The Conference Board of Canada

How Ontario Universities Benefit Regional Economies

Assessing the Regional Economic Impacts of Universities in Ontario

Impact Paper | December 9, 2021

Contents

Key Findings

- Ontario universities contribute to provincial and regional GDP in substantial ways. The combined impact of spending from university activities ($45.6 billion) and human capital development ($50.6 billion) is $96.2 billion annually, corresponding to 11.7% of provincial GDP during the 2018–2019 period.

- Earnings for graduates of Ontario universities increase by more than 70% once they earn a university degree compared with having only a high school diploma.

- In addition, university research and development (R&D) over the years is responsible for a $30.6-billion increase in GDP from 1971 to 2018. Additional investments in R&D will boost total factor productivity for years to come and contribute to Ontario's global competitiveness.

- There is variation among regions regarding the relative size of impact components. In some regions, spending from university activities makes the largest contribution to regional GDP. In these regions, universities function as "anchor institutions" that support a significant proportion of economic activity relative to the economic size of the host regions.

- In other regions, human capital development creates the largest impact. In these regions, the increase in skills and lifetime earnings of graduates is the largest contribution that Ontario universities make to regional economies.

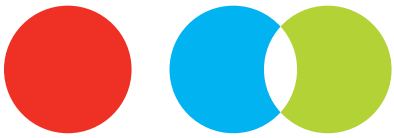
- Although most jobs and GDP contributions generated by Ontario universities are located in the 15 regions that are host to universities, there were 28,890 jobs (5.9 per cent of the province's total) supported by Ontario universities in other parts of the province during the 2018–2019 academic year. This corresponds to 2.1 per cent of total employment in these regions.

Introduction

The purpose of this study is to quantify the collective economic impacts of Ontario universities in the various regions of the province.[1]

Universities create economic and social value for their host communities through a multitude of channels. First, universities support economic activity via spending related to their activities. These benefits include purchases of local goods and services to enable university operations, major capital investments, spending by non-local students and visitors, and the additional spending power that graduates have due to their higher earnings.

Second, universities produce skilled workers who increase the overall productivity of the workforce in the province. Higher levels of human capital, typically measured by years of schooling, are associated with economic development and growth.[2] Areas with greater university access benefit from an increased likelihood that locals will attain post-secondary education.[3] Similarly, these local university graduates are more likely to seek employment within their community, thereby contributing to the economy.[4]



With the ever-increasing importance of innovation in producing and delivering goods and services, the knowledge-based economy demands a highly qualified and adaptable labour force. Notably, the quality of employee skills is a significant determinant of an organization's ability to compete globally. A lack of skill within the enterprise is one of the two most frequently reported obstacles to innovation among Canadian firms.[5] As such, a core pillar of building and maintaining a skilled and adaptable labour force is preparing Ontarians for the knowledge economy.

Sector-Level Impact on Ontario Regions

This paper estimates the impact that Ontario universities have on any one region of study, as the impacts of universities extend beyond their home regions.

In addition, this sector-wide economic impact paper should not be read as the sum of the economic impacts by individual universities, as it is limited to the information that is available. For example, individual universities often have data for specific impacts that are not available for the sector as a whole.

1 Ontario universities' economic impacts outside of the CMAs/CAs included in this report are captured under "Rest of Ontario."
2 Sianesi and Van Reenen, "Education and Economic Growth."
3 Card, "Estimating the Return to Schooling."
4 Valero and Van Reenen, "The Economic Impact of Universities."
5 Statistics Canada, "Survey of Business and Innovation Strategy 2012. "The most frequently cited obstacle is "uncertainty and risk."

A third channel through which universities contribute to their regional economies is by fostering the innovation process, both directly and indirectly. Universities influence innovation directly, as university researchers produce new products and technologies, sometimes in collaboration with local businesses, and indirectly by providing undergraduate and graduate students with the skills required to undertake research and develop innovations across the economy and society. Exposure to diverse researchers ensures access to leading-edge knowledge and contributes to a firm's propensity to innovate.[6] Overall, universities increase local innovation capacity.[7]

In addition to these channels of economic value creation, universities contribute to the development of institutional and civic institutions, which is essential for both economic and societal growth. Universities foster an ecosystem within which local civic institutions find a platform for democratic dialogue and idea-sharing through events, publications, or reports to policy-makers. More robust institutions, well-informed citizens, and a better-educated workforce ultimately lead to social cohesion and a solid foundation for future economic growth.[8]

In sum, universities are major contributors to Ontario's regional economic development. The causal relationship between university activity and GDP per capita is robust.[9] As noted by Valero and Van Reenen, "the relationship between GDP per capita and universities is not simply driven by the direct expenditures of the university, its staff and students. Part of the effect of universities on growth is mediated through an increased supply of human capital and greater innovation."[10]

Objectives

This study analyzes the economic impact of Ontario universities on 13 census metropolitan areas (CMAs) and two census agglomerations (CAs) in Ontario for the 2018–2019 academic year.[11] Specifically, we:

1. analyze the impact of spending from university activities (i.e., university spending, major capital expenditures, student and visitor spending, alumni spending) on employment, GDP, wages, and government revenue;
2. analyze human capital development impacts, focusing on the income premium experienced by university graduates relative to high school graduates;
3. estimate Total Factor Productivity (TFP) gains in regional economies attributable to the research and development (R&D) spending conducted at Ontario universities.

6 Dostie, *Innovation, Productivity, and Training.*

7 Anselin, Varga, and Acs, "Local Geographic Spillovers"; Toivanen and Väänänen, "Education and Invention"; Watzinger, Treber, and Schnitzer, "Universities and Science-Based Innovation."

8 Valero and Van Reenen, "The Economic Impact of Universities."

9 Ibid.

10 Ibid.

11 The impact of university spending, capital spending, and student visitor spending is for 2018–19, while for alumni spending and R&D the numbers are for 2018 because the data are not based on the university fiscal year but on annual data from Statistics Canada.

Appendix A provides a detailed methodology, including descriptions of each of the four impact categories, our modelling process, definitions (e.g., direct, indirect, and induced impacts), and key assumptions. Appendix B provides student enrollment, associated visitor numbers for each region, our TFP calculations for individual impact regions, and occupational impacts.

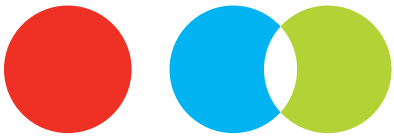
Impact Results

We analyze the impacts attributable to university activities, human capital development, and R&D activities for each region. For the component related to spending from university activities, which has four subcomponents, we examine impacts through a detailed analysis of the changes in employment, gross domestic product (GDP), labour income (wages and benefits), and taxes.[12] We provide direct, indirect, and induced economic impact estimates to highlight different mechanisms by which these impacts are generated. Spending from university activities creates $45.6 billion in GDP annually in the province (see Table 1).

For human capital development, we analyze the total number of Ontario university graduates working in the region and the income premium they earn from their university degrees. University alumni earn $50.6 billion in premium income compared with high school graduates. The total GDP impact of these two channels (spending from university activities and human capital development) is more than $96 billion.

For the R&D impacts, we estimate the increase in GDP between 1971 and 2018 that is due to total factor productivity resulting from university research over time. To do this, we first estimate the impact on GDP of university R&D activity in Ontario. We then allocate that increase in GDP across the regions by averaging three different estimates. The first is based on the industry distribution of GDP at the provincial and regional levels. The second is based on the industry distribution of business R&D activity at the provincial level. And the last is based on each region's share of university research activity in the province. We then average the results from each of these methods to create our final estimate for each region.

Investments in university R&D have increased Ontario's GDP by $30.6 billion compared to 1971 (see Table 2).



12 All monetary values are in 2018 dollars unless mentioned otherwise. Federal taxes include income tax, corporate tax, social security contributions (pension and medical), sales tax, gas tax, excise tax, and import duties. Provincial taxes include income tax, corporate tax, sales tax, gas tax, excise tax, and import duties. Municipal taxes include property tax.

