



The Economic Impact of the Montana Board of Research and Commercialization Technology

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Contents

Acknowledgements..... 1

Executive Summary 3

1. Background and Overview 6

2. Policy Analysis with the REMI Model 7

3. The Direct and Indirect Impacts of MBRCT Operations 11

 Direct Impacts 11

 Indirect Impacts: Matching and Follow-on Funding..... 12

4. The Economic Impact of MBRCT Operations..... 15

 Impacts Summary..... 15

 Employment Impacts..... 16

 Personal Income Impacts..... 18

 Output Impacts 20

 Compensation Impacts 21

 Population Impacts 21

 State Revenue Impacts 22

 Conclusion..... 23

5. Summary and Conclusion 24

6. References 25

APPENDIX: REMI Tables 26

Executive Summary

This is a study of the effects on the Montana economy of the operations of the Montana Board of Research and Commercialization Technology (MBRCT), a program established by the Montana Legislature in 2000 to encourage economic development through investment in Montana-based research projects with a clear path to commercialization. As described below, the Bureau of Business and Economic Research at the University of Montana (BBER), using a state-of-the-art policy analysis model and publicly available data on program spending and associated impacts, produced a detailed assessment of the ultimate impact of the operations of the program on employment, income, output, and population in the Montana economy.

The results of the analysis are notable for several reasons:

- They measure the changes in the economy that are due to MBRCT operations for the entire state as a whole;
- They describe the comparison of how the state economy would have evolved since 2000 if MBRCT did not exist to actual economic performance;
- They describe economic benefits of MBRCT that are net of the tax contributions and other spending in support of its programs that come from within the state; and
- They only take into account the income flows associated with the projects that have received MBRCT support, without consideration of the productivity and wealth-enhancing aspects of the innovations themselves.

The last point is especially important, since the sizable benefits of the scientific and technical advances for the economy these MBRCT-supported projects are not taken into account here, the economic impact estimates we present undoubtedly understate the actual contribution of MBRCT operations.

The Economic Impact of MBRCT Impacts Summary

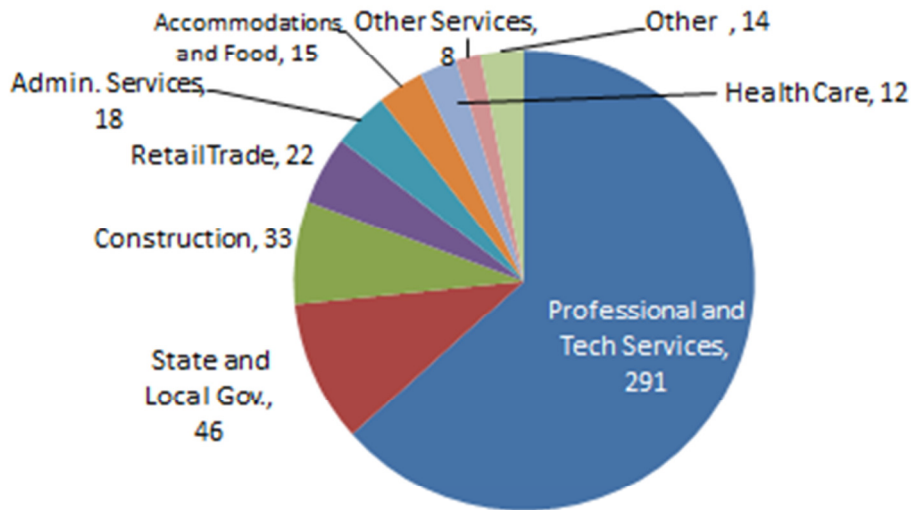
Category	Units	Impact 2001-2014	
		Total	Average per Year
Total Employment	Jobs	----	459
Personal Income	\$ Millions	315.4	22.5
Disposable Pers. Income	\$ Millions	228.6	16.3
Selected State Tax Revenues	\$ Millions	66.1	4.7
Output	\$ Millions	718.4	51.3
Population	People	----	291

This study finds that the operations of MBRCT have produced a larger, more prosperous and more populous state economy since 2000 than would have existed in its absence. Specifically, we find that in the 14-year period of MBRCT awards, 2001-2014, its operations have produced the following economic outcomes:

- an average of 459 jobs have been created over this 14-year period which owe their existence to the operations of MBRCT;
- more than \$315 million in additional income was received by Montana households, measured in inflation-corrected dollars, over this 14-year period due to MBRCT, or an average of \$22.5 million per year;
- after-tax household income of Montanans was higher by almost \$229 million over the 14-year period because of the operations of MBRCT;
- Montana-based businesses and other organizations realized \$718 million in increased gross sales, or more than \$51 million per year on average, as a result of MBRCT activities, and
- the State of Montana's tax and non-tax revenues, not including property taxes, were \$66.1 million higher in total in the 2001-2014 period due to MBRCT's impact on the economic base, with additional MBRCT-induced revenues averaging \$4.7 million during each year.

The composition of the jobs supported directly and indirectly from the activities of MBRCT is broad. While the largest category of employment gains statewide are in the Professional and Technical Services category, which is the recipient of research support from both MBRCT and other organizations, jobs in government, construction, health care and a range of other industries are created as well. These jobs are supported by the vendor purchases as well as the spending of workers in research organizations supported by MBRCT.

Employment Impacts



The economic impacts reported here are large relative to the roughly \$44 million (all historical dollar amounts adjusted to reflect purchasing power in year 2014) dispensed by the Board since 2001 because of (i) the nature of the investments, and (ii) the structure of the program itself. MBRCT funding has helped keep projects alive that have subsequently attracted significant funding from federal and other sources. We estimate that this “follow on” funding sums to more than \$372 million over the last 14 years. Also, the matching requirements of the MBRCT awards have generated another \$50 million in spending, much of it coming from non-Montana sources. Thus the program is a catalyst for significant new spending in the economy beyond that of the program itself.

The Bureau of Business and Economic Research (BBER) at the University of Montana was retained by the Montana Board of Research and Commercialization Technology (MBRCT) to prepare an assessment of the impact of its operations on the Montana economy over the last 14 years of its activities. Specifically the BBER was tasked with (i) preparing a dataset with information on grant awards, matching funding, and follow-on funding associated with each project receiving support from MBRCT, with detail on sources of funding, (ii) using an economic model of the state to consider how the economy would have evolved if the program did not exist, and (iii) comparing the observable data on economic activity to the “no MBRCT” scenario of the economy to determine the ultimate economic impact of the program. The findings of this analysis are contained in this report.

1. Background and Overview

The Montana Board of Research and Commercialization Technology (MBRCT) was established by the Montana Legislature in 1999 to encourage economic development by supporting research projects that have demonstrated commercialization potential. The program is administratively part of the Montana Department of Commerce. Its operations began in the year 2000, with its first awards made in 2001.

The grants are restricted to projects that are physically conducted in Montana and are awarded on a competitive basis. The criteria for judging the proposals for funding, listed on the MBRCT website (<http://businessresources.mt.gov/mbrct/default.mcp>) stress the strength of the projects, the qualifications of the research team, and the connection of the activity with state's existing economic base. Recipients of the awards from MBRCT have included both university-based and private sector organizations.

In its 14-year history of awards, MBRCT has supported projects in:

- agricultural research
- energy and mining research
- biotech and medical research
- photonics and optics research
- other research, including software, bioreactors, carbon dioxide sensors and biomimetic floating islands.

MBRCT has also succeeded the old Montana Science and Technology Alliance in supporting the match requirements of the National Science Foundation's EPSCoR (Experimental Program to Stimulate Competitive Research) initiative. This national program has funded research and development projects in Montana since 1980.

