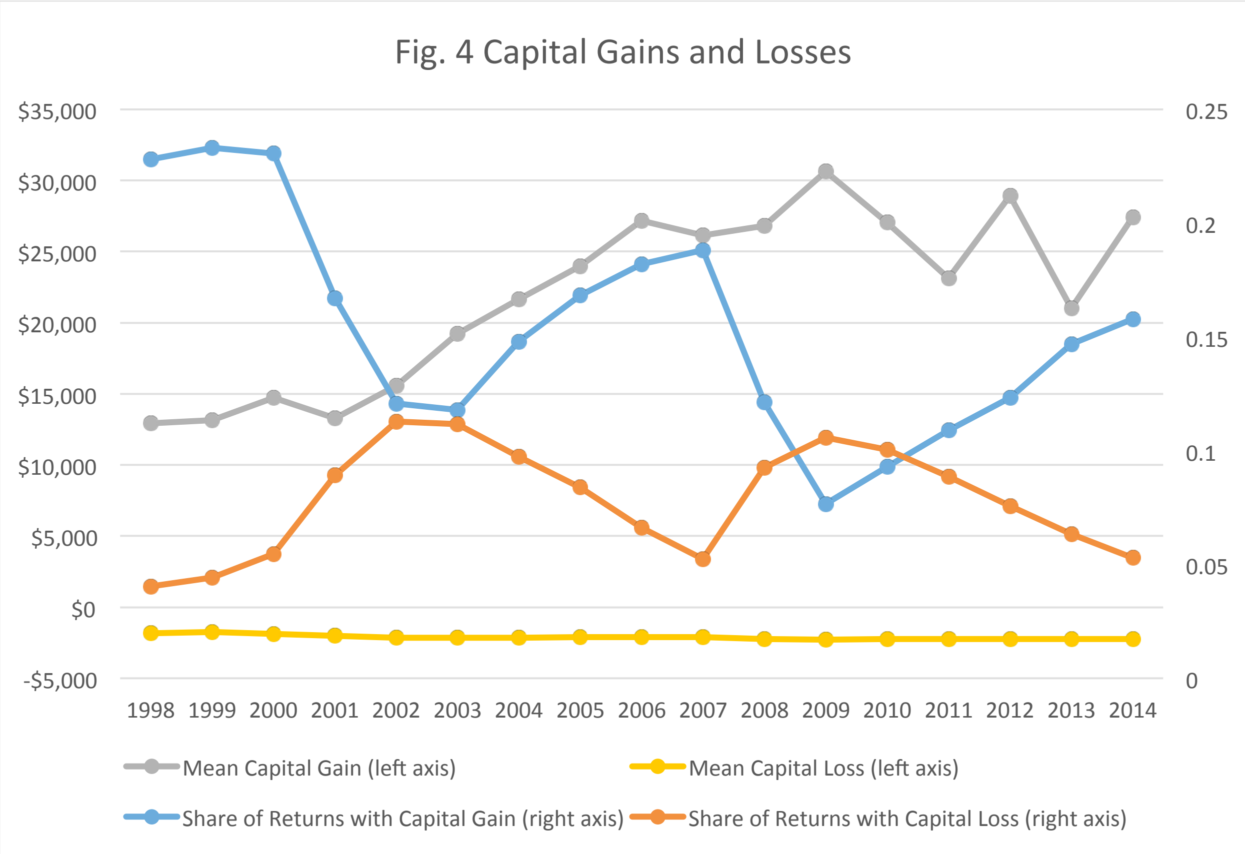
	With Item	Without Item	Difference
Interest	-4.08%	4.98%	-9.06%
Dividends	-1.76%	1.83%	-3.59%
Sole Proprietor Income	-0.37%	1.24%	-1.61%
Social Security	5.25%	0.32%	4.93%
IRA Distributions	4.47%	0.61%	3.86%
Pensions and Annuities	2.05%	0.69%	1.36%
Dependents	0.10%	1.31%	-1.21%
Age 65+	3.53%	0.40%	3.13%

	Positive	Negative	Zero
Pass-Through and Passive Income	1.62%	1.17%	0.0084

Filing Status	Single	Joint	Separate Same Form	Separate Not Same Form	Head of Household
	1.40%	0.20%	0.74%	1.92%	0.69%

In the final case, the population was divided based on whether a return shows a positive amount, a negative amount, or zero on the line for capital gains. Since the proportional growth assumption appears to be violated for these subpopulations primarily for business cycle changes, a different procedure was followed.

Figure 4 shows the proportions of returns with capital gains and losses and the average of reported gains and losses from 1998 through 2014.