Table 1
Spending and Human Capital Development Impacts of Universities
(GDP, $ millions)

Region	Spending From University Activities	Human Capital Development	Total
Greater Sudbury CMA	595	528	1,123
Guelph CMA	1,154	721	1,875
Hamilton CMA	2,574	2,781	5,355
Kingston CMA	1,247	566	1,813
Kitchener–Cambridge–Waterloo CMA	2,158	1,852	4,010
London CMA	2,169	1,673	3,841
North Bay CA	196	201	397
Oshawa CMA	871	1,109	1,980
Ottawa CMA	4,991	5,514	10,505
Peterborough CMA	360	352	712
Sault Ste. Marie CA	140	197	337
St. Catharines–Niagara CMA	909	900	1,809
Thunder Bay CMA	460	403	863
Toronto CMA	23,207	26,453	49,660
Windsor CMA	1,164	1,008	2,173
Rest of Ontario	3,415	6,350	9,765
Total	**45,609**	**50,608**	**96,217**

Note: Sum of columns and rows may not be equal to the total values due to rounding of decimal points. The premium income of university graduates is a very conservative estimate of the impact of human capital on the economy at the employer level. It represents the increased income that the employer is willing to pay for that employee because of the additional human capital. It does not account for the employer's profits or other non-wage expenses related to supporting the work of the employee.
Source: The Conference Board of Canada.

Table 2
Total Factor Productivity (TFP) Impacts
(GDP, $ millions)

Region	TFP
Greater Sudbury CMA	340
Guelph CMA	748
Hamilton CMA	2,012
Kingston CMA	788
Kitchener–Cambridge–Waterloo CMA	1,557
London CMA	1,367
North Bay CA	106
Oshawa CMA	384
Ottawa CMA	2,551
Peterborough CMA	160
Sault Ste. Marie CA	106
St. Catharines–Niagara CMA	504
Thunder Bay CMA	226
Toronto CMA	13,717
Windsor CMA	598
Rest of Ontario	5,430
Total	**30,594**

Note: Sum of column may not be equal to the total values due to rounding of decimal points.
Source: The Conference Board of Canada.

Greater Sudbury

In the Greater Sudbury region, the combined impact of spending from university activities and human capital development is $1.1 billion annually, corresponding to 11.1 per cent of GDP. University activities support 6,815 jobs annually in the region, corresponding to 8.0 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $340.2 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $595 million for 2018–2019 in the region, corresponding to 5.9 per cent of regional GDP (see Table 3).

Ontario universities supported 6,815 jobs in the region during the 2018–2019 academic year,[13] corresponding to 8.0 per cent of total regional employment.

They are a major source of labour income in the region, supporting $379 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $92 million in taxes for the federal government, $76 million in taxes for the provincial government, and $18 million in taxes for municipal government(s) during the 2018–2019 period.[14]

Knowledge and Human Capital Development

In 2015, 16,358 Ontario university graduates were working in the region. On average, they earned $77,664 in employment income, while the average high school graduate earned $45,381, representing a premium of $32,283 (see Table 4). Ontario universities support $528.1 million in additional annual earnings in the region, equivalent to 5.2 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $340.2 million compared to 1971 (see Table 5).

13 "Support" means partial or full support. We use "supported" instead of "created" to be conservative in our attribution of impacts to Ontario universities. While Ontario university activities create new positions in some sectors of the economy, in many instances universities help sustain existing jobs in the economy.

14 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 3
Economic Impacts Attributable to Spending From University Activities in Greater Sudbury

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	3,844	64	559	2,348	**6,815**
GDP ($ millions)	284	7	69	234	**595**
Labour income ($ millions)	240	4	26	109	**379**
Tax impacts ($ millions)	87	2	24	74	**187**

Note: Sum of columns and rows may not be equal to the total values due to rounding of decimal points. The premium income of university graduates is a very conservative estimate of the impact of human capital on the economy at the employer level. It represents the increased income that the employer is willing to pay for that employee because of the additional human capital. It does not account for the employer's profits or other non-wage expenses related to supporting the work of the employee.
Source: The Conference Board of Canada.

Table 4
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Greater Sudbury Is $528.1 million

Ontario university graduates working in the region	A	16,358
Average employment income of Ontario university graduates working in Ontario	B	$77,914
Adjusted for regional employment income differences	C = B*k	$77,664
Average employment income of all high school graduates working in Ontario	D	$45,527
Adjusted for regional employment income differences	E = D*k	$45,381
University employment income premium (per alumni)	F = C-E	$32,283
Premium income from a university education (aggregate)	G = A*F	$528,082,695

Notes: The average employment income of university graduates is for graduates 15 years of age and over. The average income of high school graduates is for the 25–64 year old population regardless of the location of study. Statistics Canada does not track the location of study of high school graduates. The narrower age group for high school graduates increases their average employment income.
Source: The Conference Board of Canada.

Table 5
GDP Contribution of Ontario Universities' R&D in Greater Sudbury Is $340.2 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 1.5%	1.5%
		$450,595,441
3	Region's share of provincial TFP (R&D and GDP based) @ 0.8%	0.8%
		$241,309,835
4	Region's share of university research spending @ 1.3%	1.3%
		$328,664,557
5	TFP, Greater Sudbury (average of steps 2, 3, 4)	$340,189,944

Sources: The Conference Board of Canada; Statistics Canada; COU.

Guelph

In the Guelph region, the combined impact of spending from university activities and human capital development is $1.9 billion annually, corresponding to 17.5 per cent of GDP. University activities support 13,642 jobs annually in the region, corresponding to 15.2 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $748.2 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $1.1 billion in the region for the 2018–2019 period, corresponding to 10.7 per cent of regional GDP (see Table 6).

Ontario universities supported 13,642 jobs in the region during the 2018–2019 academic year, corresponding to 15.2 per cent of total regional employment.

They are a major source of labour income in the region, supporting $810 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $183 million in taxes for the federal government, $138 million in taxes for the provincial government, and $34 million in taxes for municipal government(s) during the 2018–2019 period.[15]

Knowledge and Human Capital Development

In 2015, 22,483 Ontario university graduates were working in the region. On average, they earned $77,117 in employment income, while the average high school graduate earned $45,061, representing a premium of $32,056 (see Table 7). Ontario universities support $720.7 million in additional annual earnings in the region, equivalent to 6.7 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $748.2 million compared to 1971 (see Table 8).

15 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 6
Economic Impacts Attributable to Spending From University Activities in Guelph

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	9,222	343	1,054	3,022	**13,642**
GDP ($ millions)	675	37	139	303	**1,154**
Labour income ($ millions)	595	25	49	141	**810**
Tax impacts ($ millions)	200	15	46	93	**354**

Source: The Conference Board of Canada.

Table 7
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Guelph Is $720.7 Million

Ontario university graduates working in the region	A	22,483
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$77,117
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$45,061
University employment income premium (per alumni)	F = C-E	$32,056
Premium income from a university education (aggregate)	G = A*F	$720,707,170

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 8
GDP Contribution of Ontario Universities' R&D in Guelph Is $748.2 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 1.2%	1.2%
		$381,060,510
3	Region's share of provincial TFP (R&D and GDP based) @ 1.8%	1.8%
		$541,014,783
4	Region's share of university research spending @ 5.3%	5.3%
		$1,322,422,617
5	TFP, Guelph (average of steps 2, 3, 4)	$748,165,970

Sources: The Conference Board of Canada; Statistics Canada; COU.

Hamilton

In the Hamilton region, the combined impact of spending from university activities and human capital development is $5.4 billion annually, corresponding to 14.3 per cent of GDP. University activities support 29,333 jobs annually in the region, corresponding to 7.2 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $2 billion compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $2.6 billion for the 2018–2019 period in the region, corresponding to 6.9 per cent of regional GDP (see Table 9).

Ontario universities supported 29,333 jobs in the region during the 2018–2019 academic year, corresponding to 7.2 per cent of total regional employment.

They are a major source of labour income in the region, supporting $1.6 billion in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $380 million in taxes for the federal government, $320 million in taxes for the provincial government, and $70 million in taxes for municipal government(s) during the 2018–2019 period.[16]

Knowledge and Human Capital Development

In 2015, 85,137 Ontario university graduates were working in the region. On average, they earned $78,574 in employment income, while the average high school graduate earned $45,913, representing a premium of $32,661 (see Table 10). Ontario universities support $2.8 billion in additional annual earnings in the region, equivalent to 7.5 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $2 billion compared to 1971 (see Table 11).

16 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 9
Economic Impacts Attributable to Spending From University Activities in Hamilton

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	15,454	446	992	12,441	**29,333**
GDP ($ millions)	1,157	47	118	1,251	**2,574**
Labour Income ($ millions)	966	31	49	585	**1,631**
Tax impacts ($ millions)	343	18	36	372	**769**

Source: The Conference Board of Canada.