MBRCT awards are leveraged with funds from sources other than state government in two important ways:

Matching funds. MBRCT requires that projects must be matched at the time of the award with non-Montana state government funds at an amount at least equal to 25 percent of total project costs. In practice the projects have easily met this requirement, with matching funds averaging \$1.16 for each dollar of the awards.

Follow-on funding. Projects that have received MBRCT support have often gone on to secure funding from other sources (e.g., private investors, federal grants).

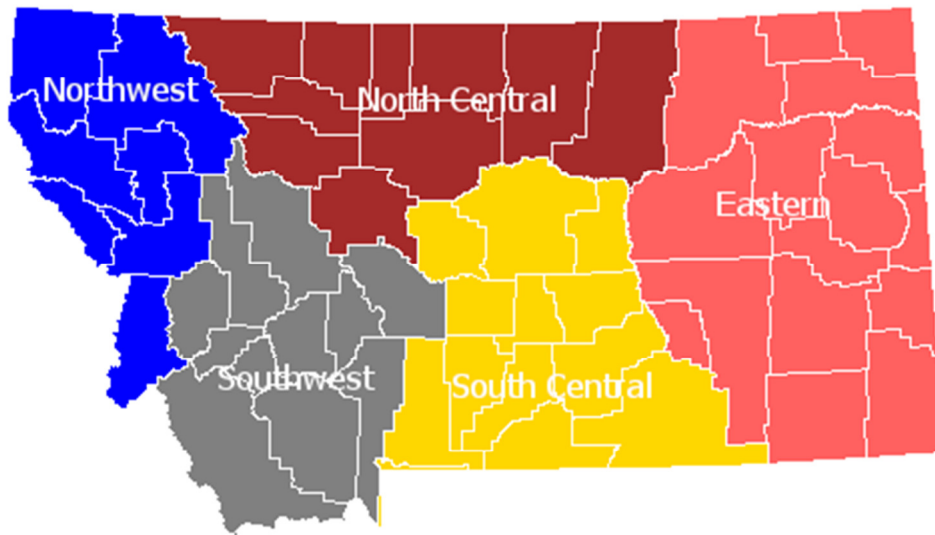
2. Policy Analysis with the REMI Model

Economic impacts occur because of events or activities that create new expenditures. Spending which is new – which is over and above existing expenditures and does not simply displace spending elsewhere in the region – not only adds to economic activity in its own right, but it also induces further spending as the recipients of wages, sales, and tax revenues spend a portion of their income in the local economy. Changes in the path of investment, migration, and prices and wages are possible as well.

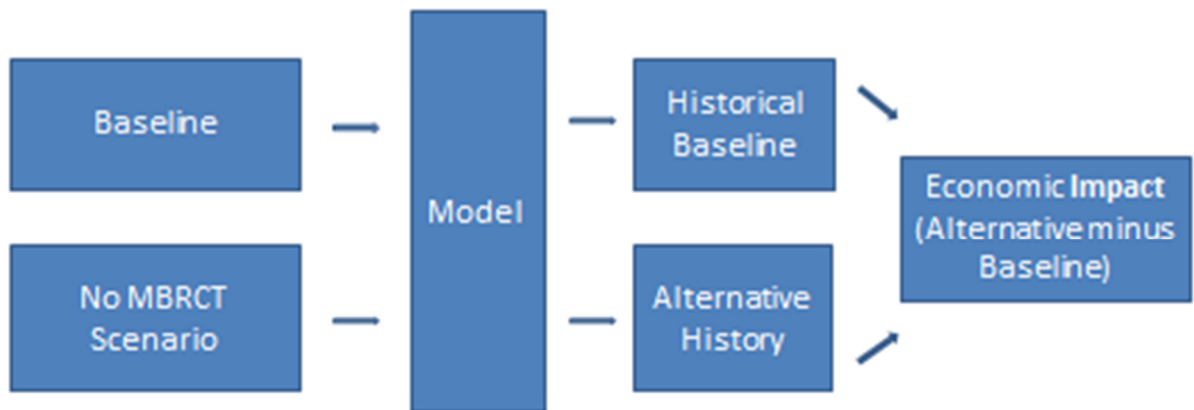
The basic tool used in this study to assess the economic contribution of MBRCT is an economic model, calibrated to represent the interactions in the Montana economy, leased from Regional Economic Models, Inc. The REMI model is one of the best known and most respected analytical tools in the policy analysis arena and has been used in more than 100 previous studies as well as dozens of peer-reviewed articles in scholarly journals. It is a state-of-the-art econometric forecasting model that incorporates dynamic feedbacks between economic and demographic variables. The REMI model forecasts employment, income, expenditures, and populations for counties and regions based on a model containing over 100 stochastic and dynamic relationships as well as a number of identities. A full explanation of the design and operation of the model can be found in Treyz (1993).

The model used in this study disaggregated the state economy into five regions: Northwest, Southwest, North Central, South Central, and Eastern. It explicitly recognizes trade flows that exist between these regions, as well as between the regions and the rest of the world. Statewide impacts reported here represent the totals for the five regions. The definition of the regions is shown in Figure 2.1 below.

**Figure 2.1
Economic Regions**



**Figure 2.2
Policy Analysis with the REMI Model**

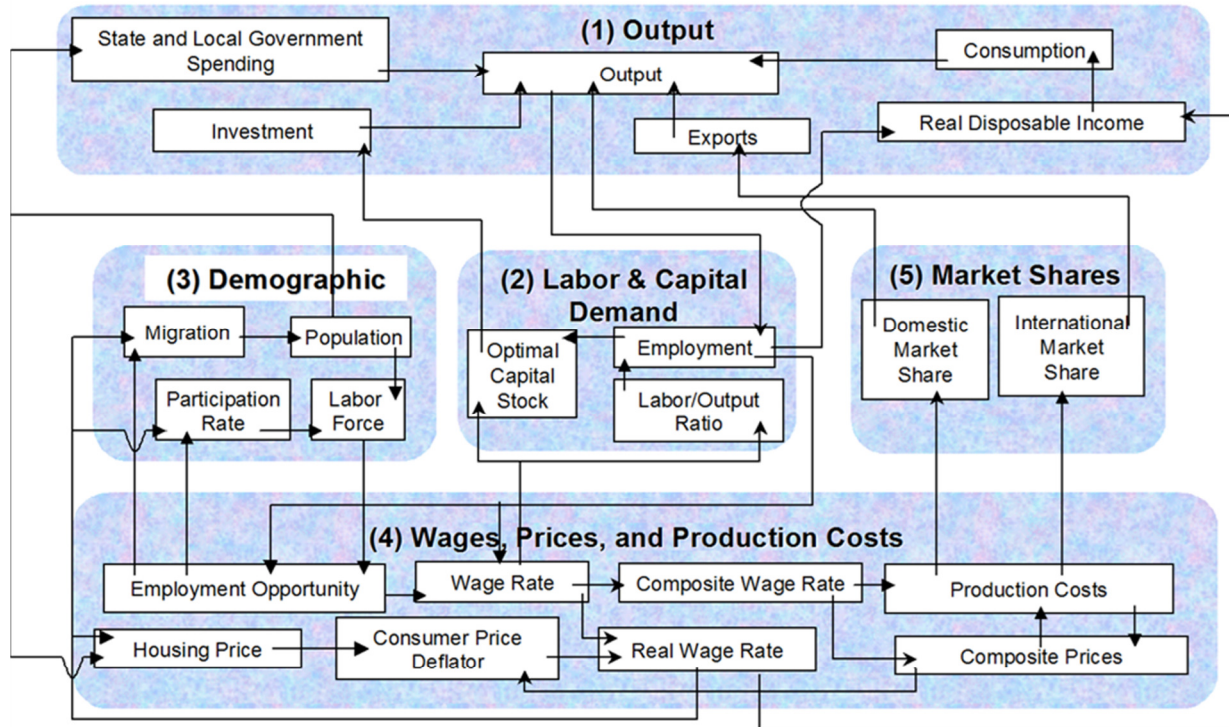


The use of the model to derive the results of this study is illustrated graphically in Figure 2.2. First, a baseline for the economy over the 14 years of MBRCT grants is produced using the model, utilizing inputs and conditions of actual history. The model is then

used a second time, with identical inputs – except that in this alternative scenario, the activity associated with MBRCT is removed from the economy. Thus the operations of MBRCT is a stimulus that ultimately has produced a different historical path of the state economy, reflecting not only the addition of the production, employment, and expenditures of the project, but how the rest of the economy reacts to those changes. The difference between the baseline and alternative scenarios of the economy represents the economic impact of MBRCT operations.

