Institute for
Competitiveness & Prosperity

Measuring Ontario's Prosperity: Developing an Economic Indicator System

The Institute for Competitiveness & Prosperity
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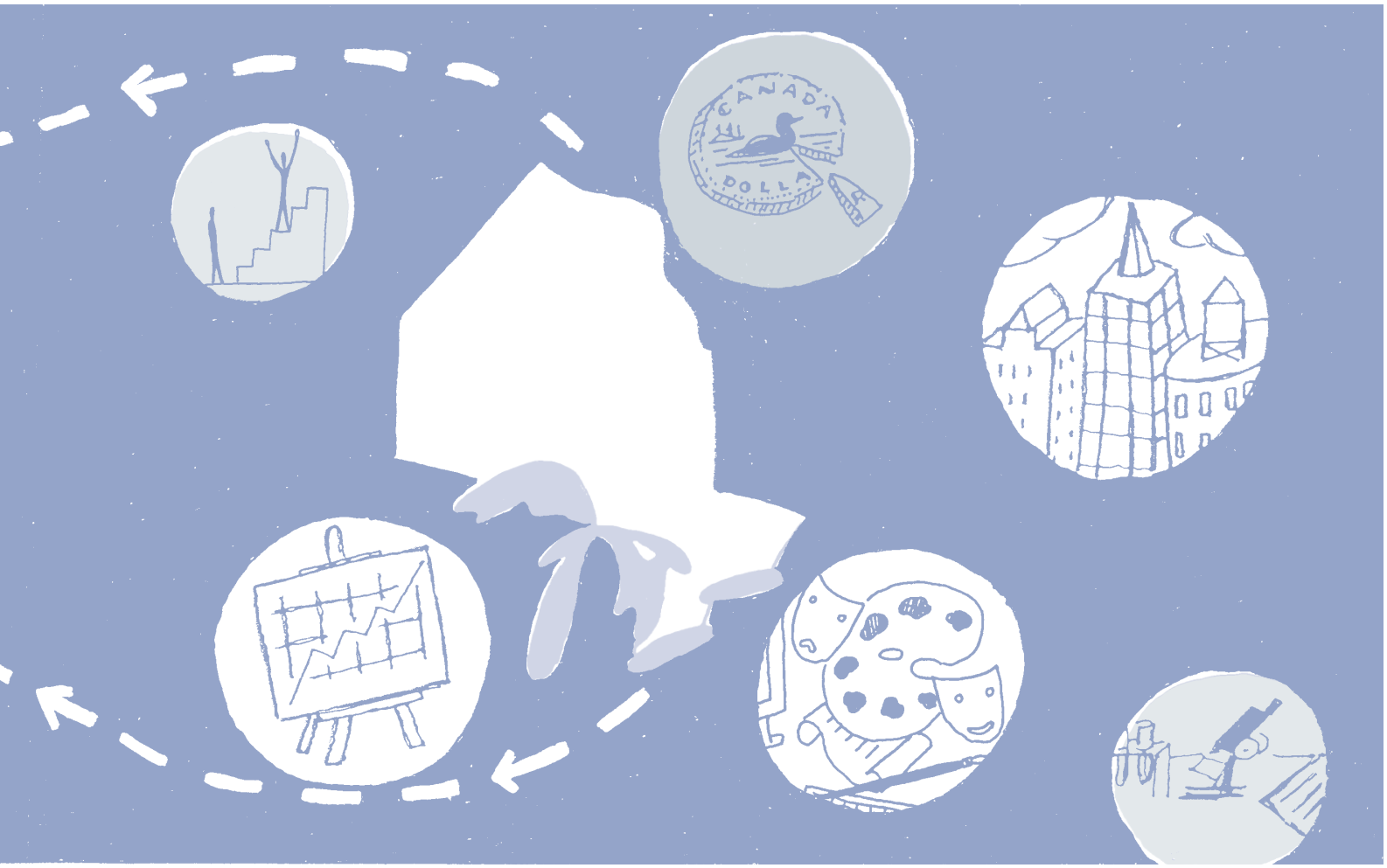

Institute for
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The Institute for Competitiveness and Prosperity is an independent not-for-profit organization established in 2001 to serve as the research arm of Ontario's Task Force on Competitiveness, Productivity and Economic Progress.

Working Papers published by the Institute are primarily intended to inform the work of the Task Force. In addition, they are designed to raise public awareness and stimulate debate on a range of issues related to competitiveness and prosperity.