Table 10
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Hamilton Is $2.8 Billion

Ontario university graduates working in the region	A	85,137
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$78,574
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$45,913
University employment income premium (per alumni)	F = C-E	$32,661
Premium income from a university education (aggregate)	G = A*F	$2,780,681,447

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 11
GDP Contribution of Ontario Universities' R&D in Hamilton Is $2 Billion Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 4.7%	4.7%
		$1,445,532,507
3	Region's share of provincial TFP (R&D and GDP based) @ 5.0%	5.0%
		$1,538,052,930
4	Region's share of university research spending @ 12.1%	12.1%
		$3,050,927,773
5	TFP, Hamilton (average of steps 2, 3, 4)	$2,011,504,403

Sources: The Conference Board of Canada; Statistics Canada; COU.

Kingston

In the Kingston region, the combined impact of spending from university activities and human capital development is $1.8 billion on an annual basis, corresponding to 18.6 per cent of GDP. University activities support 14,952 jobs annually in the region, corresponding to 18 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $788 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $1.2 billion for the 2018–2019 period in the region, corresponding to 12.8 per cent of regional GDP (see Table 12).

Ontario universities supported 14,952 jobs in the region during the 2018–2019 academic year, corresponding to 18 per cent of total regional employment.

They are a major source of labour income in the region, supporting $883 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $198 million in taxes for the federal government, $146 million in taxes for the provincial government, and $37 million in taxes for municipal government(s) during the 2018–2019 period.[17]

Knowledge and Human Capital Development

In 2015, 19,595 Ontario university graduates were working in the region. On average, they earned $69,520 in employment income, while the average high school graduate earned $40,622, representing a premium of $28,898 (see Table 13). Ontario universities support $566.2 million in additional annual earnings in the region, equivalent to 5.8 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $788 million compared to 1971 (see Table 14).

17 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 12
Economic Impacts Attributable to Spending From University Activities in Kingston

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	10,649	369	1,523	2,411	**14,952**
GDP ($ millions)	774	40	195	239	**1,247**
Labour Income ($ millions)	678	26	69	110	**883**
Tax impacts ($ millions)	227	16	64	74	**381**

Source: The Conference Board of Canada.

Table 13
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Kingston Is $566.2 Million

Ontario university graduates working in the region	A	19,595
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$69,520
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$40,622
University employment income premium (per alumni)	F = C-E	$28,898
Premium income from a university education (aggregate)	G = A*F	$566,238,930

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 14
GDP Contribution of Ontario Universities' R&D in Kingston Is $788 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 1.3%	1.3%
		$393,056,525
3	Region's share of provincial TFP (R&D and GDP based) @ 0.8%	0.8%
		$232,120,048
4	Region's share of university research spending @ 6.9%	6.9%
		$1,738,553,680
5	TFP, Kingston (average of steps 2, 3, 4)	$787,910,085

Sources: The Conference Board of Canada; Statistics Canada; COU.

Kitchener–Cambridge–Waterloo

In the Kitchener–Cambridge–Waterloo region, the combined impact of spending from university activities and human capital development is $4 billion annually, corresponding to 11.5 per cent of GDP. University activities support 25,371 jobs annually in the region, corresponding to 8.0 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $1.6 billion compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $2.2 billion for the 2018–2019 period in the region, corresponding to 6.2 per cent of regional GDP (see Table 15).

Ontario universities supported 25,371 jobs in the region during the 2018–2019 academic year, corresponding to 8.0 per cent of total regional employment.

They are a major source of labour income in the region, supporting $1.5 billion in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $391 million in taxes for the federal government, $313 million in taxes for the provincial government, and $78 million in taxes for municipal government(s) during the 2018–2019 period.[18]

Knowledge and Human Capital Development

In 2015, 59,476 Ontario university graduates were working in the region. On average, they earned $74,924 in employment income, while the average high school graduate earned $43,780, representing a premium of $31,144 (see Table 16). Ontario universities support $1.9 billion in additional annual earnings in the region, equivalent to 5.3 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $1.6 billion compared to 1971(see Table 17).

18 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 15
Economic Impacts Attributable to Spending From University Activities in Kitchener–Cambridge–Waterloo

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	17,835	386	2,879	4,271	**25,371**
GDP ($ millions)	1,323	41	368	425	**2,158**
Labour Income ($ millions)	1,130	27	136	220	**1,512**
Tax impacts ($ millions)	393	16	118	256	**782**

Source: The Conference Board of Canada.

Table 16
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Kitchener–Cambridge–Waterloo Is $1.9 billion

Ontario university graduates working in the region	A	59,476
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$74,924
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$43,780
University employment income premium (per alumni)	F = C-E	$31,144
Premium income from a university education (aggregate)	G = A*F	$1,852,343,507

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 17
GDP Contribution of Ontario Universities' R&D in Kitchener–Cambridge–Waterloo Is $1.6 Billion Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 3.9%	3.9%
		$1,203,739,767
3	Region's share of provincial TFP (R&D and GDP based) @ 5.0%	5.0%
		$1,525,912,330
4	Region's share of university research spending @ 7.7%	7.7%
		$1,940,084,742
5	TFP, Kitchener–Cambridge–Waterloo (average of steps 2, 3, 4)	$1,556,578,946

Sources: The Conference Board of Canada; Statistics Canada; COU.

London

In the London region, the combined impact of spending from university activities and human capital development is $3.8 billion annually, corresponding to 14.5 per cent of GDP. University activities support 25,103 jobs annually in the region, corresponding to 9.9 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $1.4 billion compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $2.2 billion for the 2018–2019 period in the region, corresponding to 8.2 per cent of regional GDP (see Table 18).

Ontario universities supported 25,103 jobs in the region during the 2018–2019 academic year, corresponding to 9.9 per cent of total regional employment.

They are a major source of labour income in the region, supporting $1.4 billion in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $328 million in taxes for the federal government, $264 million in taxes for the provincial government, and $62 million in taxes for municipal government(s) during the 2018–2019 period.[19]

Knowledge and Human Capital Development

In 2015, 57,811 Ontario university graduates were working in the region. On average, they earned $69,605 in employment income, while the average high school graduate earned $40,672, representing a premium of $28,933 (see Table 19). Ontario universities support $1.7 billion in additional annual earnings in the region, equivalent to 6.3 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $1.4 billion compared to 1971 (see Table 20).

19 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 18
Economic Impacts Attributable to Spending From University Activities in London

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	15,190	324	1,672	7,917	**25,103**
GDP ($ millions)	1,131	34	206	798	**2,169**
Labour Income ($ millions)	948	22	79	375	**1,424**
Tax impacts ($ millions)	336	13	66	239	**655**

Source: The Conference Board of Canada.

Table 19
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in London Is $1.7 Billion

Ontario university graduates working in the region	A	57,811
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$69,605
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$40,672
University employment income premium (per alumni)	F = C-E	$28,933
Premium income from a university education (aggregate)	G = A*F	$1,672,659,047

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 20
GDP Contribution of Ontario Universities' R&D in London Is $1.4 Billion Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 3.5%	3.5%
		$1,076,413,873
3	Region's share of provincial TFP (R&D and GDP based) @ 3.2%	3.2%
		$985,960,089
4	Region's share of university research spending @ 8.1%	8.1%
		$2,037,181,433
5	TFP, London (average of steps 2, 3, 4)	$1,366,518,465

Sources: The Conference Board of Canada; Statistics Canada; COU.

North Bay

In the North Bay region, the combined impact of spending from university activities and human capital development is $397.2 million annually, corresponding to 9.6 per cent of GDP. University activities support 2,151 jobs annually in the region, corresponding to 5.9 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $106 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $196 million for the 2018–2019 period in the region, corresponding to 4.8 per cent of regional GDP (see Table 21).

Ontario universities supported 2,151 jobs in the region during the 2018–2019 academic year, corresponding to 5.9 per cent of total regional employment.

They are a major source of labour income in the region, supporting $117 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $29 million in taxes for the federal government, $25 million in taxes for the provincial government, and $6 million in taxes for municipal government(s) during the 2018–2019 period.[20]

Knowledge and Human Capital Development

In 2015, 6,979 Ontario university graduates were working in the region. On average, they earned $69,283 in employment income, while the average high school graduate earned $40,484, representing a premium of $28,799 (see Table 22). Ontario universities support $201 million in additional annual earnings in the region, equivalent to 4.9 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $106 million compared to 1971 (see Table 23).

