



Genome Alberta

Economic Impact Assessment of Genome Alberta's
Investment Attraction

September 29,
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Notice to Reader

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The analysis and observations presented in this document are based on information provided by Genome Alberta, as well as secondary research conducted by PwC.

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Our findings are subject to the Assumptions and Limitations slide.

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PwC has been engaged by Genome Alberta to assess the economic impact of its investment attraction efforts

Background

Genome Alberta (GAB) is a publicly funded not-for-profit corporation that initiates, funds, and manages genomics research and partnerships. Since its formation in 2005, GAB has been a part of 129 research initiatives as a lead, co-lead, or participant. These initiatives have helped to deliver economic benefits to Alberta and other regions in Canada.

In this regard, GAB has asked PwC to conduct an independent economic impact assessment of its investment attraction performance of past projects.

Our approach

To assess GAB's impact we have obtained project funding data provided by GAB and used an input-output modelling approach to estimate the impact of this funding on the economy. The analysis estimated multiplier effects through indirect (supply chain) and induced (employee spending) impacts. These results capture the value of GDP, jobs and provincial and federal taxes related to these projects over a 24 year period (2002-2025).

For the purpose of the economic impact assessment, the following impact channels were investigated:

1. **Impacts Created by Genome Alberta in Alberta:** Economic impacts in Alberta resulting from (or will result from) Genome Alberta's funding for projects in Alberta.
2. **Impacts Enabled by Genome Alberta in Alberta:** Economic impacts in Alberta resulting from (or will result from) projects funded in Alberta in part by Genome Alberta (with the remaining funding coming from other project partners).
3. **Impacts Created Genome Alberta in Canada:** Economic impacts in Canada resulting from (or will result from) Genome Alberta's funding for projects in Alberta.
4. **Impacts Enabled by Genome Alberta in Canada:** Economic impacts in Canada resulting from (or will result from) projects funded in Alberta in part by Genome Alberta (with the remaining funding coming from other project partners).
5. **Alberta Impacts of wider Genome ecosystem organisation spending (e.g. Genome Canada) in rest of Canada:** Economic impacts in Alberta resulting from (or will result from) spending by other organisations in BC, Saskatchewan, Manitoba, Ontario and Quebec.

We have considered five channels of impact through which Genome Alberta and partners can support the economy

Impact type	Source of funding	Geographic location of spend	Geographic location of impact
1. Impacts Created by Genome Alberta in Alberta	Genome Alberta	Alberta	Alberta
2. Impacts Enabled by Genome Alberta in Alberta	Genome Alberta and other project partners	Alberta	Alberta
3. Impacts Created by Genome Alberta in Canada	Genome Alberta	Alberta	Canada
4. Impacts Enabled by Genome Alberta in Canada	Genome Alberta and other project partners	Alberta	Canada
5. Alberta Impacts of wider Genome ecosystem organisation spending (e.g. Genome Canada) in rest of Canada	Wider Genome ecosystem	BC, Saskatchewan, Manitoba, Ontario and Quebec.	Alberta

Economic impact assessment was performed using an input-output model of the Canadian economy

Key terminology and definitions

Economic impact assessment

The fundamental philosophy behind economic impact assessment is that spending on goods and services has attendant impacts throughout the economy. For instance, spending on genome research will generate demand for the inputs to this process (such as equipment and labour) that in turn generate additional demand that extends beyond the initial spending. Statistics Canada's Interprovincial Input-Output was used to obtain the direct, indirect and induced economic effects of Genome Alberta investment attraction in Alberta and Canada.

Economic variables

Value added or Gross Domestic Product ("GDP") – The value added to the economy, or the output valued at basic prices less intermediate consumption valued at purchasers' prices.

Employment – The number of jobs created or supported. It is expressed as the number of full-time employee ("FTE") jobs indicated in person years.

Tax revenue – Taxes on Production and Products, Corporate Income Taxes and Personal Income Taxes collected by Federal, Provincial and Municipal governments.