The model utilizes historical data on production, prices, trade flows, migration, and technological change to calibrate the relationship between five basic blocks of the regional economy as depicted in the figure on the following page: output, labor and capital demand, population and labor force, wages and prices, and market shares. The changes in production, labor demand and intermediate demand caused by the operations of the MBRCT causes these blocks of the economy to react and adjust to a new equilibrium. As described above, the difference between the baseline and the alternate scenario is the ultimate impact of the operations of MBRCT.

REMI Model Linkages (Excluding Economic Geography Linkages)



The essential philosophy of the model is that regions throughout the country compete for investment, jobs, and people. When events occur in a region they set off a chain reaction of actions causing dollar flows toward better investment and production opportunities, followed over time by a flow of workers and households toward employment opportunities and higher wages. The model embodies an 82-sector input-output matrix that describes the technological interdependence of production sectors of the economy, as well as extensive trade and capital flow data to determine the share of each sector's demand that can be met by local production.

As powerful and flexible as this tool is, the answers it provides are only as good as the questions posed to it. The majority of work in this study is carefully crafting the inputs used to construct a scenario of the Montana economy that faithfully represents all of the income flows that result from MBRCT operations. We now turn to this task.

3. The Direct and Indirect Impacts of MBRCT Operations

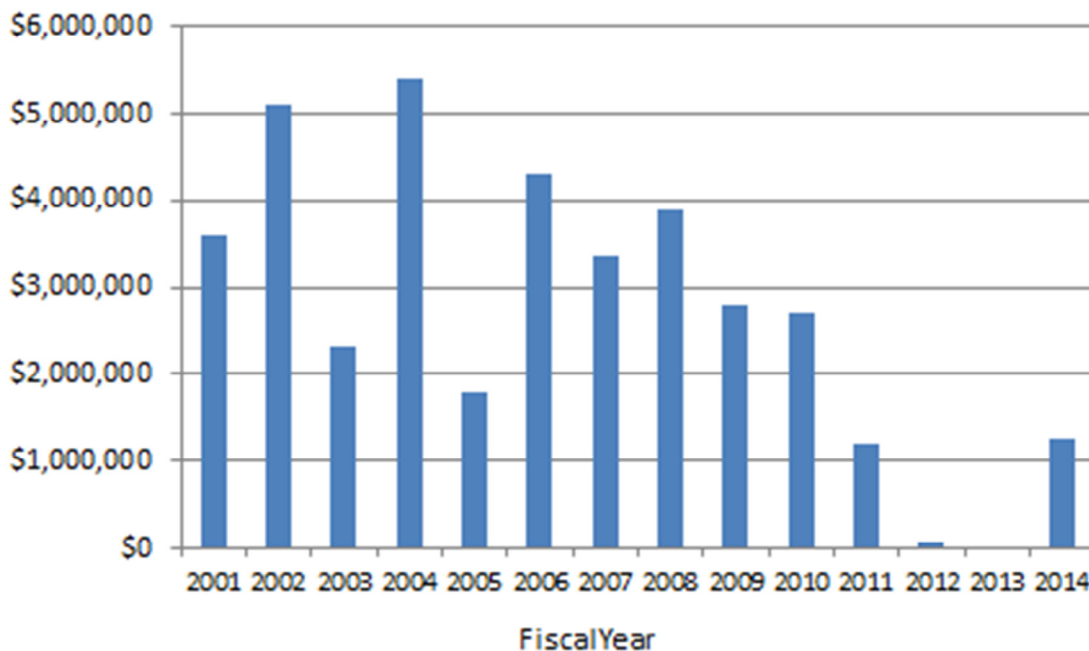
The first step in assessing the economic contribution of MBRCT is to measure the spending, employment, and output of the agency itself. More precisely, we will present the spending of the agency on research and the tax support of that spending. We refer to this as the direct impact of MBRCT. Closely related to these direct impacts are the indirect impacts – the spending of other organizations that is associated with MBRCT projects but are not part of MBRCT itself. This is the spending match that MBRCT requires for funded project, as well as the follow-on funding of other organizations in support of the research project in subsequent years.

The third component of the overall economic impact, the induced impacts, represent the reaction of the economy as the direct and indirect spending due to MBRCT is received by Montana businesses, households and governments. These impacts are estimated with the use of the REMI model introduced in the previous section.

Direct Impacts

The direct impacts considered in this study are the disbursements of grants by MBRCT. The first disbursement of awards by MBRCT in support of its mission occurred in fiscal year 2001.

Figure 3.1
Awards by MBRCT



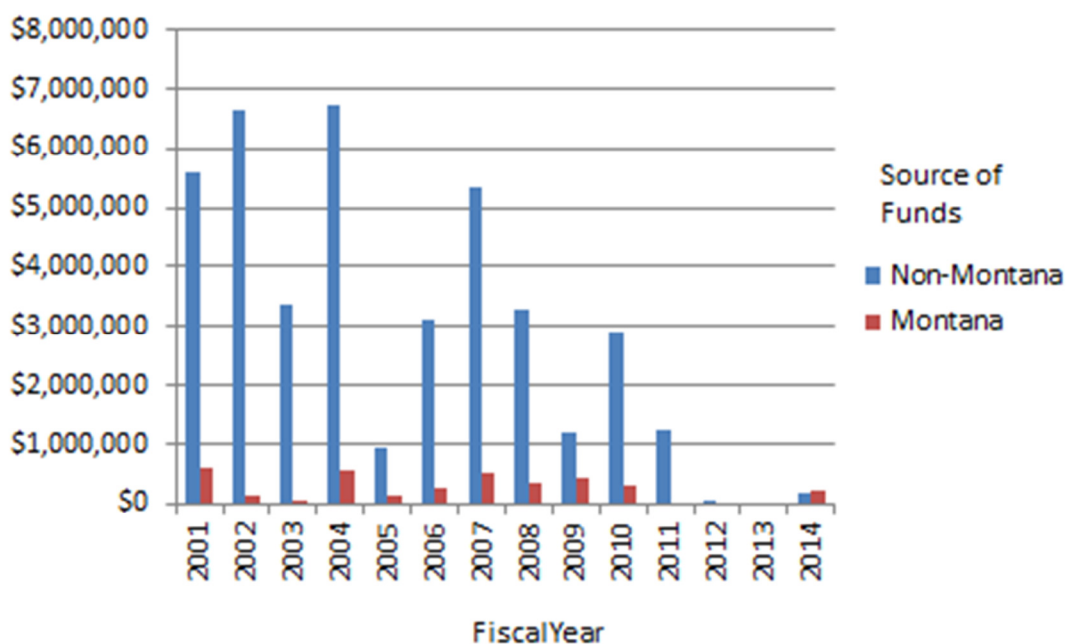
Since the program has generally operated on a two-year cycle, fluctuations in grants over the years have largely reflected timing issues as well as variability in the flow of competitive applications. As shown in Figure 3.1, there was a marked change in grant activity as the recession impacted state government finances. This culminated in the fiscal years 2012 and 2013 when grant activity essentially was halted. Over the entire 14-year period 2001-2014, the program dispensed \$37.7 million in grants to Montana-based businesses, universities, and other organizations.