20 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 21
Economic Impacts Attributable to Spending From University Activities in North Bay

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	1,086	12	186	868	**2,151**
GDP ($ millions)	83	1	24	89	**196**
Labour Income ($ millions)	68	1	9	40	**117**
Tax impacts ($ millions)	25	<1	8	27	**60**

Source: The Conference Board of Canada.

Table 22
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in North Bay Is $201 Million

Ontario university graduates working in the region	A	6,979
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$69,283
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$40,484
University employment income premium (per alumni)	F = C-E	$28,799
Premium income from a university education (aggregate)	G = A*F	$200,990,285

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 23
GDP Contribution of Ontario Universities' R&D in North Bay Is $106 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 0.5%	0.5%
		$168,099,887
3	Region's share of provincial TFP (R&D and GDP based) @ 0.4%	0.4%
		$128,014,796
4	Region's share of university research spending @ 0.1%	0.1%
		$22,079,980
5	TFP, North Bay (average of steps 2, 3, 4)	$106,064,888

Sources: The Conference Board of Canada; Statistics Canada; COU.

Oshawa

In the Oshawa region, the combined impact of spending from university activities and human capital development is $2 billion annually, corresponding to 12.7 per cent of GDP. University activities support 8,808 jobs annually in the region, corresponding to 4.1 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $384.4 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $871 million for the 2018–2019 period in the region, corresponding to 5.6 per cent of regional GDP (see Table 24).

Ontario universities supported 8,808 jobs in the region during the 2018–2019 academic year, corresponding to 4.1 per cent of total regional employment.

They are a major source of labour income in the region, supporting $478 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $115 million in taxes for the federal government, $109 million in taxes for the provincial government, and $25 million in taxes for municipal government(s) during the 2018–2019 period.[21]

Knowledge and Human Capital Development

In 2015, 33,718 Ontario university graduates were working in the region. On average, they earned $79,155 in employment income, while the average high school graduate earned $46,252, representing a premium of $32,903 (see Table 25). Ontario universities support $1.1 billion in additional annual earnings in the region, equivalent to 7.1 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $384.4 million compared to 1971 (see Table 26).

21 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 24
Economic Impacts Attributable to Spending from University Activities in Oshawa

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	3,116	72	547	5,073	**8,808**
GDP ($ millions)	257	8	68	537	**871**
Labour Income ($ millions)	194	5	28	251	**478**
Tax impacts ($ millions)	74	2	21	151	**249**

Source: The Conference Board of Canada.

Table 25
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Oshawa Is $1.1 Billion

Ontario university graduates working in the region	A	33,718
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$79,155
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$46,252
University employment income premium (per alumni)	F = C-E	$32,903
Premium income from a university education (aggregate)	G = A*F	$1,109,426,066

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 26
GDP Contribution of Ontario Universities' R&D in Oshawa Is $384.4 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 1.8%	1.8%
		$544,627,917
3	Region's share of provincial TFP (R&D and GDP based) @ 1.6%	1.6%
		$490,438,157
4	Region's share of university research spending @ 0.5%	0.5%
		$118,147,554
5	TFP, Oshawa (average of steps 2, 3, 4)	$384,404,543

Sources: The Conference Board of Canada; Statistics Canada; COU.

Ottawa

In the Ottawa region, the combined impact of spending from university activities and human capital development is $10.5 billion annually, corresponding to 15.8 per cent of GDP. University activities support 55,186 jobs annually in the region, corresponding to 9.7 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $2.6 billion compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $5 billion for the 2018–2019 period in the region, corresponding to 7.5 per cent of regional GDP (see Table 27).

Ontario universities supported 55,186 jobs in the region during the 2018–2019 academic year, corresponding to 9.7 per cent of total regional employment.

They are a major source of labour income in the region, supporting $2.9 billion in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $729 million in taxes for the federal government, $648 million in taxes for the provincial government, and $152 million in taxes for municipal government(s) during the 2018–2019 period.[22]

Knowledge and Human Capital Development

In 2015, 155,245 Ontario university graduates were working in the region. On average, they earned $85,445 in employment income, while the average high school graduate earned $49,928, representing a premium of $35,518 (see Table 28). Ontario universities support $5.5 billion in additional annual earnings in the region, equivalent to 8.3 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $2.6 billion compared to 1971 (see Table 29).

22 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 27
Economic Impacts Attributable to Spending from University Activities in Ottawa

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	24,669	633	4,101	25,783	**55,186**
GDP ($ millions)	1,856	66	493	2,575	**4,991**
Labour Income ($ millions)	1,513	43	197	1,217	**2,969**
Tax impacts ($ millions)	559	25	158	786	**1,529**

Source: The Conference Board of Canada.

Table 28
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Ottawa Is $5.5 Billion

Ontario university graduates working in the region	A	155,245
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$85,445
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$49,928
University employment income premium (per alumni)	F = C-E	$35,518
Premium income from a university education (aggregate)	G = A*F	$5,513,932,450

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 29
GDP Contribution of Ontario Universities' R&D in Ottawa Is $2.6 Billion Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 8.8%	8.8%
		$2,693,348,624
3	Region's share of provincial TFP (R&D and GDP based) @ 5.7%	5.7%
		$1,747,351,540
4	Region's share of university research spending @ 12.8%	12.8%
		$3,212,130,869
5	TFP, Ottawa (average of steps 2, 3, 4)	$2,550,943,678

Sources: The Conference Board of Canada; Statistics Canada; COU.

Peterborough

In the Peterborough region, the combined impact of spending from university activities and human capital development is $711.9 million annually, corresponding to 10.1 per cent of GDP. University activities support 4,083 jobs annually in the region, corresponding to 6.5 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $159.8 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $360 million for the 2018–2019 period in the region, corresponding to 5.1 per cent of regional GDP (see Table 30).

Ontario universities supported 4,083 jobs in the region during the 2018–2019 academic year, corresponding to 6.5 per cent of total regional employment.

They are a major source of labour income in the region, supporting $227 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $54 million in taxes for the federal government, $45 million in taxes for the provincial government, and $11 million in taxes for municipal government(s) during the 2018–2019 period.[23]

Knowledge and Human Capital Development

In 2015, 12,994 Ontario university graduates were working in the region. On average, they earned $65,168 in employment income, while the average high school graduate earned $38,079, representing a premium of $27,089 (see Table 31). Ontario universities support $352 million in additional annual earnings in the region, equivalent to 5.0 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $159.8 million compared to 1971 (see Table 32).

23 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 30
Economic Impacts Attributable to Spending From University Activities in Peterborough

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	2,218	37	297	1,532	**4,083**
GDP ($ millions)	165	4	37	154	**360**
Labour Income ($ millions)	140	2	14	71	**227**
Tax impacts ($ millions)	49	1	12	46	**109**

Source: The Conference Board of Canada.

Table 31
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Peterborough Is $352 Million

Ontario university graduates working in the region	A	12,994
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$65,168
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$38,079
University employment income premium (per alumni)	F = C-E	$27,089
Premium income from a university education (aggregate)	G = A*F	$351,986,292

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 32
GDP Contribution of Ontario Universities' R&D in Peterborough Is $159.8 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 0.7%	0.7%
		$215,443,791
3	Region's share of provincial TFP (R&D and GDP based) @ 0.5%	0.5%
		$164,069,075
4	Region's share of university research spending @ 0.4%	0.4%
		$99,857,734
5	TFP, Peterborough (average of steps 2, 3, 4)	$159,790,200

Sources: The Conference Board of Canada; Statistics Canada; COU.

Sault Ste. Marie

In the Sault Ste. Marie region, the combined impact of spending from university activities and human capital development is $337.1 million annually, corresponding to 7.6 per cent of GDP. University activities support 1,531 jobs annually in the region, corresponding to 3.9 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $105.6 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $140 million for the 2018–2019 period in the region, corresponding to 3.2 per cent of regional GDP (see Table 33).

Ontario universities supported 1,531 jobs in the region during the 2018–2019 academic year, corresponding to 3.9 per cent of total regional employment.