Impact level breakdown

Direct impacts result from companies' spending on suppliers and employees.

Indirect impacts arise from the activities of the firms providing inputs to a company's suppliers (in other words, the suppliers of its suppliers).

Induced impacts are the result of consumer spending by employees of the businesses stimulated by direct and indirect expenditures.

The *total economic impact* is equal to the sum of the Direct, Indirect, and Induced economic impacts.

Genome Alberta has enabled/will enable up to \$222.8m in funding in Alberta between 2002-2025, with \$51.6m directly from GAB.

Cumulative funds for total project budgets in Alberta (nominal dollar values)



- In nominal or cash terms, Genome Alberta participated in projects totalling \$222.8 million from 2002-2025 (both enabled and created). To calculate economic impacts, total funding was converted to 2020 dollars to account for inflation; future spend was discounted according to an assumed 2% inflation rate per year. The values in 2020 dollars are shown on the following slide.
- Genome Alberta funds are defined as funds provided by the Government of Alberta (multiple sources) that are managed directly by Genome Alberta and provided to supported projects.
- Between 2005 and 2025, Genome Alberta alone has provided / will provide on average \$2.5 million in funding per year.
- Including the spend across Canada by Genome Alberta, Genome Canada and project partners (not shown in this chart), total research funding between 2002 and 2025 is estimated to be \$558.6m in nominal terms, translating to \$609.7m in 2020 dollars.

In 2020 fixed prices, Genome Alberta has enabled/will enable over \$242.7m of genome research spend in Alberta, including \$56.5m of funding directly provided by GAB

Cumulative funds for total project budgets in Alberta (2020 dollars)



- This chart shows the equivalent data translated into fixed 2020 prices to control for inflation and allow results to be reported on a cumulative basis. This adjustment acts to increase the value of spend before 2020 and reduce the value of spend after 2020.
- Between 2005 and 2025, Genome Alberta alone has provided / will provide on average \$2.7 million in funding per year. Around half of cumulative funding was / will be spent on researchers' salaries.
- Of the \$186.3 million in cumulative funding from other sources, \$103.1 million was / will be provided by Genome Canada.
- In addition, Genome Alberta has provided / will provide almost \$4 million in funding for projects in other provinces.

Source: Genome Alberta

We estimate that GAB Created plus Enabled research projects will result in \$226m in GDP in the province and \$22m in provincial tax revenue

Table 1: Impacts Created - Cumulative impact of Genome Alberta's spending (2002-2025), Alberta only, 2020 fixed prices

Impact type	Direct	Indirect	Induced	Total
GDP (\$M)	\$31.9	\$9.9	\$15.1	\$56.9
Employment (FTE, person-years)	306	71	90	467
Labour income (\$M)	\$31.9	\$5.7	\$6.2	\$43.8
Provincial tax revenue* (\$M)	\$2.3	\$0.9	\$2.3	\$5.5

Table 2: Impacts Enabled - Cumulative impact of projects enabled and part funded by Genome Alberta, 2002-2025), Alberta only, 2020 fixed prices

Impact type	Direct	Indirect	Induced	Total
GDP (\$M)	\$118.5	\$48.2	\$59.0	\$225.8
Employment (FTE, person-years)	1,137	353	352	1,842
Labour income (\$M)	\$118.5	\$28.3	\$24.2	\$171.1
Provincial tax revenue* (\$M)	\$8.7	\$4.4	\$9.0	\$22.0

- The two tables present estimated Alberta-wide impacts as a result from funding provided (or that will be provided) by Genome Alberta (Impacts Created) and from spending on projects that are part funded by Genome Alberta and other sources (Impacts Enabled).
- Impacts Enabled (shown in Table 2) also capture the Impacts Created (shown in Table 1) so the two are not additive.
- The cumulative GDP impact in Alberta defined as Impacts Created are estimated to amount to \$56.9 million between 2002-2025.
- The cumulative GDP impact in Alberta defined as Impacts Enabled are estimated to amount to \$225.8 million between 2002-2025. This level of impact would also support 1,842 person years of employment.
- An important definitional point is that direct GDP, estimated through input-output modelling, will always be lower than the associated direct spending upon which it is estimated (spending totalled \$242.7m as shown on the previous page). This is because GDP is a net measure designed to capture the value-added from economic activity while spending is a gross measure.