The proportion of returns with capital gains follows a strongly pro-cyclical pattern, with large drops during and after recessions and increases during recoveries and booms. The proportion of returns with capital losses follows a pattern that is almost the mirror image of the pattern for returns with gains. It increases during recessions and decreases during recoveries.

Average gains have followed a relatively complex pattern. They showed little change from 1998 through 2001. This was followed by a steady increase through 2006, with the average gain being about twice as large in 2006 as in 2001. Since 2006, the level of average gains has stayed high but with increased year to year variation.

In contrast, the average loss has changed little over time. This is probably because most taxpayers with losses are constrained by the limit of $3,000 on capital losses that can be used to offset ordinary income in one year.

In constructing this case, the baseline forecast of total net gains was taken as given, and the other assumptions were chosen to give the baseline totals while approximating the observed patterns.

The line-item per-capita growth rate was set to zero for the subpopulation with losses. Regressions were used to estimate two relationships between the growth rates for mean gain and the numbers of returns with gains and losses:

$$(7) \quad mean\ gain\ growth\ rate = 0.06104 - 0.0808\ number\ of\ gains\ growth\ rate$$

and

$$(8) \quad number\ of\ losses\ growth\ rate = -1.0895\ number\ of\ gains\ growth\ rate\ .$$

This leaves the growth rate for the number of gains as a free parameter which was set for each year to make the sum of gains and losses from the subpopulations equal the total net gains in the baseline forecast.

The distribution of capital gains and losses within the income distribution is very skewed, with capital gains concentrated at the high end of the income distribution. Because of this, just taking the subpopulations of returns with positive, negative, and zero capital gains in the base year and changing their weights in the forecast years would shift the whole income distribution. Increasing or decreasing the weight assigned to returns with capital gains would, in effect, increase or decrease the proportion of returns with high incomes.

To minimize distortions of the income distribution, the population was divided into percentiles of total income and then each percentile was further divided into groups with positive, negative and zero capital gains. The growth factors were applied separately to these 300 subpopulations.

Table 3, on the following page, shows the results of these experiments. With 2014 as the base year, it shows total tax liability for the base case and the absolute and percentage differences for each of the change cases.

Table 3. Impact on Revenue Forecast of Dividing Population into Sub-Populations with Different Growth Rates
Subpopulations With and Without Types of Income or Other Attributes

Year	Baseline Tax Liability ($ million)	Taxable Interest		Dividends		Sole Proprietor Income (Schedule C)		Capital Gains		Pass-Through and Passive Income		Taxable Social Security		Taxable IRA Distributions		Taxable Pensions and Annuities		Dependents		Age 65+		Filing Status	
		$ million	%	$ million	%	$ million	%	$ million	%	$ million	%	$ million	%	$ million	%	$ million	%	$ million	%	$ million	%	$ million	%
2015	1027.998	-23.547	-2.3%	-6.549	-0.6%	1.613	0.2%	9.494	0.9%	3.448	0.3%	1.538	0.1%	-2.755	-0.3%	-5.601	-0.5%	-1.079	-0.1%	0.080	0.0%	-1.747	-0.2%
2016	1086.908	-48.286	-4.4%	-13.280	-1.2%	5.473	0.5%	10.725	1.0%	9.713	0.9%	2.675	0.2%	-7.045	-0.6%	-16.323	-1.5%	-2.242	-0.2%	0.310	0.0%	-3.652	-0.3%
2017	1144.897	-72.404	-6.3%	-19.192	-1.7%	8.181	0.7%	17.472	1.5%	13.459	1.2%	2.983	0.3%	-13.440	-1.2%	-33.366	-2.9%	-3.544	-0.3%	0.455	0.0%	-5.695	-0.5%
2018	1198.844	-96.013	-8.0%	-24.218	-2.0%	10.090	0.8%	28.451	2.4%	7.451	0.6%	2.488	0.2%	-21.609	-1.8%	-55.136	-4.6%	-4.965	-0.4%	0.547	0.0%	-7.868	-0.7%
2019	1260.625	-121.587	-9.6%	-30.096	-2.4%	12.857	1.0%	35.703	2.8%	0.685	0.1%	2.967	0.2%	-28.157	-2.2%	-73.020	-5.8%	-6.552	-0.5%	0.556	0.0%	-10.251	-0.8%
2020	1327.715	-147.893	-11.1%	-35.851	-2.7%	16.392	1.2%	43.300	3.3%	-5.885	-0.4%	4.152	0.3%	-34.415	-2.6%	-90.941	-6.8%	-8.302	-0.6%	0.524	0.0%	-12.835	-1.0%

Montana has a biennial budgeting process. As the legislature meets in the second half of one fiscal year, it adopts a budget for the following two fiscal years. The income tax forecast produced in the fall before the legislative session begins in January uses the returns from the previous calendar year to forecast revenue for the current fiscal year and the next two fiscal years. This requires the forecasting process to produce four calendar-year tax liability estimates, a backcast of tax liability for the just-completed calendar year and three years of forecasts. Table 3 shows six years of forecasts, but only the four years from 2015 through 2018 would be used in the budgeting process. Violations of the assumption of proportional growth can safely be ignored if correcting for them has a negligible effect within this four-year forecasting window.