They are a major source of labour income in the region, supporting $78 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $21 million in taxes for the federal government, $20 million in taxes for the provincial government, and $4 million in taxes for municipal government(s) during the 2018–2019 period.[24]

Knowledge and Human Capital Development

In 2015, 7,017 Ontario university graduates were working in the region. On average, they earned $67,445 in employment income, while the average high school graduate earned $39,410, representing a premium of $28,035 (see Table 34). Ontario universities support $196.7 million in additional annual earnings in the region, equivalent to 4.4 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $105.6 million compared to 1971 (see Table 35).

24 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 33
Economic Impacts Attributable to Spending From University Activities in Sault Ste. Marie

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	550	0	85	896	**1,531**
GDP ($ millions)	42	0	10	89	**140**
Labour Income ($ millions)	32	0	4	42	**78**
Tax impacts ($ millions)	14	0	3	28	**45**

Source: The Conference Board of Canada.

Table 34
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Sault Ste. Marie Is $196.7 Million

Ontario university graduates working in the region	A	7,017
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$67,445
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$39,410
University employment income premium (per alumni)	F = C-E	$28,035
Premium income from a university education (aggregate)	G = A*F	$196,728,137

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 35
GDP Contribution of Ontario Universities' R&D in Sault Ste. Marie Is $105.6 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 0.6%	0.6%
		$176,185,401
3	Region's share of provincial TFP (R&D and GDP based) @ 0.4%	0.4%
		$134,172,239
4	Region's share of university research spending @ <0.1%	0.0%
		$6,609,770
5	TFP, Sault Ste. Marie (average of steps 2, 3, 4)	$105,655,803

Sources: The Conference Board of Canada; Statistics Canada; COU.

St. Catharines–Niagara

In the St. Catharines–Niagara region, the combined impact of spending from university activities and human capital development is $1.8 billion annually, corresponding to 10.1 per cent of GDP. University activities support 10,198 jobs annually in the region, corresponding to 5.0 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $504.3 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $909 million for the 2018–2019 period in the region, corresponding to 5.1 per cent of regional GDP (see Table 36).

Ontario universities supported 10,198 jobs in the region during the 2018–2019 academic year, corresponding to 5 per cent of total regional employment.

They are a major source of labour income in the region, supporting $541 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $132 million in taxes for the federal government, $118 million in taxes for the provincial government, and $29 million in taxes for municipal government(s) during the 2018–2019 period.[25]

Knowledge and Human Capital Development

In 2015, 34,088 Ontario university graduates were working in the region. On average, they earned $63,526 in employment income, while the average high school graduate earned $37,120, representing a premium of $26,406 (see Table 37). Ontario universities support $900.1 million in additional annual earnings in the region, equivalent to 5 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $504.3 million compared to 1971 (see Table 38).

25 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 36
Economic Impacts Attributable to Spending From University Activities in St. Catharines–Niagara

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	4,585	260	962	4,391	**10,198**
GDP ($ millions)	337	27	119	427	**909**
Labour Income ($ millions)	274	18	45	204	**541**
Tax impacts ($ millions)	101	10	38	130	**279**

Source: The Conference Board of Canada.

Table 37
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in St. Catharines–Niagara Is $900.1 Million

Ontario university graduates working in the region	A	34,088
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$63,526
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$37,120
University employment income premium (per alumni)	F = C-E	$26,406
Premium income from a university education (aggregate)	G = A*F	$900,137,072

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 38
GDP Contribution of Ontario Universities' R&D in St. Catharines–Niagara Is $504.3 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 2.4%	2.4%
		$735,709,817
3	Region's share of provincial TFP (R&D and GDP based) @ 2.1%	2.1%
		$655,202,303
4	Region's share of university research spending @ 0.5%	0.5%
		$122,088,316
5	TFP, St. Catharines–Niagara (average of steps 2, 3, 4)	$504,333,479

Sources: The Conference Board of Canada; Statistics Canada; COU.

Thunder Bay

In the Thunder Bay region, the combined impact of spending from university activities and human capital development is $862.7 million annually, corresponding to 14.5 per cent of GDP. University activities support 5,186 jobs annually in the region, corresponding to 8.2 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $226.2 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $460 million for the 2018–2019 period in the region, corresponding to 7.7 per cent of regional GDP (see Table 39).

Ontario universities supported 5,186 jobs in the region during the 2018–2019 academic year, corresponding to 8.2 per cent of total regional employment.

Ontario universities are a major source of labour income in the region, supporting $286 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $69 million in taxes for the federal government, $58 million in taxes for the provincial government, and $14 million in taxes for municipal government(s) during the 2018–2019 period.[26]

Knowledge and Human Capital Development

In 2015, 13,690 Ontario university graduates were working in the region. On average, they earned $70,826 in employment income, while the average high school graduate earned $41,385, representing a premium of $29,441 (see Table 40). Ontario universities support $403.1 million in additional annual earnings in the region, equivalent to 15.2 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $226.2 million compared to 1971 (see Table 41).

26 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 39
Economic Impacts Attributable to Spending From University Activities in Thunder Bay

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	2,806	42	362	1,976	**5,186**
GDP ($ millions)	213	4	43	199	**460**
Labour Income ($ millions)	172	3	17	94	**286**
Tax impacts ($ millions)	64	2	14	61	**141**

Source: The Conference Board of Canada.

Table 40
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Thunder Bay Is $403.1 Million

Ontario university graduates working in the region	A	13,690
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$70,826
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$41,385
University employment income premium (per alumni)	F = C-E	$29,441
Premium income from a university education (aggregate)	G = A*F	$403,053,847

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 41
GDP Contribution of Ontario Universities' R&D in Thunder Bay Is $226.2 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 0.9%	0.9%
		$276,177,736
3	Region's share of provincial TFP (R&D and GDP based) @ 0.7%	0.7%
		$210,320,407
4	Region's share of university research spending @ 0.8%	0.8%
		$192,110,048
5	TFP, Thunder Bay (average of steps 2, 3, 4)	$226,202,730

Sources: The Conference Board of Canada; Statistics Canada; COU.

Toronto

In the Toronto region, the combined impact of spending from university activities and human capital development is $49.7 billion annually, corresponding to 11.8 per cent of GDP. University activities support 243,672 jobs annually in the region, corresponding to 7.3 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $13.7 billion compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $23.2 billion for the 2018–2019 period in the region, corresponding to 5.5 per cent of regional GDP (see Table 42).

Ontario universities supported 243,672 jobs in the region during the 2018–2019 academic year, corresponding to 7.3 per cent of total regional employment.

They are a major source of labour income in the region, supporting $13.1 billion in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $2.8 billion in taxes for the federal government, $2.6 billion in taxes for the provincial government, and $606 million in taxes for municipal government(s) during the 2018–2019 period.[27]

Knowledge and Human Capital Development

In 2015, 752,692 Ontario university graduates were working in the region. On average, they earned $84,547 in employment income, while the average high school graduate earned $49,403, representing a premium of $35,144 (see Table 43). Ontario universities support $26.5 billion in additional annual earnings in the region, equivalent to 6.3 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $13.7 billion compared to 1971 (see Table 44).

27 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 42
Economic Impacts Attributable to Spending From University Activities in Toronto

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	87,697	2,676	14,648	138,651	**243,672**
GDP ($ millions)	6,937	282	1,768	14,220	**23,207**
Labour Income ($ millions)	5,346	177	744	6,858	**13,125**
Tax impacts ($ millions)	2,035	109	419	3,600	**6,163**

Source: The Conference Board of Canada.

Table 43
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Toronto Is $26.5 Billion

Ontario university graduates working in the region	A	752,692
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$84,547
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$49,403
University employment income premium (per alumni)	F = C-E	$35,144
Premium income from a university education (aggregate)	G = A*F	$26,452,895,131

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 44
GDP Contribution of Ontario Universities' R&D in Toronto Is $13.7 Billion Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 48.0%	48.0%
		$14,676,566,025
3	Region's share of provincial TFP (R&D and GDP based) @ 51.6%	51.6%
		$15,779,593,607
4	Region's share of university research spending @ 42.6%	42.6%
		$10,694,742,347
5	TFP, Toronto (average of steps 2, 3, 4)	$13,716,967,326

Sources: The Conference Board of Canada; Statistics Canada; COU.

Windsor

In the Windsor region, the combined impact of spending from university activities and human capital development is $2.1 billion annually, corresponding to 13.1 per cent of GDP. University activities support 12,716 jobs annually in the region, corresponding to 7.6 per cent of total regional employment. In addition, we estimate that investments in university R&D have increased regional GDP by $598.3 million compared to 1971.