Taking into account the spillovers to other provinces, the cumulative impacts of GAB-enabled investments in Alberta is estimated at \$272.8m

Table 3: Impacts Created - Cumulative impact of Genome Alberta's spending (2002-2025), Canada, 2020 fixed prices

Impact type	Direct	Indirect	Induced	Total
GDP (\$M)	\$31.9	\$14.8	\$21.1	\$67.8
Employment (FTE, person-years)	306	112	135	552
Labour income (\$M)	\$31.9	\$8.8	\$9.4	\$50.1
Federal tax revenue* (\$M)	\$4.7	\$1.7	\$2.8	\$9.2

Table 4: Impacts Enabled - Cumulative impact of projects enabled and part funded by Genome Alberta (2002-2025), Canada, 2020 fixed prices

Impact type	Direct	Indirect	Induced	Total
GDP (\$M)	\$118.5	\$71.1	\$83.1	\$272.8
Employment (FTE, person-years)	1,137	540	532	2,208
Labour income (\$M)	\$118.5	\$42.6	\$37.1	\$198.2
Federal tax revenue* (\$M)	\$17.3	\$8.1	\$11.2	\$36.6

- It is also the case that the rest of Canada also benefits from the activity enabled by GAB in Alberta (both Impacts Created and Impacts Enabled). Such spillovers to other provinces arise through indirect and induced effects (e.g. purchases from a supplier in BC made by a project in Alberta.)
- Tables 3 and 4 present estimates of the Canada wide impacts of the projects supported in Alberta. As on the previous page, the results are not additive with the values from Table 3 already captured in Table 4.
- Table 3 contains estimates of the cumulative GDP impact in Canada created by (or will be created by) Genome Alberta's investments in Alberta from 2002-2025. On a Canada wide basis this is estimated to be \$67.8 million, around \$11m higher than the Alberta only impacts shown in Table 1.
- The cumulative GDP impact in Canada enabled by (or will be enabled by) Genome Alberta and partner investments in Alberta from 2002-2025 is estimated to be \$272.8 million, around \$47m more than the Alberta only impacts shown in Table 2.

Activity from the broader genome ecosystem in the rest of Canada also benefit Alberta's economy, supporting \$12.3m in GDP

Table 5: Alberta Impacts of wider Genome ecosystem organisation spending (e.g. Genome Canada) (2002-2025), 2020 fixed prices

Impact type	Direct	Indirect	Induced	Total
GDP (\$M)	-	\$7.2	\$6.1	\$12.3
Employment (FTE, person-years)	-	36	36	72
Labour income (\$M)	-	\$3.3	\$2.8	\$6.1
Provincial tax revenue* (\$M)	-	\$0.7	\$1.0	\$1.8

- A final category we assessed is how Alberta's economy benefits from the activities of GAB's partner organizations in the rest Canada such as Genome Canada.
- These impacts consider the spend of Genome Canada and GAB's sister organizations and other project partners in BC, Saskatchewan, Manitoba, Ontario and Quebec. There some spillover impacts from this expenditure in Alberta via indirect and induced effects.
- It is important to note that these impacts are less closely related to GAB's activities since GAB does not directly fund it. As a result, we have presented it separately to the other impacts shown on preceding pages. Nevertheless this activity through the Genome research ecosystem does provide an economic benefit to Alberta.
- The cumulative GDP impact in Alberta created by (or will be created by) this channel is estimated to be \$12.3 million and to support 72 person years of employment. Given this spend is not created or enabled by Genome Alberta, we consider that it should not be added to the impacts presented elsewhere in this report.