Since the source of funding for MBRCT grants are state tax dollars, in a “no MBRCT” scenario for the state economy those funds would be available for other uses. Since it is impossible to know what those uses might have been, in this scenario we essentially return those dollars to tax payers by reducing personal taxes by an equal amount.

Indirect Impacts: Matching and Follow-on Funding

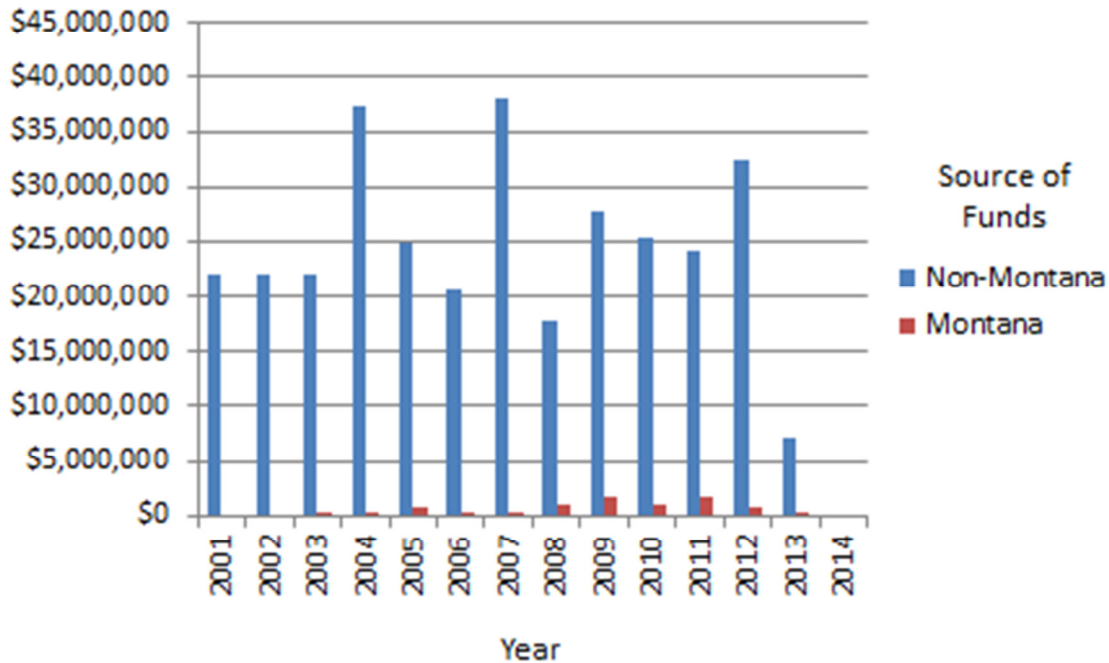
MBRCT requires that projects must be matched at the time of the award with non-state government funds at an amount at least equal to 25 percent of total project costs. In practice the projects have easily met this requirement, with matching funds averaging \$1.16 for each dollar of the awards. For purposes of the analysis, we identify the sources of those funds as Montana and non-Montana. In the “no MBRCT” scenario, the non-Montana spending is lost to the economy, while the matching spending from Montana businesses is returned as increased proprietor income.

Figure 3.2
Matching Funds for MBRCT Projects



As shown in Figure 3.2, the pattern of matching spending over the years is identical to the MBRCT grants. The matching funds are overwhelmingly sourced from outside the state. In many cases the source for matching spending is the federal government.

Figure 3.3
Follow-on Funding for MBRCT Projects

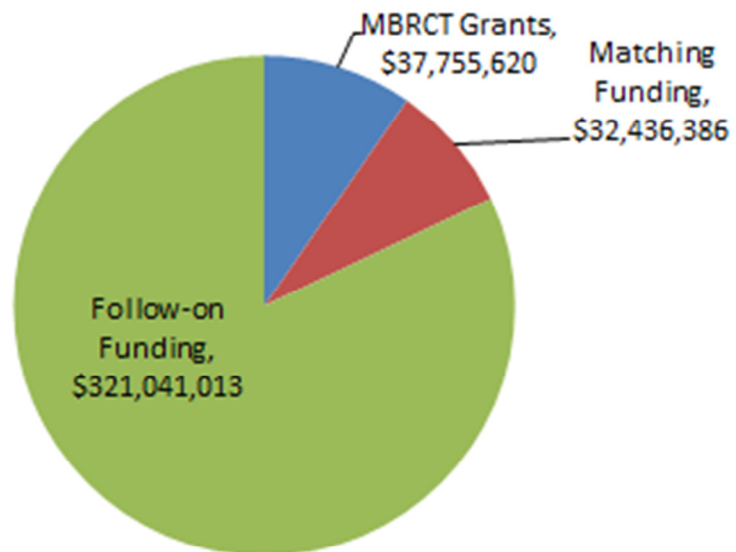


Subsequent to the awarding of MBRCT funds, projects often attract additional investment. This follow-on funding can last many years after the year of the MBRCT award, in amounts that are substantially larger than the MBRCT funding. The source of funds is again classified as either from Montana sources or from outside the state. This spending is recorded in the year it is made.

As shown in Figure 3.3, funding from outside Montana dominates the total. The figure also shows that the dollar amount of funding is much larger than the original program funding, with a pattern that not closely correlated with the program or matching funding.

The relative size of these three spending streams associated with MBRCT operations is shown for the 2001-2014 period in Figure 3.4. The figure makes it clear that it is the follow-on funding – most of it sourced from outside the state – which contributes the most to total direct (MBRCT) and indirect (matching and follow-on) spending.

Figure 3.4
Direct and Indirect Impacts of MBRCT
Cumulative Totals, 2001-2014



The higher degree of leverage of MBRCT awards depicted in Figure 3.4 is a dominant factor in producing the economic impacts described in this report. We now turn to a description of those findings.

4. The Economic Impact of MBRCT Operations

A Montana economy without MBRCT would not have the income and expenditure flows described in the previous section – research and commercialization projects would not be supported, matching and follow-on spending from out-of-state sources would not occur, and tax money used to support MBRCT would be freed for other purposes or returned to taxpayers. The economy of the state of Montana would have evolved differently over the last 14 years as a result.

The economy would also not have benefited from the productivity-enhancing nature of the products and innovations supported in part by MBRCT investment. We have made no effort to quantify the economic benefits that flow from these outcomes of MBRCT investment, which could be substantial. Thus the impacts reported here are undoubtedly conservative, with actual impacts even greater than these results.

The impacts reported in this section represent the difference between actual economic activity over the past 14 years of MBRCT operations and what would have occurred in its absence. The latter has been estimated using an economic model to determine the new “resting point” for a state economy with the direct and indirect impacts of MBRCT operations removed.

Since the program has been in operation over the years 2001-14, with direct and indirect impacts varying over the period, for simplicity we present impacts here which are either aggregated or averaged over the 14 years, as appropriate. Impacts for individual years, which vary, are available in the Appendix.

Impacts Summary

The results of this study show that the Montana economy is larger, more prosperous and more populous today because of the operations of MBRCT. Even after taking into account the tax support of MBRCT, the program produces a significant net benefit to the economy as a whole. Specifically we find that:

- an average of 459 jobs over this 14-year period owed their existence to the operations of MBRCT;
- more than \$315 million in additional income was received by Montana households, measured in inflation-corrected dollars, over this 14-year period due to MBRCT, or an average of \$22.5 million per year;
- after-tax household income of Montanans was higher by almost \$229 million over the 14-year period because of the operations of MBRCT;
- Montana-based businesses and other organizations realized \$718 million in increased gross sales, or more than \$51 million per year on average, as a result

of MBRCT activities, and

- the State of Montana’s tax and non-tax revenues, not including property taxes, were \$66.1 million higher in total in the 2001-2014 period due to MBRCT’s impact on the economic base, with additional MBRCT-induced revenues averaging \$4.7 million during each year.