Spending From University Activities

GDP supported by Ontario universities was $1.2 billion for the 2018–2019 period in the region, corresponding to 7 per cent of regional GDP (see Table 45).

Ontario universities supported 12,716 jobs in the region during the 2018–2019 academic year, corresponding to 7.6 per cent of total regional employment.

They are a major source of labour income in the region, supporting $689 million in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities generated $455 million in taxes for the federal government, $431 million in taxes for the provincial government, and $102 million in taxes for municipal government(s) during the 2018–2019 period.[28]

Knowledge and Human Capital Development

In 2015, 33,217 Ontario university graduates were working in the region. On average, they earned $73,025 in employment income, while the average high school graduate earned $42,670, representing a premium of $30,355 (see Table 46). Ontario universities support $1 billion in additional annual earnings in the region, equivalent to 6.1 per cent of GDP.

Research and Development

Cumulative investments in university R&D have increased the region's GDP by $598.3 million compared to 1971 (see Table 47).

28 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 45
Economic Impacts Attributable to Spending From University Activities in Windsor

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	5,791	85	1,292	5,548	**12,716**
GDP ($ millions)	444	8	153	559	**1,164**
Labour Income ($ millions)	349	5	63	272	**689**
Tax impacts ($ millions)	140	3	153	691	**988**

Source: The Conference Board of Canada.

Table 46
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities in Windsor Is $1 Billion

Ontario university graduates working in the region	A	33,217
Average employment income of Ontario university graduates	B	$77,914
Adjusted for regional employment income differences	C = B*k	$73,025
Average employment income of Canadian high school graduates	D	$45,527
Adjusted for regional employment income differences	E = D*k	$42,670
University employment income premium (per alumni)	F = C-E	$30,355
Premium income from a university education (aggregate)	G = A*F	$1,008,289,128

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 47
GDP Contribution of Ontario Universities' R&D in Windsor Is $598.3 Million Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410
2	Region's share of provincial TFP (GDP based) @ 2.2%	2.2%
		$664,623,500
3	Region's share of provincial TFP (R&D and GDP based) @ 2.9%	2.9%
		$901,462,084
4	Region's share of university research spending @ 0.9%	0.9%
		$228,764,990
5	TFP, Windsor (average of steps 2, 3, 4)	$598,283,525

Sources: The Conference Board of Canada; Statistics Canada; COU.

Rest of Ontario

In the rest of Ontario,[29] the combined impact of spending from university activities and human capital development is $9.8 billion annually, corresponding to 7.2 per cent of GDP. University activities support 28,890 jobs annually in the rest of Ontario, corresponding to 2.1 per cent of total employment. In addition, we estimate that investments in university R&D have increased GDP by $5.4 billion compared to 1971.

Spending From University Activities

GDP supported by Ontario universities in the rest of Ontario was $3.4 billion for the 2018–2019 period, corresponding to 2.5 per cent of regional GDP (see Table 48).

Ontario universities supported 28,890 jobs in the rest of the province during the 2018–2019 academic year, corresponding to 2.1 per cent of total employment in the rest of Ontario.

They are a major source of labour income in the rest of Ontario, supporting $1.3 billion in 2018–2019.

Besides being a major source of employment and labour income, Ontario universities contribute significantly to government tax revenues in the region. Spending from university activities in the rest of Ontario generated $422 million in taxes for the federal government, $416 million in taxes for the provincial government, and $93 million in taxes for municipal government(s) during the 2018–2019 period.[30]

Knowledge and Human Capital Development

In 2015, 196,065 Ontario university graduates were working in other parts of the province. On average, they earned $77,914 in employment income, while the average high school graduate earned $45,527, representing a premium of $32,387 (see Table 49). Ontario universities support $6.3 billion in additional annual earnings in the rest of the province, equivalent to 4.7 per cent of GDP in these regions.

Research and Development

Cumulative investments in university R&D have increased GDP in the rest of Ontario by $5.4 billion compared to 1971 (see Table 50). This estimate accounts for the remainder of TFP not accounted for by the 15 regions of interest.

29 Rest of Ontario refers to Ontario minus the previously cited 15 regions.

30 Sum of these tax impacts may not be equal to total tax impacts provided in the following table due to rounding of decimal points.

Table 48
Economic Impacts Attributable to Spending From University Activities in the Rest of Ontario

Type of Impact	University Spending	Major Capital Spending	Student and Visitor Spending	Alumni Spending of Premium Income	Total
Employment	5,977	402	1,527	20,983	**28,890**
GDP ($ millions)	570	40	154	2,651	**3,415**
Labour income ($ millions)	293	25	80	920	**1,318**
Tax impacts ($ millions)	243	11	57	618	**930**

Source: The Conference Board of Canada.

Table 49
The Annual Aggregate Earnings Differential for Graduates of Ontario Universities Working in Other Parts of the Province Is $6.3 Billion

Ontario university graduates working in the province	A	1,506,565
Ontario university graduates working in the 15 regions	B	1,310,500
Ontario university graduates working in the rest of the province	C = A-B	196,065
Average employment income of Ontario university graduates	D	$77,914
Average employment income of Canadian high school graduates	E	$45,527
University employment income premium (per alumni)	F = D-E	$32,387
Premium income from a university education (aggregate)	G = C*F	$6,349,964,935

Sources: The Conference Board of Canada; Statistics Canada; COU.

Table 50
GDP Contribution of Ontario Universities' R&D in the Region Is $5.4 Billion Compared to 1971

Step	Estimation	GDP
1	Ontario TFP attributable to Ontario universities	$30,593,768,996
2	15 regions' share of provincial GDP @ 82%	82%
	Ontario TFP attributable to Ontario universities in the 15 regions	$25,163,513,984
3	TFP, Rest of Ontario (Step 1)	$5,430,255,012

Sources: The Conference Board of Canada; Statistics Canada; COU.

Conclusion

The economic impacts associated with universities in Ontario vary considerably across regions within the province. These impacts are influenced directly by what these institutions do, but also by the size and economic activity of the communities in which they reside. Although the impacts are larger in some communities than others, in all the regions we considered here, Ontario universities provide significant benefits.

University Activities

In aggregate, university activities supported $45.6 billion in economic activity in Ontario for the 2018–2019 academic year, equivalent to 5.6 per cent of GDP in the province. University activities also supported 487,639 jobs in the province (6.7 per cent of the total) and generated $13.6 billion in government revenues.

Among the spending categories related to university activities, alumni and university spending generate the greatest impact. The impacts of student and visitor spending and major capital expenditures are smaller, but still considerable.

Knowledge and Human Capital

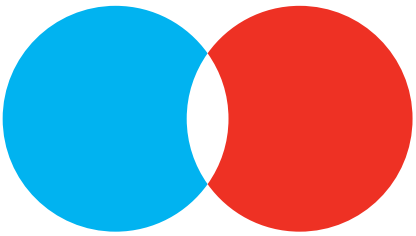
Beyond the economic impacts related to spending from university activities, Ontario universities serve an important function in Ontario's efforts to equip the workforce with crucial skills for a dynamic, knowledge-based economy. The entry of skilled workers into the labour market improves the quality of human capital—a major factor in a company's ability to innovate and remain competitive in the global economy.

Importantly, Ontario university graduates earn an income premium over high school graduates, owing to their skills and knowledge. Earnings for graduates of Ontario universities increase by 71 per cent once they earn a university degree, compared with having only a high school diploma. In total, alumni earn $50.6 billion in additional income thanks to their university education, which is equivalent to 6.2 per cent of Ontario's GDP.

Research and Development

Finally, universities contribute to regional economies by fostering the innovation process. Regional economies benefit from university R&D in a variety of ways. Some regions benefit directly when research addresses local industry and business needs (e.g., through co-development and co-patenting). In other instances, research is relevant to entire industries, resulting in the benefits spreading to all communities where that industry is present, regardless of where it took place.

Our estimate of these impacts is captured through productivity improvements in the province. We estimate that university R&D activity has increased Ontario's GDP by $30.6 billion compared to 1971.



Appendix A
Methodology

Impact Category Descriptions

Spending From University Activities

University Spending

This includes salaries and benefits paid to university personnel, spending on materials and supplies, spending on furniture and equipment, money paid for outsourced services (e.g., external contractors), and spending on other products and services necessary for the ongoing operation of Ontario universities.[31]

Major Capital Spending

This consists of spending on major capital investments in building construction, land development, and site improvement.