Government spend on R&D and innovation often drives positive economic growth, exceeding returns from other types of spend.

To provide greater context for these results, it is helpful to think about them in relation to returns on different types of government spending. Funding of research will have spending related effects which are estimated in this report. These arise, for example, through the funding of local salaries and the associated multiplier effects on the economy.

Additionally, research funding can have “catalytic” economic effects, where the research can lead to increased market opportunities due to new product and service development or increased productivity. These can have additional economic effects but these have not been measured within the scope of this study.

Recent academic research indicates that government spending on innovation creates a larger overall economic impact than other common forms of government spending such as government consumption (e.g. procurement of goods and services) and government investment (e.g. construction of physical assets). A report from the University College London Institute for Innovation and Public Purpose using data from the United States estimated that the overall the GDP benefit from a dollar of public spend on R&D is 3.7 times higher than a dollar of spend on government investment and 6.9 times higher than a dollar of spend on government consumption.¹

¹ University College London, Institute for Innovation and Public Purpose, [The macroeconomic impact of government innovation policies: A quantitative assessment](#).

Assumptions and Limitations

The conclusions expressed and information presented in this report rely on the following major assumptions:

- Completeness, reliability, and accuracy of data provided by Genome Alberta to PwC; and
- That the 2017 Statistics Canada Input-Output model constitute a reasonable representation of the underlying relationships in the Alberta and Canadian economies during the relevant periods modeled in the report.

Input-Output modeling limitations

Like any economic model, the I-O model used to conduct this study is conceptually an abstraction that attempts to be complex enough to accurately capture and estimate the most significant impacts to the real-life economy caused by an economic activity, yet simple enough to be analytically and intuitively meaningful. This I-O analysis therefore implicitly assumes that the Inter-industry relationships in Alberta and Canada estimated in the I-O model constitute a reasonable representation of the underlying relationships in the economy during the relevant periods modeled in the report.

Generally, I-O analysis does not address whether the inputs have been used in the most productive manner or whether the use of these inputs in this industry promotes economic growth by more than their use in another industry or economic activity. Nor does input-output analysis evaluate whether these inputs might be employed elsewhere in the economy if they were not employed in this industry at the time of the analysis. Input-output analysis calculates the direct, indirect and induced economic impacts that can reasonably be expected to affect the economy based on historical relationships within the economy. This analysis does not take into account fundamental shifts in the relationships within the economy that may have taken place since the estimation of industry relationships by Statistics Canada, nor shifts that may take place in the future.

Data limitations

PwC has relied upon the information provided by Genome Alberta, including projections of future spend. PwC has relied upon the completeness, accuracy, and fair presentation of all information and data obtained from Genome Alberta, which were not audited or otherwise verified. The findings in this report are conditional upon such completeness, accuracy, and fair presentation, which have not been verified independently by PwC. Accordingly, we provide no opinion, attestation or other form of assurance with respect to the results of this study.

Assumptions and Limitations

Further considerations for input-Output modeling

Input-output modelling is a widely used approach by economists to measure economic impacts of different scenarios in a comparable way. There are several assumptions implicit to the modelling approach which are also important to note.

1. Constant returns of scale and technique in production.
2. There is no mechanism for price adjustments or responses to price changes.
3. A lack of supply constraints inputs to production (e.g. labour).
4. No household and government budget constraints.

While it is not possible to definitively state the extent to which these limitations may impact the results of an individual analysis, in general terms they are likely to be more restrictive when assessing a major increase in demand rather than a more limited one. For example, if a large mine is constructed in a rural area then the assumption of no labour supply constraints may not be valid. Given the spending assessed in this study is distributed widely across Alberta and is relatively small in relation to the overall economy (impacts of to \$20 million a year compared to over \$300 billion in GDP in Alberta), this means that it is less likely than in some other studies for these assumptions to negatively affect the reliability of results.