The mandate of the Task Force, which was announced in the April 2001 Speech from the Throne, is to measure and monitor Ontario's competitiveness, productivity and economic progress compared to other provinces and U.S. states and to report to the public on a regular basis.

It is the aspiration of the Task Force to have a significant influence in increasing Ontario's competitiveness, productivity and capacity for innovation. This, they believe, will help ensure continued success in the creation of good jobs, increased prosperity and a high quality of life for all Ontarians. The Task Force intends to seek breakthrough findings from their research and to propose significant innovations in public policy which stimulate businesses, governments and educational institutions to take action.

The Task Force's first report to the people of Ontario is to be published in the fall of 2002.

Comments on this working paper are welcome and should be directed to the Institute for Competitiveness & Prosperity (see inside rear cover for contact information).

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Foreword and Acknowledgements

As the research arm of the Task Force on Productivity, Competitiveness, and Economic Progress, the Institute for Competitiveness and Prosperity reports its research findings to Ontario's stakeholders in a series of Working Papers. I am pleased to present the Institute's second Working Paper, which is intended both to assist the Task Force in its work on benchmarking Ontario's performance and to stimulate public debate on the economic challenges facing the province of Ontario.

In this paper, we propose an Indicator System, which will guide the selection and ongoing measurement of key indicators of the innovation and upgrading that are required to strengthen the province's relative position in North America.

We deconstruct GDP per capita – our selected capstone indicator of economic progress – into six component drivers for which information is currently available. Building on our previous work, we explore how these drivers are shaped and how they interact with Ontario's industry clusters, which we mapped in Working Paper No. 1.

We find yet more evidence that Ontario performs extremely well compared to its global competitors, but against its North American peer group, its performance is middling at best.

We have found that Ontario has a firm foundation on which to build its economic future. The prosperity of all Ontarians rests on making strategic, thoughtful choices. While the province is economically strong and well equipped to handle future challenges, we have found areas in which inertia and fear of change could squander our ample advantages.

We gratefully acknowledge the ongoing support from our colleagues at the Institute for Strategy and Competitiveness at Harvard Business School.

We look forward to discussing this Working Paper with Ontarians.

Roger L. Martin, *Chairman*
Institute for Competitiveness and Prosperity

Executive Summary

An important part of the mandate for the Task Force on Competitiveness, Productivity, and Economic Progress and for the Institute for Competitiveness and Prosperity is the development of an economic indicator system.

Quoting from the Task Force mandate:

• Create a framework to assess Ontario's productivity, competitiveness, and economic progress compared with the other 9 provinces and the 50 U.S. states;

• Spearhead the identification and undertake measurement of Ontario's productivity, competitiveness and economic progress indicators compared with the other 9 provinces and the 50 U.S. states;

• Confer with the public/stakeholders and experts on the best way to benchmark Ontario's productivity, competitiveness and economic progress.

This Working Paper has been developed with these three mandates in mind.

In the first Working Paper we put forward GDP per capita as the measure of Ontario's economic progress and proposed a measurement framework with four components – *effectiveness, utilization, profile,* and *intensity.* The Working Paper also looked for the first time at Ontario's clusters of traded industries – concluding that Ontario had an above-average presence of traded clusters.

Nevertheless, we found that Ontario trailed all but two of the fifteen other North American jurisdictions we proposed as the set against which we would benchmark our economic performance. In fact our GDP per capita is 13.8 per cent behind the median of these jurisdictions. This translates to a performance gap of $4,880 in GDP per capita or CDN $6,000 (using purchasing power parity).

We think Ontarians ought to aspire to improve our standing within this group and, along with the Task Force on Competitiveness, Productivity, and Economic Progress, want to engage in a consultation process to help define these economic aspirations.

An indicator system will be useful to understanding the nature of the challenge before us, identifying policy recommendations for Ontario's stakeholders and tracking our progress against our aspirations.

As a first step in developing an Indicator System, we sub-divide the four components of GDP per capita into eight drivers that are measureable and comparable between jurisdictions. We then identify the contributions to the performance gap from each of the drivers.

This analysis is helpful in describing Ontario's economic progress and the size of the gap in meeting our aspirations. The challenge for an indicator system is to identify the measures that affect, not just describe, our economic performance. To that end we are proposing as part of the Indicator System a series of three measures that capture our capacity for innovating and upgrading. These three measures – attitudes, investments, and motivations – operate at the level of the individual, the firm, and the cluster. These measures interact with the drivers described above to strengthen our economic performance.