In five cases, the difference from baseline revenue is less than 1% in all four years from 2015 through 2018. These are the cases where subpopulations are defined by whether the taxpayer has income from a sole proprietor business, whether the taxpayer has taxable social security benefits, whether the taxpayer has dependents, whether the taxpayer is age 65 or over, and by filing status. These are all cases where subpopulations have different growth trends, and in some cases those differences are relatively small.

In three more cases, the maximum difference from the baseline in 2015 through 2018 is 2% or less. These are the cases where subpopulations are defined by whether the taxpayer has dividends, pass-through and passive income, or taxable IRA distributions. These also are cases where subpopulations have different growth rates, but the differences are relatively small.

The three cases with larger differences are where subpopulations are defined by whether the taxpayer has interest income, taxable pension income, or capital gains or losses. These cases have some important differences from the others.

With interest income, there has been a large reduction in the proportion of returns with an amount on this line and the two subpopulations are both large. This contrasts with some of the other cases where one subpopulation is growing rapidly but is a relatively small proportion of the population and the revenue difference from taking subpopulations into account is smaller.

With pension and annuity income, the subpopulation with an amount on this line is growing about three times faster than the subpopulation without. This subpopulation also has considerable overlap with other subpopulations growing faster than the general population - taxpayers age 65 or over, taxpayers with social security income, and taxpayers with IRA income.

With capital gains or losses, there are large cyclic changes in the proportion of returns with an amount on this line.

Interest

From 1998 to 2014, the proportion of returns reporting interest income was cut almost in half, from 62.7% to 34.6%.

Interest is a fixed payment for the use of another's money. A taxpayer may receive interest from a financial institution where they have an account, from a business or government whose bonds they hold, or from an individual or business loan such as a mortgage. There may be a number of reasons why the proportion of individuals reporting interest has fallen over time.

One possibility is that people may have moved funds out of interest bearing accounts and bonds and into other assets because of falling interest rates. Interest rates generally have fallen since the early 1980s. Yields on Aaa corporate bonds peaked at over 15% in 1981, have declined relatively steadily since then and currently are at about 3.5%. Interest rates on savings accounts are essentially zero. People may have responded to this lower spread between interest-paying and non-interest paying accounts by keeping all of their funds in checking accounts that do not pay interest and in assets such as money market funds where income is counted as dividends rather than interest.

Another possibility is that people have responded to lower interest rates and the increasing availability of credit cards by holding fewer liquid assets. More people may be relying on credit cards rather than bank accounts for their emergency funds.

However, the data does not appear to support either of these hypotheses. The Federal Reserve does not publish data on the number of bank accounts, but it does publish data on total balances in various types of accounts. There has been a tenfold increase in the balance in savings account since 1989. It seems unlikely that this increase in balances has occurred at the same time that the number of accounts has been cut in half.

A third possibility is that people still have savings accounts and receive interest from them but fewer are reporting it. Financial institutions are required to send a form 1099-INT to any customer who was paid at least $10 in interest. With an interest rate of 0.1%, a taxpayer would need to have a savings account balance of at least $10,000 to earn $10 in interest and receive a 1099. People not reporting their interest when they do not receive a 1099 would explain the drop in the proportion of taxpayers reporting interest income.

If this is the explanation for the fall in the proportion of taxpayers reporting interest, it also implies that interest income is under-reported. The revenue loss is probably not significant. If 30% of Montana taxpayers each fail to report $2 of interest, the revenue loss would be about $300,000. A more serious problem for forecasting is that a model to forecast interest income is likely to under-estimate the response to a future increase in interest rates if it does not take this into account.

Taxable Pension and Annuity Income

Montana's population is getting older, and the proportion with retirement income is increasing. Not only is the existing population aging, the state has net in-migration of middle-aged and older adults. Some are retiring to Montana, while others have reached a point in life where they can afford to live in a place with relatively low average incomes but a lot of amenities. Most retirees have a pension or some other kind of retirement income. Many of the middle-aged pre-tirees also are using retirement income from previous careers in another state to supplement wage and salary or business income from new careers in Montana.