Student and Visitor Spending

This corresponds to spending by students who relocate to attend a university in Ontario. This includes out-of-province domestic students, international students, and non-local Ontario students.[32] These students generate an economic impact for the regions through their living expenditures (e.g., accommodation, food, books, supplies, computers, transportation, telecommunications, leisure). We do not consider tuition and fees as part of student spending because they are captured by university spending.

Where non-local students used to live affects how much of their spending we can use to estimate economic impact. Ontario students who move to attend university within the province have the lowest economic impact (per student). All spending by domestic out-of-province and international students is new to the province, and so they have the highest economic impact.

31 University spending does not include scholarships, which are captured in student spending.

32 In the third group, we only consider Ontario residents who attend a university located in a different county from their county of residence. This means that local students (i.e., Ontario residents who attend a university in the county of their residence) generate no new economic impact for the region.

Visitor spending includes spending by friends and relatives who visit university students (e.g., on accommodation, food and beverage, recreation and entertainment, retail purchases, and transportation). Among the three groups of students we focus on, international students generate the largest impact per visitor.

Alumni Spending of Premium Income

University students are increasing their human capital by building skills, which increases their productivity and leads to higher-paying jobs. According to the 2016 Census, the average employment income of Ontario university graduates with a bachelor's degree was $32,387 more than the average for all Canadian high school graduates (adjusted for inflation in 2018). Some of this income is taxed and some is saved, but the rest creates an economic impact by flowing through the economy. We calculate regional spending data based on the number of university graduates working at the regional level and the earnings differential (adjusted for regional employment income differences).

Human Capital Development

University education increases students' skills and future earnings, ultimately making them more productive members of society. The economic impact of human capital is the additional premium income of university alumni, the expenses incurred by the employer to support the work of alumni, and employer profits that result from the additional skills of university-educated employees. We do not have enough information to calculate the full impact of the increase in human capital development resulting from a university education, and as a result we use a conservative estimate equal to the premium income of university alumni.

Increases in Total Factor Productivity Due to R&D

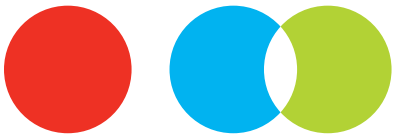
We use the total factor productivity (TFP) method to measure the growth in GDP attributable solely to technological improvements, accounting for changes in labour and capital productivity. This entails estimating the portion of regional GDP growth that can be explained by productivity gains resulting from the advancements of a province's higher education R&D system. We use a three-step approach to estimate TFP gains in regional economies.

First, we estimate provincial GDP growth attributable to university research in Ontario. For this, we follow the method developed by Fernand Martin.[33] Because Martin's method is designed for national economies, we must assume that Ontario's economy benefits from higher education R&D in comparable terms (i.e., the same as Canada). Specifically, the provincial economy is sufficiently large and diverse that it can convert research ideas into productivity gains.[34] Using this methodology, we estimate that R&D activity at Ontario universities has added $30.6 billion to the province's GDP compared to 1971, with $25.1 billion of that activity occurring in the 15 regions of interest (see Table 51).

Table 51
GDP Contribution of Ontario Universities' R&D in the 15 Regions Is $25.1 Billion Compared to 1971

Step	Estimation	GDP
1	Change in real GDP in Ontario since 1971	$599,172,914,147
2	Growth attributable to total factor productivity (TFP)	20%
	TFP = 1 * 2	$119,834,582,829
3	Exclusion of foreign R&D effects @ 31%	69%
		$82,685,862,152
4	Share of R&D by Ontario universities @ 37%	37%
	Ontario TFP attributable to Ontario universities	$30,593,768,996
5	15 regions' share of provincial GDP @ 82%	82%
	Ontario TFP attributable to Ontario universities in the 15 regions	$25,114,366,410

Sources: The Conference Board of Canada; Statistics Canada; COU.



33 Martin, "The Economic Impact of Canadian University R&D."

34 There is indeed greater leakage of R&D benefits out of the province compared to the country; however, there is also reverse leakage (i.e., the Ontario economy benefits from higher education R&D activity in other provinces). As such, it is reasonable to assume that, in proportional terms, TFP gains accruing to the Ontario economy are the same as to Canada.

Second, we develop and apply three different methods for how regions might benefit from TFP gains occurring at the provincial level:

- **Method 1** estimates regional TFP gains as a function of the industry distribution of GDP at the provincial level and the region's share of provincial GDP in different industries. According to this approach, we estimate that industries accounting for larger portions of GDP benefit more from TFP gains.
- **Method 2** estimates regional TFP gains as a function of the industry distribution of business R&D at the provincial level and the region's share of provincial GDP in industries. According to this approach, we estimate that industries with substantial business R&D activity benefit more from TFP gains.
- **Method 3** distributes the TFP growth to the regions based on their share of provincial university R&D. This approach is based on evidence from the literature that the needs of local industry and businesses drive some of the research activity undertaken by a university (e.g., co-development of products, co-patenting between academic scientists and industry inventors).[35]

Third, we take an average of those three estimates. Given the uncertainty and lack of empirical data regarding how regional industries benefit from Ontario universities' spending, we believe the average figure is a reasonable proxy for real impact.

Using the Input-Output (I-O) Model

We use The Conference Board of Canada's in-house I-O model to estimate the impact of spending from university activities in the province. The I-O model is customized to reflect the trade flows across Ontario regions and the rest of the country. Region-specific purchase coefficients reflect the propensity of businesses and consumers to purchase locally depending on the prevalence of industrial activity in the impact area (i.e., one of the 15 impact regions in Ontario).

Based on Statistics Canada's 2015 provincial and territorial supply and use and I-O tables, we model the way a dollar injected into one sector is spent and then circulated through other sectors of the economy, generating waves of economic activity, or so-called "economic multiplier" effects (see Exhibit 1).[36] The model creates a series of multipliers that, in aggregate, describe the economic implications of the original activity.

35 Anselin, Varga, and Acs, "Local Geographic Spillovers"; Watzinger, Treber, and Schnitzer, "Universities and science-based innovation."

36 For simplicity, two rounds of spending are shown in this exhibit. In reality, spending continues in the region until the last dollar from the stimulus leaves the economy, either in the form of savings or leakage.

For direct events entered as industry output, the model applies estimates of each worker's average employment and compensation to show the direct effects on jobs and monetary value figures. It then applies an event's value to local and national sector-specific production functions and follows them through transaction and payment cycles to estimate the indirect and induced impacts. During each cycle, the procedure removes expenditures to government, savings, and non-local purchases (i.e., leakage), so the results reflect only transactions that affect the local economy.[37] The I-O model enables us to distinguish the following impact categories:

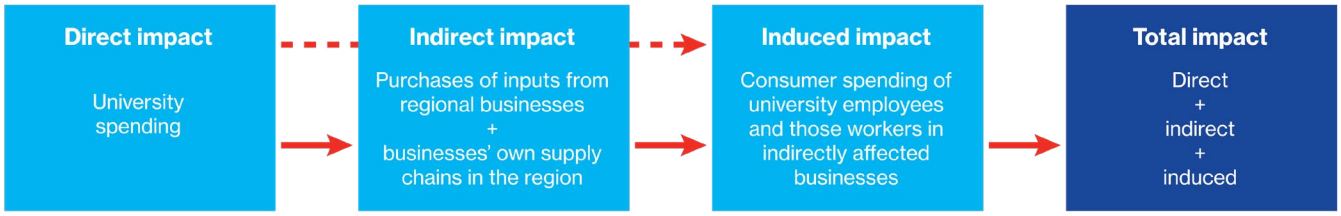
Direct effects: These are the economic effects directly associated with spending (university spending, major capital spending, student and visitor spending, alumni spending).

Indirect effects: The indirect or supply chain effects measure the economic effects associated with the use of intermediate inputs or other support services that are required for the direct impacts to occur.

Induced effects: These are the effects that occur as a result of employees in directly and indirectly impacted sectors spending their wages. Consequently, induced effects concentrate in consumer-oriented industries such as food and beverage, real estate, retail, and personal services.

Total impacts: This is the sum of direct, indirect, and induced impacts (see Exhibit 1).