Table 4.1
Impacts Summary

Category	Units	Impact 2001-2014	
		Total	Average per Year
Total Employment	Jobs	----	459
Personal Income	\$ Millions	315.4	22.5
Disposable Pers. Income	\$ Millions	228.6	16.3
Selected State Tax Revenues	\$ Millions	66.1	4.7
Output	\$ Millions	718.4	51.3
Population	People	----	291

The outcomes reflect the highly leveraged nature of MBRCT investments. Since (i) those investments are matched at the same time as MBRCT funding, (ii) significant additional funds are directed to these projects in subsequent years, and (iii) the source of both matching funds and follow-on funds are from outside Montana, the operations of MBRCT have an outsized impact. We now examine that impact in greater detail.

Employment Impacts

Because the spending by projects supported by MBRCT shows up as income for Montana businesses and households, their subsequent spending supports jobs in a broad spectrum of otherwise unrelated industries. This is apparent from an examination of the employment impacts shown in Table 4.2.

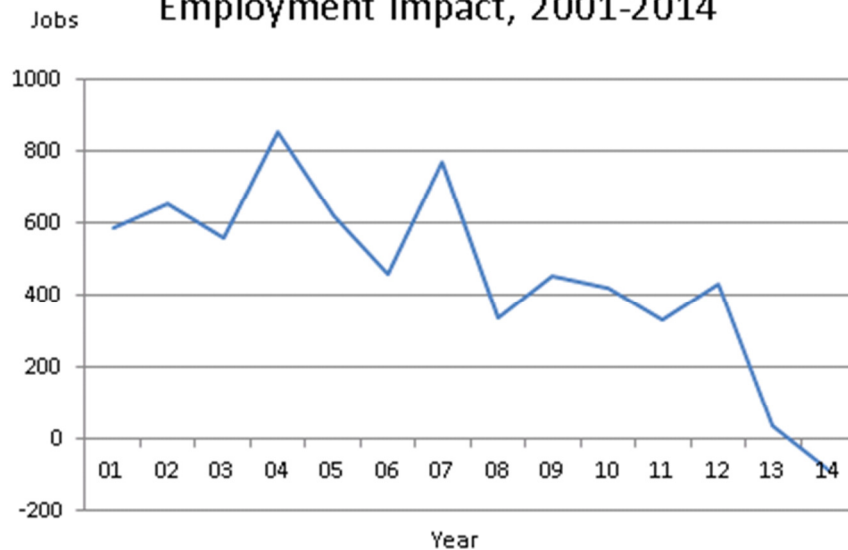
While most of the 459 total jobs supported by the operations of MBRCT in the state economy over the last 14 years are in the professional and technical services companies and organizations (including universities) that are recipients of the funds, the employment footprint spreads out across a number of other industries, including construction, retail trade, health care, accommodations and food and administrative services. Local government jobs are supported largely though the increased population of school-aged children and the associated higher demand for public schools.

Table 4.2
Employment Impacts

Industry	Impact 2001-2014 Average per Year
Construction	33
Retail Trade	22
Real Estate and Rental and Leasing	7
Professional and Technical Services	291
Administrative and Waste Services	18
Health Care and Social Assistance	12
Arts, Entertainment, and Recreation	5
Accommodation and Food Services	15
Other Services, except Public Administration	8
Other Private Sector	2
State Government	24
Local Government	22
TOTAL	459

It is important to note that since the funding of MBRCT has been interrupted in recent years, the average employment impacts of the program – as well as all of the other economic impacts reported here – understate MBRCT’s “fully funded” impacts considerably. As shown in Figure 4.1, the additional jobs supported by MBRCT operations range from over 800 in 2004 to zero or even negative in recent years. (Small negative impacts in individual years reflect jobs lost due to higher and less competitive wages produced by earlier years of high activity). The average job impact using the period 2001-2010 is 571 jobs.

Figure 4.1
Employment Impact, 2001-2014



Personal Income Impacts

Since MBRCT operations make the Montana economy larger, it is not surprising to learn that the income received by Montana households is higher as a result. The detail on personal income impacts, shown in Table 4.3, illustrates this point. Total wages and salaries paid to Montana workers were \$245.3 million higher over the 14-year period, which averages to \$17.5 million in paychecks per year due to MBRCT. When the higher benefits (\$56.4 million) and higher income of business owners (\$33.6 million) are added, this represents \$334.0 million in additional earnings over the 14-year period that are attributable to the operations of MBRCT.

The induced impacts of MBRCT show up in other forms of income as well. Income from rents, interest, and dividends is higher by an average of \$1.9 million per year due to the impact of MBRCT spending on population and the capital stock. Transfer income, on the other hand, is slightly lower. This is because income-based transfers from government programs are slightly reduced as income rises.

Table 4.3
Personal Income Impacts (\$ millions)

Category	Impact 2001-2014 (mill. \$)	
	Total	Average per Year
Total Earnings by Place of Work	334.0	23.9
Total Wage and Salary Disbursements	245.3	17.5
Supplements to Wages and Salaries	56.4	4.0
Employer contributions for employee pension and insurance funds	36.9	2.6
Employer contributions for government social insurance	19.6	1.4
Proprietors' income with inventory valuation and capital consumption adjustments	33.6	2.4
Less: Contributions for government social insurance	45.9	3.3
Employee and self-employed contributions for government social insurance	26.4	1.9
Employer contributions for government social insurance	19.6	1.4
Plus: Adjustment for residence*	1.1	0.1
Gross In	10.4	0.7
Gross Out	9.3	0.7
Equals: Net earnings by place of residence	296.4	21.2
Plus: Rental, interest, and dividend income	26.8	1.9
Plus: Personal current transfer receipts	-7.9	-0.6
Equals: Personal Income	315.4	22.5
Less: Personal current taxes	86.8	6.2
Equals: Disposable personal income	228.6	16.3

* Total earnings data are derived from records of employers who are located in Montana. Since some Montana workers are employed by out-of-state firms, and some Montana firms employ workers from other states, the adjustment for residence nets out these two impacts to produce an estimate of Montana residents' income.

The overall result is that personal income, which is the income received by Montana households net of the Social Security contributions made by them or their employers on their behalf, has averaged \$16.3 million more per year over 2001-2014 because of the operations of MBRCT. After income taxes, that represents \$16.3 million more in disposable income statewide per year.

Output Impacts

Montana business and governments realize higher gross sales of their products and services due to the operations of MBRCT. When looking at these gross sales, or output, impacts in Table 4.4, we see that most of these gains are realized by companies and organizations (including universities) in the Professional and Technical Services category which contains most research and development activity. The operations of MBRCT create an economy where these firms have sold about \$491 million more in the 2001-2014 period, or an average impact of \$35.1 million per year.

Table 4.4
Output Impacts, \$ Millions

Category	Impact 2001-2014	
	Total	Average per Year
Construction	50.8	3.6
Wholesale Trade	10.2	0.7
Retail Trade	26.2	1.9
Real Estate and Rental and Leasing	20.6	1.5
Professional, Scientific, and Technical Services	491.0	35.1
Administrative and Waste Management Services	15.1	1.1
Health Care and Social Assistance	19.8	1.4
Arts, Entertainment, and Recreation	2.7	0.2
Accommodation and Food Services	11.3	0.8
Other Services, except Public Administration	6.5	0.5
State and Local Government	64.3	4.6
TOTAL	718.4	51.3

Other industries have seen sizable gains as well. Construction firms have enjoyed more than \$50 million more in business over the time that MBRCT has been in operation. As shown in the table, there have also been sales gains in retail, real estate and leasing, administrative services, and health care.