If the forecasting process correctly predicts the growth of total pension and annuity income but under-forecasts the number of people receiving this income, it will over-estimate the incomes of individual retirees and therefore overestimate their tax liabilities. On the other hand, it the forecasting process correctly predicts per-capita pension income of pension recipients but under-forecasts the number of people receiving pension income it will under-forecast total income and tax revenue.

Taxpayers who receive pension and annuity income are also more likely to be in subpopulations defined by other factors. They are more likely to also have Social Security or IRA income, are more likely to claim an extra exemption for being age 65 or older, and are less likely to have dependents. These interactions would need to be taken into account in adjusting for the growth of returns with pension and annuity income.

Capital Gains

In Montana, capital gains income is taxed at a lower rate than ordinary income, and this preferential treatment creates a nonlinearity not present with other types of income. This probably contributes to the larger revenue impact for this scenario than for most others. Also, capital gains income is notoriously volatile and hard to forecast.

The difference between the baseline and the scenario with changing subpopulation proportions is not that large, in either absolute or percentage terms, but is large enough to be a potential concern. On the other hand, the baseline forecast has unrealistically calm behavior of capital gains. It assumes a steady decline averaging 3%, with the largest year-to-year change being 8.6%. Since 1988, year-to-year changes in capital gains have averaged 23%. The largest one-year change was 51%, and the smallest was 2%.

Some taxpayers, mostly with higher incomes, have capital gains every year or in most years. Other taxpayers have capital gains, but only rarely. Part of the folklore absorbed by many policy makers is the idea that most capital gains are one-time events resulting from the sale of a business. This is probably exactly the opposite of what happens. When a small business owner who has good financial advice sells their business, they are likely to structure the sale as an installment sale, where recognition of capital gains will be spread over the term of the sale. This will result in someone who has sold a business reporting capital gains every year for a number of years.

Individuals who rarely have capital gains are more likely to have those gains from the sale of financial assets. In some cases, these sales will be part of normal life-cycle changes in asset holdings, such as retirees converting part of their wealth to retirement income or changing their portfolios to hold fewer stocks and more bonds. In some cases, one-time gains will result from the ability of people to time the recognition of gains, such as recognizing gains in years when they can be offset with business losses. In other cases, one-time gains will result from rebalancing of portfolios by selling stocks that have increased in value to get back to the desired asset mix. Individuals who manage their own portfolios may do this consciously. Individuals who have invested in mutual funds may find that fund managers have done this for them and that they have unexpected capital gains realizations. In both cases, taxpayers who do not report capital gains every year would be more likely to have realized gains in years when stock prices have risen and they, or the managers of mutual funds they hold, have chosen to realize some of those gains.

Ignoring the differences in subpopulations implicitly assumes that the same proportion of taxpayers have one-time or rare gains or losses every year when it appears that variations in total capital gains income are driven in part by a change in these proportions.

IV Conclusions

The Montana income tax forecasting process assumes that all subpopulations of income tax filers will grow at the same rate over the forecast period. For a number of subpopulations, this assumption has not been true in the past. This *may* bias the forecasts. For most of the simulations reported here, the difference between the baseline forecast and one with different subpopulation growth rates is small or negligible. In three cases it may be large enough to be a concern. In two of these cases, subpopulations with and without reported interest income and subpopulations with and without pension income, the difference in subpopulation growth rates has been large and sustained. In the other case, subpopulations with and without capital gains or losses, there have been large cyclic changes in proportions.

In the simulations where there were relatively small differences in subpopulation growth trends, the impact of ignoring these differences on short-run forecasts was small. This is likely to be a general result. Ignoring differences in subpopulation growth trends could introduce significant bias for forecasts stretching decades into the future, but for forecasts for a two-year budget period, the bias is likely to be immaterial.

The three cases where simulations produced larger differences between the baseline and the cases with different subpopulation growth rates deserve further scrutiny.

If the fall in the proportion of returns reporting interest income is primarily due to non-reporting by people who do not receive 1099s, it is likely that, when interest rates rise in the future, the current forecasting process will under-forecast the resulting increase in interest income, concentrate it in too few taxpayers, or both. With the non-linearities in the income tax this can have a significant effect on the revenue estimate, as the simulation shows.