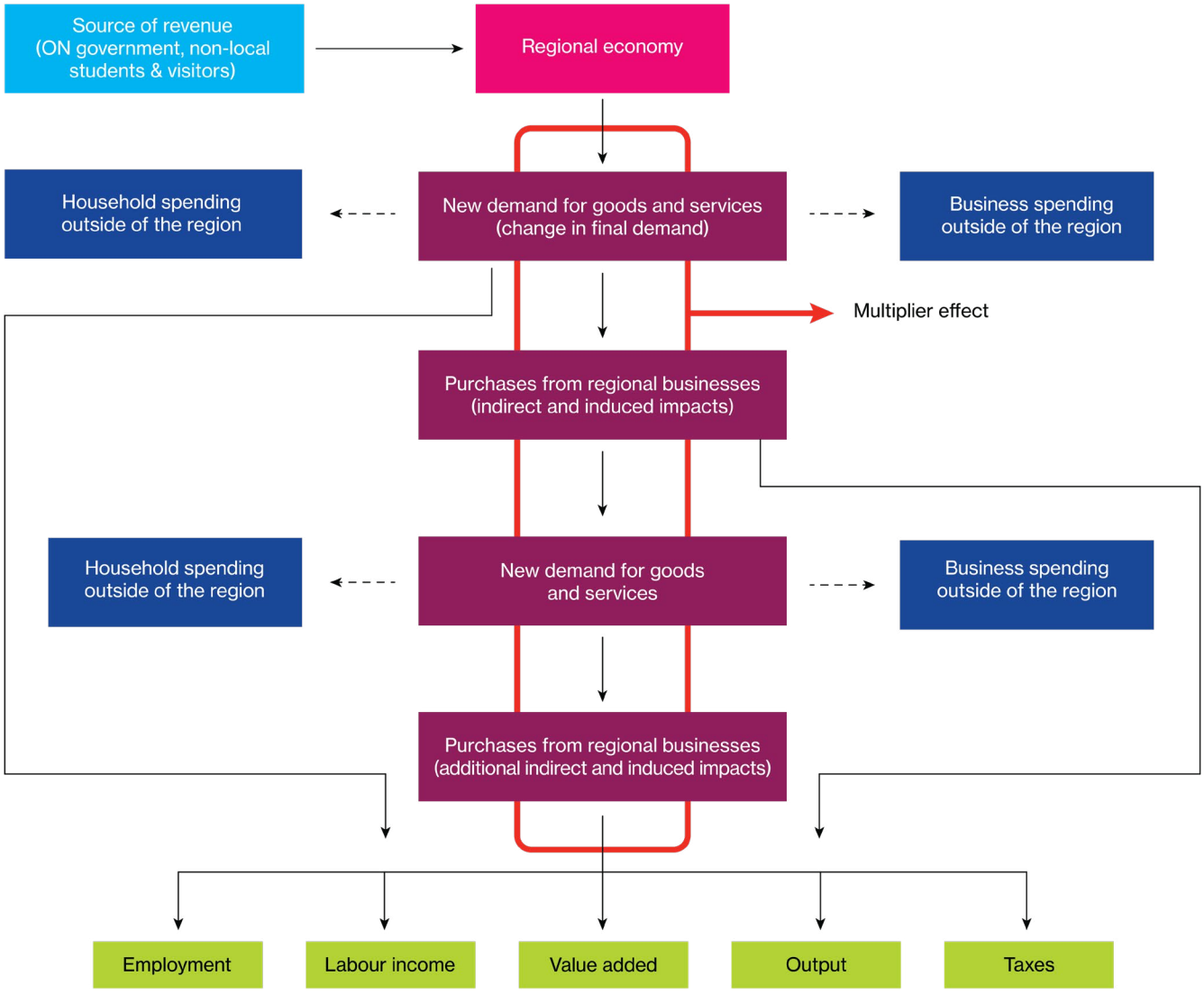
Exhibit 1
Direct, Indirect, Induced, and Total Economic Impacts



Note: This figure is adapted from Oxford Economics. This illustration is for university spending, but an analogous illustration applies to other impact components as well.
Sources: Oxford Economics; The Conference Board of Canada.

37 IMPLAN, *IMPLAN Pro Manual: Analysis Guide*.

Exhibit 2
The Process of Economic Impact Generation Resulting From Spending From University Activities



Note: This figure is adapted from Oxford Economics. This illustration is for university spending, but an analogous illustration applies to other impact components as well.
Sources: Oxford Economics; The Conference Board of Canada.

Total Multipliers

Final consumption (or final demand) drives input-output models. Industries increase production to meet the new demand created by directly affected industries. The production of additional goods and services by indirectly affected industries in turn generates new demand in other industries of the economy, and so on. Expressed as a ratio, multipliers summarize this cycle of spending in the economy.

Besides essential background information about economic modelling, we include here the assumptions upon which modelling is based.

Key Assumptions

The accounting conventions that form the basis of an I-O model and the way our I-O model makes estimations impose assumptions that readers ought to be aware of when interpreting the results.[38] Since some of these assumptions can lead to an overstatement of the impacts of a project or program, many users of impact models consider the estimates as upper bounds.[39] Our I-O model is based on several assumptions:

- constant returns to scale
- no supply constraints
- fixed commodity input structure
- homogenous sector output
- industry technology assumption

The first assumption is that the production functions are linear, meaning that "if additional output is required, all inputs increase proportionately."[40] Under this assumption, if $1 of new university activity in the impact area triggers $2 in total economic activity, then $1,000 will trigger $2,000, $1 million will trigger $2 million, and $1 billion will trigger $2 billion. In reality, this might not be the case: "A plant operating at full capacity might not be able to increase its capacity without undertaking aggressive capital investment, hiring new workers in a tight labour market, or acquiring expensive new property—realities that will impact the ratio of total economic activity to the direct impact. These common business practices are examples of the 'non-linear' reality of business."[41]

The second assumption is that there are no supply constraints. "An industry has unlimited access to raw materials and its output is limited only by the demand for its products."[42] In the world of business, rising demand creates scarcity. Similar to how the cost of construction materials increased during the housing sector boom of the mid-2000s, or the way China's rapid economic growth has created scarcities in concrete and energy supply, investing millions of dollars into a specific industry might create short-term shortages in labour, materials, services, and raw materials.

38 IMPLAN, *IMPLAN Pro Manual: Analysis Guide*; Bureau of Economic Analysis, *RIMS II*.
39 Bess and Ambargis, "Input-Output Models."
40 Sommers, *Economic Analysis for a Regional Center*.
41 IMPLAN, *IMPLAN Pro Manual: Analysis Guide*.
42 Ibid.

Third, we assume there is no product substitution in the short term: "Price changes do not cause a firm to buy substitute goods. This structure assumes that changes in the economy will affect the industry's output but not the mix of commodities and services it requires to make its products. Input-output analysis will not be as accurate in cases in which a long-term spike in costs or a shortage in supply induces businesses to locate new suppliers or make their products differently (by substituting advanced machinery for labour, for example)."[43] Consequently, economic impact analysis "can only establish how spending would flow through the economy at a fixed point in time, not how the structure of the economy would change as a result of that spending."[44]

The fourth assumption is that sector output is uniform: "The proportions of all the commodities produced by that industry remain the same, regardless of total output. An industry will not increase the output of one product without proportionately increasing the output of all its other products."[45]

Finally, the industry technology assumption implies that "an industry uses the same technology to produce all its products. In other words, an industry has a primary or main product and all other products are by-products of the primary product."[46]

43 Ibid.
44 Ibid.
45 Ibid.
46 Ibid.

Appendix B
Data

Access the Data

Data are available for detailed economic impacts, student and visitor spending, TFP, and occupational impacts.

Detailed Economic Impacts

These tables present direct, indirect, and induced impacts by four impact categories: employment, GDP, labor income, and taxes.

Download tables

Student and Visitor Spending Calculation

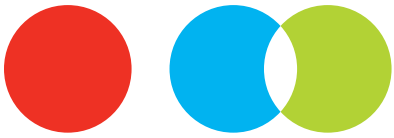
These tables present student enrollment and associated visitor numbers for each region. They also include spending per term and estimated aggregate spending in each region.

TFP Impacts

These tables present detailed TFP calculations for individual impact regions. There are three tables for each region, corresponding to the three TFP estimation methods.

Occupational Impacts

This table provides the average number of STEM degrees awarded per year during the 2014–2018 period.



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Any omissions in fact or interpretation remain the sole responsibility of The Conference Board of Canada. The findings do not necessarily reflect the views of the Council of Ontario Universities.

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The Conference Board of Canada

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