Following a consultation process related to this and our first Working Paper, the Task Force will propose an aspiration goal for Ontarians and set out more detailed recommendations on how we intend to gather and synthesize the measures in our proposed Indicator System. Future Working Papers from the Institute will report Ontario's progress towards these ends.

Laying the Ground Work

In our first Working Paper, *A View of Ontario: Ontario's Clusters of Innovation*, we established the base for the initial work by the Task Force on Productivity, Competitiveness, and Economic Progress and the Institute for Competitiveness and Prosperity by articulating the case for linking productivity and competitiveness with economic progress.

The Working Paper went on to focus on Ontario's clusters of innovation building on the collaborative work of the U.S. Council on Competitiveness and the Institute for Strategy and Competitiveness at Harvard Business School.

This first Working Paper had four conclusions:

• Ontario is one of the world's leaders in GDP per capita, the main driver of prosperity, but lags many other North American jurisdictions

• *Effectiveness* and *Utilization* provide the best leverage for increasing GDP per capita long term

• Clusters of traded industries contribute to increasing a region's competitiveness

• Ontario has strength and diversity in its clusters of traded industries

In more detail the first Working Paper discusses:

Ontario's GDP per capita performance.

Ontario is a world leader in GDP per capita, a key measure of an economy's strength and its citizens' living standards. For jurisdictions of substantial size (over 6 million or at least half Ontario's size), Ontario is among the most prosperous in the world outside the United States. The Institute has selected the 16 North American jurisdictions that have populations greater than 6 million for closer examination. Within this peer group, Ontario stands 14th – ahead of Florida and Quebec as shown in Table 1. Our GDP per capita is fully 32.2 per cent lower than Massachusetts, the North American leader. Against the median of the 16 jurisdictions Ontario's GDP per capita is 13.8 per cent behind.

The drivers of GDP per capita.

In the first Working Paper we drew upon the performance model which breaks down GDP per capita into its four components, as seen in the GDP identity below.

Two of the components, *effectiveness* and *utilization*, appear to have the most leverage to affect GDP per capita. Several economists point to Canada's persistent inability to keep pace with the productivity (*effectiveness*) performance of the G7 countries, particularly the U.S.[1] Work by John Baldwin and others at Statistics Canada identified *utilization* performance as the key difference between Canada and the United States between the 1980s and

$$\text{GDP per capita} = \underbrace{\frac{\text{GDP}}{\text{hours worked}}}_{\text{Effectiveness}} \times \underbrace{\frac{\text{hours worked}}{\text{jobs}}}_{\text{Intensity}} \times \underbrace{\frac{\text{jobs}}{\text{potential labour force}}}_{\text{Utilization}} \times \underbrace{\frac{\text{potential labour force}}{\text{population}}}_{\text{Profile}}$$

[1] Trefler, for example, explained this persistent gap as a weakness in Canadians' ability to create product innovation, as opposed to creating process innovation. For further discussion about this issue, see Trefler, D. (1999). "Does Canada Need a Productivity Budget?" Policy Options. July/August 1999.

the 1990s thereby explaining the increased gap in GDP per capita performance over the same period.

The other two factors – *intensity* and *profile* – change little in the short term.

The importance of clusters of traded industries.

The first Working Paper set out the importance of clusters citing work done by Professor Michael Porter of the Institute for Strategy and Competitiveness at Harvard Business School. The Porter Diamond (see Figure 9, page 29) describes the factors that provide pressure for clusters to perform well (rivalry and demand conditions) and factors that provide support (factor inputs and related industries). His research has shown that clusters of traded industries tend to be more productive, innovative and pay higher wages. The Working Paper showed for the first time Ontario's clusters of traded industries in comparison to the rest of Canada and the United States. In fact, Ontario has the highest percentage of its employment in clusters of traded industries of all North American jurisdictions we studied. The challenge is to explain Ontario's mediocre economic performance against its peer group given the strong presence of clusters of traded industries in the province.

Table 1: GDP Per Capita, Ontario and Selected North American Jurisdictions

Jurisdiction	2000 GDP per capita, $US PPP	Index versus median	Performance Lead or Gap
Massachusetts	$44,878	1.271	**$9,578**
New Jersey	$43,151	1.222	**$7,851**
New York	$42,115	1.193	**$6,816**
California	$39,698	1.125	**$4,398**
Illinois	$37,626	1.066	**$2,326**
Virginia	$36,922	1.046	**$1,623**
Georgia	$36,175	1.025	**$875**
Texas	$35,598	1.008	**$298**
N. Carolina	$35,002	0.992	$298
Pennsylvania	$32,895	0.932	$2,405
Ohio	$32,823	0.930	$2,477
Michigan	$32,740	0.927	$2,560
Indiana	$31,608	0.895	$3,691
Ontario	**$30,420**	**0.862**	**$4,880**
Florida	$29,539	0.837	$5,761
Quebec	$25,052	0.710	$10,248
Median	$35,300		

Source: Statistics Canada; Bureau of Economic Analysis; Institute for Competitiveness and Prosperity
Note: In performance gap, black indicates a performance **"lead"** and red indicates a **"gap."**
All figures in U.S. dollars, using purchasing power parity.