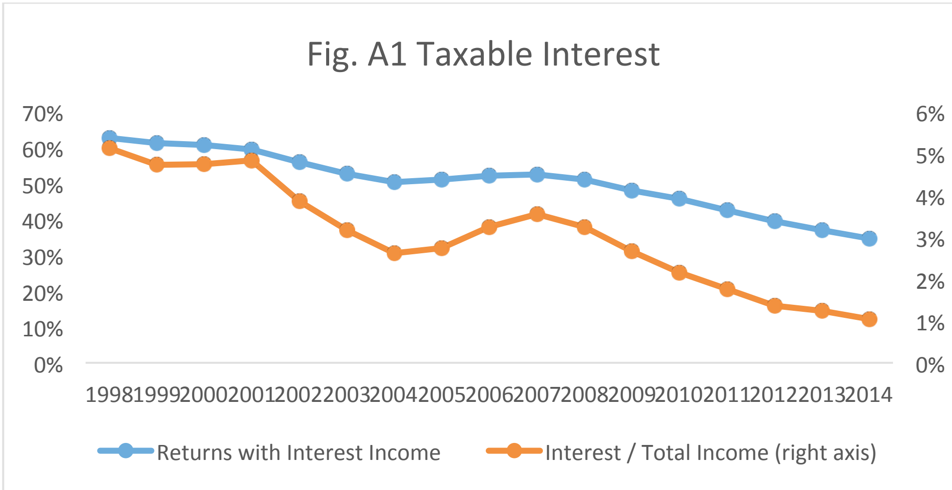
Aging of the population involves several simultaneous trends. The proportion of taxpayers claiming an extra exemption because of their age is increasing. The proportions of returns with pension income, taxable IRA distributions, and social security benefits are increasing. The proportions of taxpayers age 65 and over with wage and salary income or income from active participation in a business are increasing. Individually, most of these trends have small effects on the forecast, and the effects are not all in the same direction. Assuming a constant proportion of the population has pension or annuity income has a relatively large effect. It is not clear what the net revenue effect of this demographic transition will be, but it probably merits more examination.

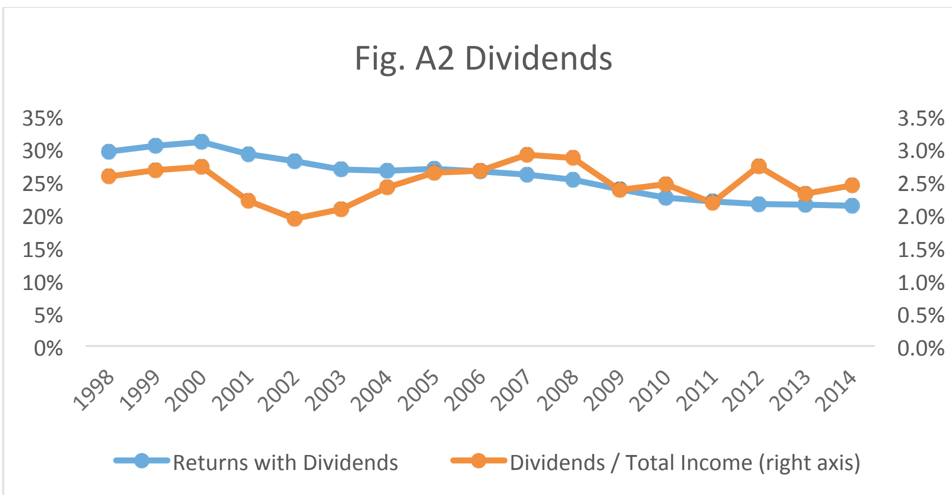
Cyclic changes in reported capital gains are due more to changes in the number of taxpayers reporting gains and losses than to changes in the size of reported gains and losses. Ignoring this biases the forecast. *If* total capital gains could be forecast with confidence, this would be a concern. However, the average percentage forecasting error for total capital gains income since the 2001 legislative session is 41%. In this context, a 2% to 3% bias from assuming fixed subpopulation proportions seems minor. If forecasters are using the model for sensitivity analysis to gage the impact of different economic conditions on revenue, it might be worthwhile to take cyclic variations in the number of taxpayers with capital gains and losses into account, or at least know the direction of the effect. When forecasters are using the model to produce a point forecast for budgeting purposes, it probably is more important to recognize that the assumptions about capital gains income will almost certainly be significantly off than to try to make a marginal improvement in the revenue estimate resulting from those assumptions.