Compensation Impacts

While the jobs that have been created in the Montana economy because of the operations of MBRCT are spread across a wide spectrum of economic activity, the program's focus on research and technology directs funds disproportionately to industries that pay higher than average wages. Over its 14-year history of awarding grants to research organizations, an additional \$245.3 million in wages and salaries have been paid in Montana that are attributable to the existence of the program, as shown in Figure 4.5. Compensation, which add benefits to this figure, was increased by \$300.6 million. When business proprietor income is added to this last figure, the total earning increase in the economy due to MBRCT over the years 2001-2014 has been \$334.0 million.

Table 4.5
Compensation Impacts

Category	Units	Impact 2001-2014	
		Total	Average per Year
Wages and Salaries	\$ Millions	245.3	17.5
Compensation	\$ Millions	300.6	21.5
Earnings	\$ Millions	334.0	23.9
Earnings per Job, New Jobs	\$ Dollars	----	51,943

Population Impacts

A larger economy, with more job opportunity, is an attraction to potential workers outside Montana. It also can cause a Montanan, who might have migrated to another state, to stay in Montana instead. Thus MBRCT operations have an impact on state population.

Table 4.6
Population Impacts

Age Cohort	Population Increase Average 2001-2014
Ages 0-14	72
Ages 15-24	40
Ages 25-64	172
Ages 65+	7
TOTAL	291

The pattern of the population impacts is slower and more gradual than other economic impacts. Increased job opportunities in Montana relative to other states due to MBRCT cause in migration from other states only gradually. Those who do migrate for job opportunities tend to be younger, and bring their children (existing or yet-to-be born) with them.

Averaging over the 14-year period of MBRCT operations, the population of the state is 291 people larger than would be the case if MBRCT did not exist. As shown in the table, the age distribution of the new residents is skewed to the younger cohorts, with 40 additional school-aged residents and 172 working age residents in Montana as a result of MBRCT.

State Revenue Impacts

Another aspect of the economic impacts of MBRCT are those that affect governments. A larger and more populous economy also creates a larger tax base, which produces more state tax and non-tax revenues than would be the case if MBRCT did not exist. Table 4.7 below highlights a few of the revenues that would be affected by MBRCT operations.

Table 4.7
State Revenue Impacts, \$ Millions

Category	Impact 2001-2014	
	Total	Average per Year
Intergovernmental Revenue	11.1	0.8
Selective Sales Tax	4.0	0.3
License Taxes	1.9	0.1
Individual Income Tax	13.1	0.9
Corporate Income Tax	1.8	0.1
Other Taxes	7.0	0.5
Current Charges	6.8	0.5
Miscellaneous General Revenue	4.9	0.3
Utility Revenue	0.0	0.0
Liquor Store Revenue	0.3	0.0
Insurance Trust Revenue	15.1	1.1
TOTAL	66.1	4.7

These tax impact estimates are computed using average effective tax rates and tax revenue categories that correspond to those used in the Census of Governments.

Conclusion

This section has examined the economic impacts of the operations of MBRCT in greater detail. Through a conservative analysis that:

- does not take into account the productivity-enhancing nature of the innovations supported by MBRCT funding,
- is net of the tax contributions and other Montana-based spending associated with the support of MBRCT and other related investments, and
- includes the years 2012 and 2013 in the study period during which MBRCT grants were essentially halted,

We find that the impact of the program's operations have been substantial, especially when compared to the relatively modest size of tax-supported MBRCT grants.

To make this comparison as fairly as possible, we must first adjust the dollar amounts of MBRCT grants to reflect purchasing power in year 2014, which are the units in which all dollar impacts in this section have been reported. Using this conversion, the \$37.7 million in recorded MBRCT spending is equivalent to \$44.0 million in 2014 dollars. Compared to this contribution of taxpayers over the 2001-2014 period, MBRCT operations have produced a Montana economy that:

- is larger by \$315.4 million in personal income, or \$7.17 larger for every dollar of MBRCT spending;
- has realized \$718.4 million in additional gross sales by Montana businesses, or \$16.33 in additional sales for every dollar of MBRCT spending, and
- has produced \$66.1 million in additional state tax and non-tax revenue, or \$1.50 in additional revenue per dollar of MBRCT spending.

The large amount of leverage associated with MBRCT grants from out-of-state organizations (including the federal government) have produced this extraordinary result.

5. Summary and Conclusion

This has been a study of how the Montana economy has been impacted by the ongoing operations of the Montana Board of Commercialization and Technology (MBRCT), a program in the Montana Department of Commerce designed to support research and development of Montana-based projects with a direct path to commercialization. The Bureau of Business and Economic Research, the main research unit of the School of Business Administration at the University of Montana, was contracted by MBRCT to compare the historical evolution of the state economy over the period 2001-2014 to how it might have evolved if MBRCT had not existed.

Using data on actual grants dispensed since 2001, together with matching and follow-on spending associated with MBRCT-supported projects, an economic model was used to estimate how the state economy would have performed had that spending not taken place. As part of this analysis, it was recognized that a no-MBRCT scenario economy would have the tax dollars committed to the program available for other uses, including returning them to taxpayers. A comparison of this “no MBRCT” economy and the actual economic performance provides a comprehensive measure of the impact of the agency’s operations.

Our basic finding is that the agency’s operations have had an outsized impact on the state economy. Specifically, we find that the economy in the years 2001-2014 has been larger, more prosperous, and more populous due to the activities of MBRCT. In comparing the actual economy to the “no MBRCT” scenario, we find that:

- 459 jobs, on average, have owed their existence in the state economy to MBRCT operations over the 2001-2014 period;
- average earnings for these new jobs have been \$51,943 per year;
- Montana households have received \$315.4 million (all dollar amounts measured in 2014 purchasing power) in additional personal income over the 14-year period, or an average of \$22.5 million per year, as a result of MBRCT operations;
- Montana businesses have realized \$718.4 million in additional gross sales of products and services, averaging \$51.3 million per year during 2001-2014, due to MBRCT operations;
- the state of Montana’s tax and non-tax revenues were \$66.1 million higher over the 2001-2014 period because of MBRCT’s impact on the overall economy, representing about \$4.7 million per year in additional revenue.

By almost any measure, the program’s impacts have been substantial and it clearly has been a good investment in the state economy.

6. References

Regional Economic Modeling: A Systematic Approach to Economic Forecasting and Policy Analysis; George I. Treyz, 1993. Norwell: Kluwer Academic Publishers.

“Design of a Multiregional Policy Analysis Model,” George I. Treyz, Journal of Regional Science, Volume 20, Issue 2, pp. 191-206, May 1980.

“The REMI Economic-Demographic Forecasting and Simulation Model,” George I. Treyz, Dan S. Rickman, and Gang Shao, International Regional Science Review, Volume 14, pp. 221-253, December 1991.