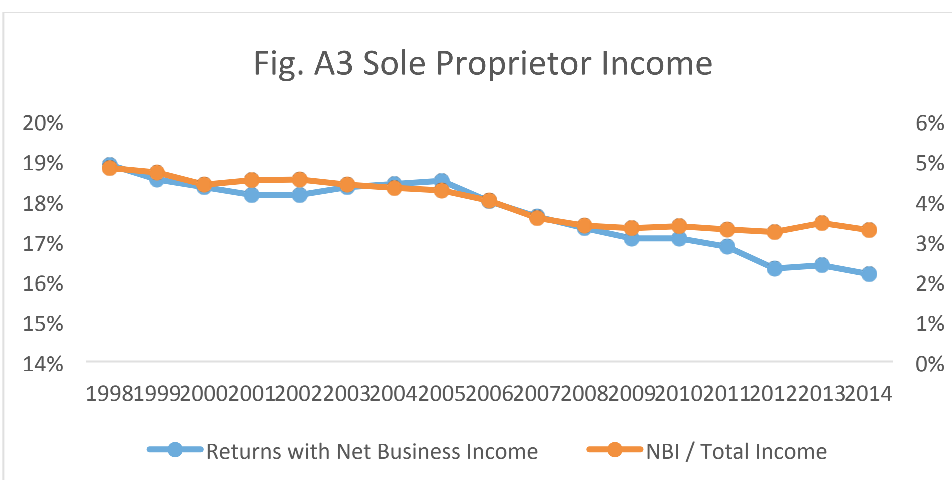
In addition to the substantive findings, this project demonstrated that modifying the mechanical steps of the forecasting process to incorporate differential growth rates for subpopulations is not technically difficult. However, improving the forecasting process by incorporating heterogeneous growth rates would require identifying relevant subpopulations, successfully modeling their changes over the business cycle, and successfully forecasting future business cycles and various subpopulations' reactions to them. Unless this is done well, it is possible that the extra complexity could prove to be an additional source of forecasting error rather than a corrective for existing bias.

Appendix A

The following graphs show the proportion of taxpayers using various items on the income tax return. For income line items, the graphs also show the proportion of total income reported on that line.







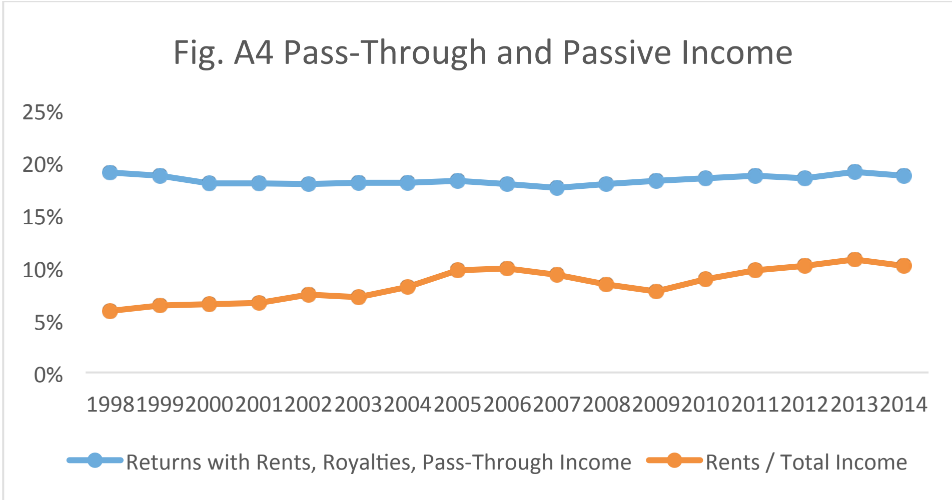


Fig. A4 Pass-Through and Passive Income
25%
20%
15%
10%
5%
0%
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Returns with Rents, Royalties, Pass-Through Income
Rents / Total Income

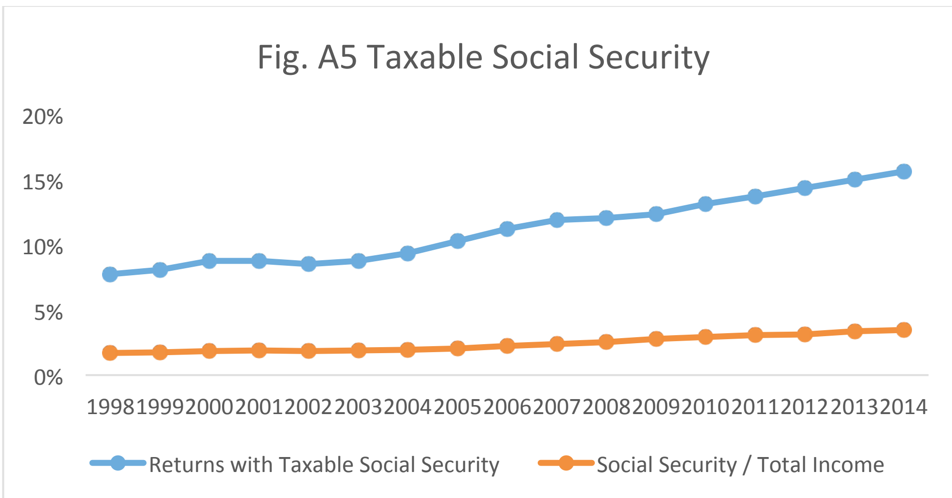


Fig. A5 Taxable Social Security
20%
15%
10%
5%
0%
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Returns with Taxable Social Security
Social Security / Total Income

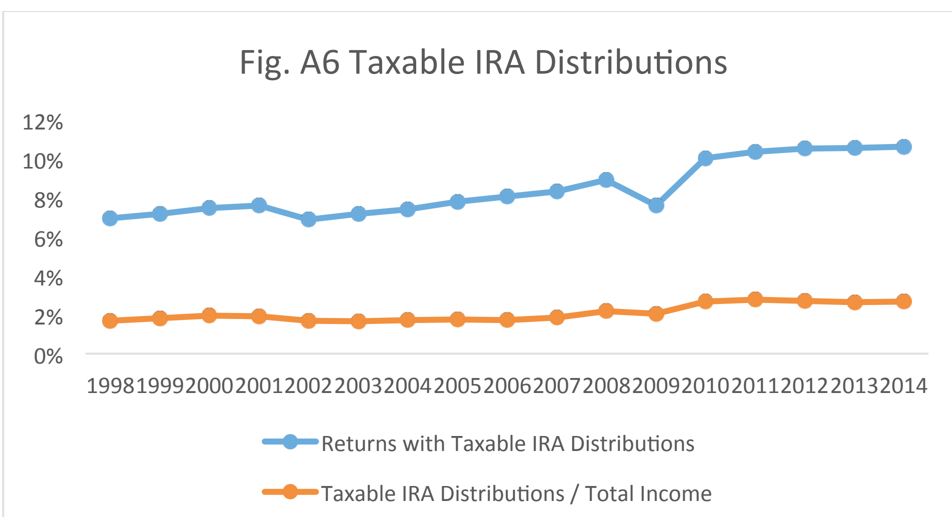
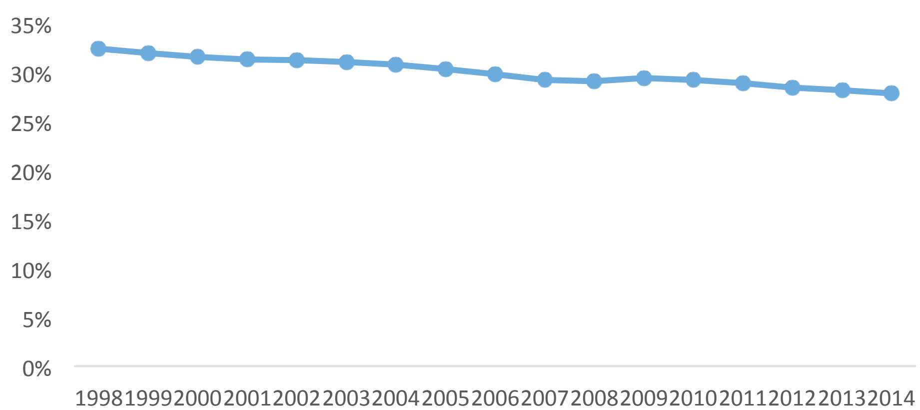


Fig. A6 Taxable IRA Distributions
12%
10%
8%
6%
4%
2%
0%
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Returns with Taxable IRA Distributions
Taxable IRA Distributions / Total Income