APPENDIX: REMI Tables

Personal Income															
MBCRT study.rwb															
Regional Simulation 1 compared to Standard Regional Control - Difference															
Region = All Regions															
Browser															
PI+ Montana Regions v1.5.2 (Build 3307)															
Category	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total Earnings by Place of Work	Millions of Fixed (2014) Dollars	26.707	31.477	27.479	42.357	31.848	24.965	40.260	19.396	24.355	22.816	18.098	23.742	3.723	-3.262
Total Wage and Salary Disbursements	Millions of Fixed (2014) Dollars	18.398	21.754	19.723	29.563	22.736	18.271	28.084	15.137	18.979	17.711	14.641	17.732	3.807	-1.195
Supplements to Wages and Salaries	Millions of Fixed (2014) Dollars	4.063	4.765	4.340	6.509	5.042	4.067	6.343	3.460	4.450	4.211	3.592	4.383	1.184	0.025
Employer contributions for employee pension and insurance funds	Millions of Fixed (2014) Dollars	2.646	3.104	2.831	4.243	3.290	2.655	4.153	2.259	2.910	2.755	2.349	2.870	0.775	0.015
Employer contributions for government social insurance	Millions of Fixed (2014) Dollars	1.417	1.661	1.509	2.266	1.752	1.413	2.189	1.202	1.540	1.456	1.242	1.513	0.408	0.010
Proprietors' income with inventory valuation and capital consumption adjustments	Millions of Fixed (2014) Dollars	4.378	5.131	3.597	6.469	4.127	2.648	5.943	0.795	1.068	1.029	0.005	1.893	-1.279	-2.227
Less: Contributions for Government Social Insurance	Millions of Fixed (2014) Dollars	3.349	3.966	3.614	5.420	4.183	3.367	5.201	2.835	3.603	3.383	2.850	3.464	0.828	-0.127
Employee and Self-Employed Contributions for Government Social Insurance	Millions of Fixed (2014) Dollars	1.932	2.305	2.105	3.155	2.431	1.954	3.011	1.634	2.063	1.927	1.608	1.951	0.420	-0.137
Employer contributions for government social insurance	Millions of Fixed (2014) Dollars	1.417	1.661	1.509	2.266	1.752	1.413	2.189	1.202	1.540	1.456	1.242	1.513	0.408	0.010
Plus: Adjustment for Residence	Millions of Fixed (2014) Dollars	-0.014	0.000	0.043	0.050	0.086	0.085	0.094	0.100	0.096	0.096	0.110	0.111	0.117	0.100
Gross Inflow	Millions of Fixed (2014) Dollars	0.608	0.766	0.809	1.077	0.864	0.743	0.980	0.649	0.823	0.787	0.758	0.841	0.428	0.236
Gross Outflow	Millions of Fixed (2014) Dollars	0.622	0.766	0.766	1.027	0.778	0.658	0.885	0.549	0.727	0.692	0.649	0.730	0.311	0.136
Equals: Net Earnings by Place of Residence	Millions of Fixed (2014) Dollars	23.760	28.063	24.568	37.674	28.148	21.986	35.684	16.965	21.668	20.305	16.174	21.482	3.199	-3.270
Plus: Rental, Personal Interest, and Personal Dividend Income	Millions of Fixed (2014) Dollars	0.418	0.791	1.148	1.586	1.868	1.932	2.241	2.189	2.336	2.429	2.506	2.687	2.498	2.203
Plus: Personal Current Transfer Receipts	Millions of Fixed (2014) Dollars	-2.438	-2.489	-1.733	-2.872	-1.479	-0.607	-1.958	0.267	-0.175	0.091	0.623	0.255	2.135	2.520
Equals: Personal Income	Millions of Fixed (2014) Dollars	21.738	26.363	23.988	36.391	28.535	23.313	35.965	19.422	23.828	22.824	19.305	24.422	7.836	1.453
Less: Personal current taxes	Millions of Fixed (2014) Dollars	7.616	10.245	6.274	11.787	6.151	8.143	8.867	6.765	6.182	5.886	3.699	3.310	0.757	1.092
Equals: Disposable personal income	Millions of Fixed (2014) Dollars	14.125	16.121	17.711	24.602	22.387	15.168	27.098	12.656	17.645	16.938	15.602	21.109	7.078	0.363

Output															
MBCRT study.rwb															
Regional Simulation 1 compared to Standard Regional Control - Difference															
Region = All Regions															
Browser															
PI+ Montana Regions v1.5.2 (Build 3307)															
Category	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Forestry, Fishing, and Related Activities	Millions of Fixed (2014) Dollars	0.002	0.000	-0.002	-0.004	-0.013	-0.023	-0.029	-0.042	-0.046	-0.048	-0.048	-0.045	-0.045	-0.041
Mining	Millions of Fixed (2014) Dollars	0.007	-0.010	-0.037	-0.064	-0.102	-0.136	-0.147	-0.171	-0.175	-0.184	-0.190	-0.189	-0.201	-0.195
Utilities	Millions of Fixed (2014) Dollars	0.247	0.243	0.187	0.255	0.122	-0.013	0.123	-0.113	-0.055	-0.082	-0.120	-0.061	-0.258	-0.315
Construction	Millions of Fixed (2014) Dollars	3.023	4.586	5.187	6.977	6.510	4.854	6.271	3.587	3.521	3.097	2.459	3.272	0.097	-2.668
Manufacturing	Millions of Fixed (2014) Dollars	0.347	0.368	0.313	0.416	0.234	0.031	0.182	-0.152	-0.076	-0.129	-0.189	-0.094	-0.393	-0.506
Wholesale Trade	Millions of Fixed (2014) Dollars	0.786	0.862	0.891	1.259	1.068	0.670	1.307	0.475	0.761	0.712	0.610	0.906	0.130	-0.194
Retail Trade	Millions of Fixed (2014) Dollars	1.881	2.101	2.234	3.197	2.764	1.681	3.414	1.219	1.946	1.829	1.617	2.435	0.377	-0.495
Transportation and Warehousing	Millions of Fixed (2014) Dollars	0.052	0.047	0.029	0.041	0.005	-0.030	-0.008	-0.068	-0.057	-0.063	-0.073	-0.057	-0.099	-0.104
Information	Millions of Fixed (2014) Dollars	0.304	0.318	0.259	0.390	0.240	0.100	0.284	-0.015	0.052	0.023	-0.031	0.043	-0.208	-0.277
Finance and Insurance	Millions of Fixed (2014) Dollars	0.402	0.393	0.318	0.468	0.282	0.058	0.309	-0.126	-0.039	-0.080	-0.157	-0.045	-0.386	-0.479
Real Estate and Rental and Leasing	Millions of Fixed (2014) Dollars	2.458	2.804	2.592	3.676	2.662	1.552	2.833	0.728	1.237	0.992	0.616	1.187	-0.903	-1.800
Professional, Scientific, and Technical Services	Millions of Fixed (2014) Dollars	40.597	45.684	37.707	59.381	41.469	34.362	55.315	28.585	38.199	36.063	29.582	35.615	7.542	0.878
Management of Companies and Enterprises	Millions of Fixed (2014) Dollars	0.003	-0.009	-0.026	-0.040	-0.063	-0.083	-0.093	-0.114	-0.120	-0.127	-0.133	-0.134	-0.138	-0.131
Administrative and Waste Management Services	Millions of Fixed (2014) Dollars	1.306	1.451	1.229	2.014	1.517	1.123	1.985	0.822	1.083	1.016	0.756	1.060	0.031	-0.257
Educational Services	Millions of Fixed (2014) Dollars	0.044	0.051	0.055	0.076	0.068	0.048	0.079	0.041	0.053	0.052	0.049	0.063	0.029	0.011
Health Care and Social Assistance	Millions of Fixed (2014) Dollars	1.805	1.833	1.867	2.648	2.207	1.099	2.718	0.626	1.274	1.212	1.058	1.851	0.135	-0.510
Arts, Entertainment, and Recreation	Millions of Fixed (2014) Dollars	0.244	0.263	0.236	0.357	0.271	0.174	0.341	0.123	0.186	0.174	0.141	0.209	0.012	-0.053
Accommodation and Food Services	Millions of Fixed (2014) Dollars	1.113	1.196	1.066	1.559	1.116	0.685	1.390	0.448	0.785	0.730	0.604	0.916	0.008	-0.290
Other Services, except Public Administration	Millions of Fixed (2014) Dollars	0.607	0.650	0.625	0.900	0.710	0.411	0.856	0.252	0.429	0.393	0.320	0.518	-0.001	-0.195
State and Local Government	Millions of Fixed (2014) Dollars	5.835	6.476	5.548	8.120	5.788	4.354	7.141	3.457	4.588	4.260	3.570	4.405	0.911	-0.202