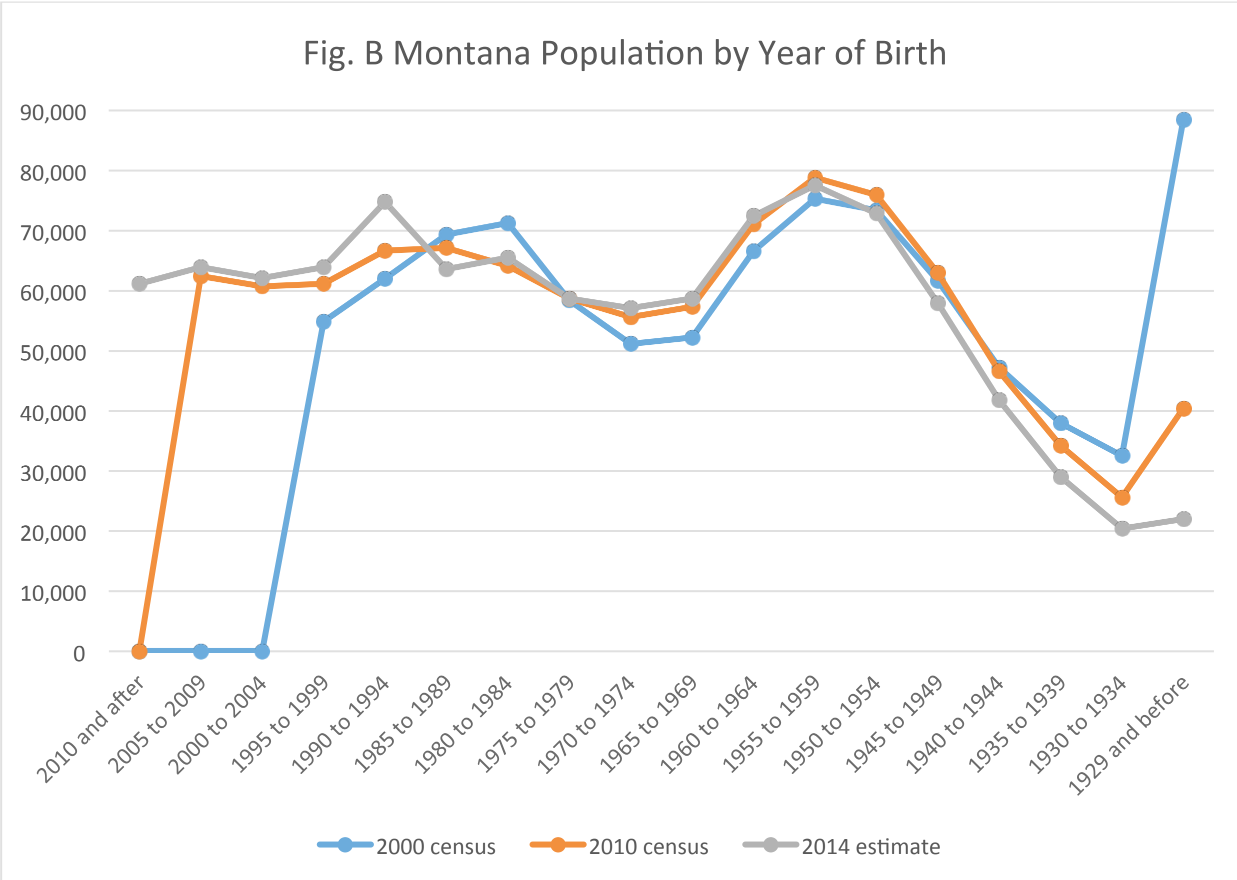
Fig. A7 Taxable Pensions and Annuities

Fig. A8 Returns with Dependents



Appendix B

Figure B illustrates some important trends in the age structure of Montana's population, but it takes some effort to understand.



The three curves represent two measurements of the Montana population, the 2000 and 2010 censuses, and one estimate, done by the Census Bureau for 2014. Each of the points on those curves shows the number of people in the state born in a five year period, except for the right-most points which show the number born in 1929 or before.

The general shape of the curves reflects important characteristics of the population. The downward slope of the right end of the curve reflects both smaller numbers of people born early in the 20th century and the fact that many Montana residents born before 1930 have died or moved away. The hump between 1945 and 1965 is the post-war baby boom, and the smaller, wider hump between about 1975 and 1999 is the boomer echo, the large number of children born to the large number of baby boomers.

The differences between the curves show changes to one cohort over time, through birth, death, and net migration. In the absence of migration, the dots for a particular cohort would follow a predictable pattern. On curves for years before the cohort was born, it would be at zero, as the dot for people born between 2005 and 2009 is on the blue curve for the 2000 census. For the first measurement after the cohort is born, its dot would jump to the level showing births during the five year period less a small amount of infant and early childhood mortality. Without migration, this is the highest population this cohort would achieve. Subsequent measurements would be shown by a sequence of slightly lower dots, reflecting deaths in childhood, adolescence, early adulthood, and middle age. After middle age, the dots would drop faster and would eventually return to zero.

Any departure from this pattern must be due to net migration. Figure B shows significant migration impacts in three age groups.

For people born between 1945 and 1975, the 2010 census counted more than the 2000 census, and for people born between 1960 and 1979, the 2014 estimates are higher than the 2010 census.

For people born between 1980 and 1989, the 2010 census counts are lower than the 2000 census by more than can be accounted for by the low death rates of teenagers and young adults.

For people born after 1990, the 2010 census counts are higher than the 2000 counts and the 2014 estimates are higher than the 2010 counts.

These departures from the no-migration pattern indicate two significant areas of net migration. Young adults, on net, are leaving the state, and middle aged adults are moving to the state and bringing children with them.

Appendix C

Figure C1 shows actual capital gains income reported on Montana resident income tax returns from 2000 through 2014 and forecasts adopted by the Montana legislature for those years. Each of the forecasts adopted by the legislature includes four calendar years. It includes a backcast for the just-completed year, for which data is not yet available, and forecasts for the current year and the two following years. The Montana legislature meets in the first months of odd-numbered years, so forecasts for each year are adopted in two legislative sessions. Figure C2 shows forecast errors as a percent of actual capital gains income.