Total Compensation															
MBCRT study.rwb															
Regional Simulation 1 compared to Standard Regional Control - Difference															
Region = All Regions															
Browser															
PI+ Montana Regions v1.5.2 (Build 3307)															
Category	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Wage and Salary Disbursements	Millions of Fixed (2014) Dollars	18.398	21.754	19.723	29.563	22.736	18.271	28.084	15.137	18.979	17.711	14.641	17.732	3.807	-1.195
Compensation	Millions of Fixed (2014) Dollars	22.406	26.445	23.973	35.975	27.715	22.289	34.340	18.541	23.299	21.797	18.098	21.945	4.947	-1.154
Earnings by Place of Work	Millions of Fixed (2014) Dollars	26.707	31.477	27.479	42.357	31.848	24.965	40.260	19.396	24.355	22.816	18.098	23.742	3.723	-3.262
Average Annual Wage Rate	Thousands of Fixed (2014) Dollars	0.006	0.008	0.008	0.010	0.009	0.008	0.009	0.007	0.008	0.007	0.006	0.006	0.003	0.002
Average Annual Compensation Rate	Thousands of Fixed (2014) Dollars	0.005	0.007	0.008	0.010	0.009	0.009	0.010	0.008	0.009	0.008	0.007	0.007	0.004	0.003
Average Annual Earnings Rate	Thousands of Fixed (2014) Dollars	0.007	0.010	0.008	0.012	0.010	0.009	0.012	0.007	0.007	0.006	0.005	0.006	0.002	0.001

Revenues															
MBCRT study.rwb															
Regional Simulation 1 compared to Standard Regional Control - Difference															
Region = All Regions															
Browser															
PI+ Montana Regions v1.5.2 (Build 3307)															
Category	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Intergovernmental Revenue	Millions of Fixed (2014) Dollars	0.216	0.382	0.541	0.730	0.842	0.839	0.967	0.917	0.957	0.973	0.980	1.036	0.924	0.765
General Sales Tax	Millions of Fixed (2014) Dollars	0.339	0.377	0.383	0.551	0.461	0.310	0.569	0.242	0.352	0.330	0.292	0.398	0.098	-0.024
Selective Sales Tax	Millions of Fixed (2014) Dollars	0.291	0.324	0.329	0.474	0.397	0.266	0.490	0.208	0.302	0.284	0.251	0.343	0.084	-0.021
License Taxes	Millions of Fixed (2014) Dollars	0.139	0.154	0.157	0.225	0.189	0.127	0.233	0.099	0.144	0.135	0.120	0.163	0.040	-0.010
Individual Income Tax	Millions of Fixed (2014) Dollars	1.025	1.203	1.058	1.624	1.217	0.958	1.556	0.752	0.969	0.917	0.748	0.986	0.201	-0.070
Corporate Income Tax	Millions of Fixed (2014) Dollars	0.156	0.173	0.147	0.227	0.160	0.120	0.209	0.092	0.132	0.123	0.099	0.130	0.009	-0.025
Other Taxes	Millions of Fixed (2014) Dollars	0.170	0.201	0.180	0.275	0.211	0.170	0.269	0.138	0.175	0.168	0.141	0.182	0.052	0.006
Current Charges	Millions of Fixed (2014) Dollars	0.496	0.589	0.527	0.805	0.616	0.497	0.789	0.405	0.513	0.491	0.414	0.534	0.154	0.018
Miscellaneous General Revenue	Millions of Fixed (2014) Dollars	0.354	0.421	0.377	0.575	0.440	0.355	0.563	0.289	0.367	0.351	0.295	0.381	0.110	0.013
Utility Revenue	Millions of Fixed (2014) Dollars	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Liquor Store Revenue	Millions of Fixed (2014) Dollars	0.023	0.027	0.024	0.037	0.029	0.023	0.037	0.019	0.024	0.023	0.019	0.025	0.007	0.001
Insurance Trust Revenue	Millions of Fixed (2014) Dollars	1.096	1.301	1.164	1.778	1.361	1.096	1.740	0.894	1.133	1.085	0.913	1.178	0.339	0.040
TOTAL	Millions of Fixed (2014) Dollars	4.303	5.153	4.886	7.302	5.923	4.761	7.422	4.055	5.069	4.881	4.273	5.355	2.018	0.694

Employment															
MBCRT study.rwb															
Regional Simulation 1 compared to Standard Regional Control - Difference															
Region = All Regions															
Browser															
PI+ Montana Regions v1.5.2 (Build 3307)															
Category	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Forestry, Fishing, and Related Activities	Individuals (Jobs)	0	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1
Mining	Individuals (Jobs)	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1	-1
Utilities	Individuals (Jobs)	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Construction	Individuals (Jobs)	0	-2	-1	98	90	76	52	62	32	29	23	16	23	-6
Manufacturing	Individuals (Jobs)	0	0	0	3	1	0	0	0	-1	-1	-1	-1	-1	-2
Wholesale Trade	Individuals (Jobs)	0	-1	-1	15	7	6	3	6	2	3	3	2	3	0
Retail Trade	Individuals (Jobs)	0	-6	-5	91	45	37	21	41	13	21	19	16	25	2
Transportation and Warehousing	Individuals (Jobs)	0	0	0	1	0	0	-1	0	-1	-1	-1	-1	-1	-1
Information	Individuals (Jobs)	0	0	0	3	1	0	0	0	-1	-1	-1	-1	-1	-1
Finance and Insurance	Individuals (Jobs)	0	0	0	4	0	-1	-2	-2	-3	-3	-3	-3	-3	-4
Real Estate and Rental and Leasing	Individuals (Jobs)	0	-1	0	41	23	16	8	15	2	4	3	0	3	-7
Professional, Scientific, and Technical Services	Individuals (Jobs)	3	45	99	909	516	361	293	477	234	304	286	226	277	48
Management of Companies and Enterprises	Individuals (Jobs)	0	0	0	0	0	0	-1	-1	-1	-1	-1	-1	-1	-1
Administrative and Waste Management Services	Individuals (Jobs)	0	1	5	69	37	26	18	32	12	17	15	11	16	-1
Educational Services	Individuals (Jobs)	0	0	0	3	1	1	1	1	0	1	1	1	1	0
Health Care and Social Assistance	Individuals (Jobs)	0	-5	-5	59	26	20	9	24	4	10	9	8	15	-1
Arts, Entertainment, and Recreation	Individuals (Jobs)	0	0	0	19	10	7	4	8	3	4	4	3	4	0
Accommodation and Food Services	Individuals (Jobs)	0	-1	0	54	28	21	14	25	10	15	14	12	17	4
Other Services, except Public Administration	Individuals (Jobs)	0	-3	-2	45	20	14	6	16	2	6	5	4	8	-2
State Government	Individuals (Jobs)	0	35	38	32	45	29	21	34	17	24	22	19	22	4
Local Government	Individuals (Jobs)	0	27	30	25	38	29	22	36	17	21	20	16	20	5

Population															
MBCRT study.rwb															
Regional Simulation 1 compared to Standard Regional Control - Difference															
Region = All Regions															
Browser															
PI+ Montana Regions v1.5.2 (Build 3307)															
Category	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ages 0-14	Individuals	19	34	48	66	77	77	89	86	89	91	91	95	84	68
Ages 15-24	Individuals	17	29	38	49	52	45	50	41	42	41	41	46	38	26
Ages 25-64	Individuals	41	75	109	150	177	181	210	204	214	217	219	229	206	173
Ages 65+	Individuals	0	0	1	2	3	4	6	7	9	10	12	13	15	16