Ontario's mix of clusters.

The first Working Paper showed the diversity of Ontario's clusters compared to other jurisdictions, explored selected clusters, and provided some city-specific results. It confirmed the significance of our Automotive, Financial Services, and Entertainment clusters and revealed the relatively high ranking of our Pharmaceuticals and Biotechnology Cluster within North America.

The first Working Paper showed the fundamental strength of Ontario's economy, but set the bar higher for its continued progress – which will be the result of innovation and competitiveness. As Roger Martin stated in the first Working Paper,

> *Relentless innovation and upgrading of productivity are the keys to international competitiveness in the modern economy. While Ontario has some firms that belong in the ranks of the world's best, the overall economy is not where it needs to be. Ontario firms have to set high goals and aspire to be global players by serving the most demanding customers at home and abroad.*

In the balance of this Working Paper, we propose an indicator system that helps determine how high Ontarians want to set our goal and measures our progress against this aspiration. ●

Our Approach to an Indicator System

The ultimate goal of the Institute's research agenda is to measure and monitor Ontario's competitiveness, productivity and economic progress. Economic progress creates opportunities for individuals to better their lives. As economist Pierre Fortin noted in his 1999 C.D. Howe Institute's Benefactors Lecture, The Canadian Standard of Living: Is There A Way Up:

> *A rising standard of living provides not only more resources for materialistic individualistic consumption, but also for improved health, intellectual and social welfare, and cultural undertakings, increased leisure, a cleaner environment, and better social relations…*
>
> *Real economic growth also facilitates the fight against inequality and poverty, because people are always more ready to share part of an increasing income than to absorb an absolute reduction in a stagnant income. Growth is clearly not* sufficient *for all these things to happen, but it is certainly a* necessary *precondition (Fortin, 1999, p. 3).*

Our previous research has found that the robust expansion of a region's economy relies, in part, on the strength of its clusters of traded industries. Other facets of the economy also play a role; developing a system of indicators to measure the drivers of growth is a complementary goal to understanding the dynamics of these clusters.

Why an indicator system?

An indicator system helps Ontarians understand the linkages between economic strength and better quality of life. By deconstructing the components of this growth into discrete measurements, we will articulate the main drivers of economic progress, which, in turn, reveal the necessary preconditions for a rising standard of living. The indicator system also serves as a tool for decision makers in government and industry. It identifies both problems and opportunities for policymakers and business leaders, and indicates possible initiatives for improvement. Used consistently over time, indicators can help track changes and trends in economic performance, thereby revealing where policy might best be employed to spur ongoing improvements in Ontarians' quality of life.

Our objective is to create an integrated *system,* as opposed to a set of unrelated measurements, that will result in a coherent picture of Ontario's economic challenges and provide a basis for debating and discussing workable policy solutions.

Some Cautions About Indicators Systems

Measuring Ontario's performance against other jurisdictions requires the practical process of selecting appropriate measurements. Often, gathering data on the actual measure presents insurmountable measurement problems. For example, the concept of "competitiveness" lacks a precise, agreed upon definition and there is no consistent data collection system for competitiveness. We need to reflect on what specific measureable indicators lead to competitiveness.

The goal of benchmarking is to create an objective set of criteria by which various jurisdictions can be ranked. Ideally, all data sources are available, accurate, and comparable. But in practice, particularly at the state and province level, data are collected using different meas-

urement techniques, different geographic boundaries, and different time series. These practical issues present a trade-off between comparability and finding the best measure. For our purposes, comparability is paramount.

We argue that the underlying factors driving innovation and upgrading are primary determinants for economic performance, and outline a framework for understanding and improving these factors.

Indicators: The basic criteria

The end-goal of an indicator system must drive the development of individual indicators. In this case, policy solutions must be derived from the trends and changes we measure. In order to best serve the Task Force's needs, the Institute will select indicators that:

- **Provide a causal model:** the Indicator System should examine and explain the gap between potential and actual performance.

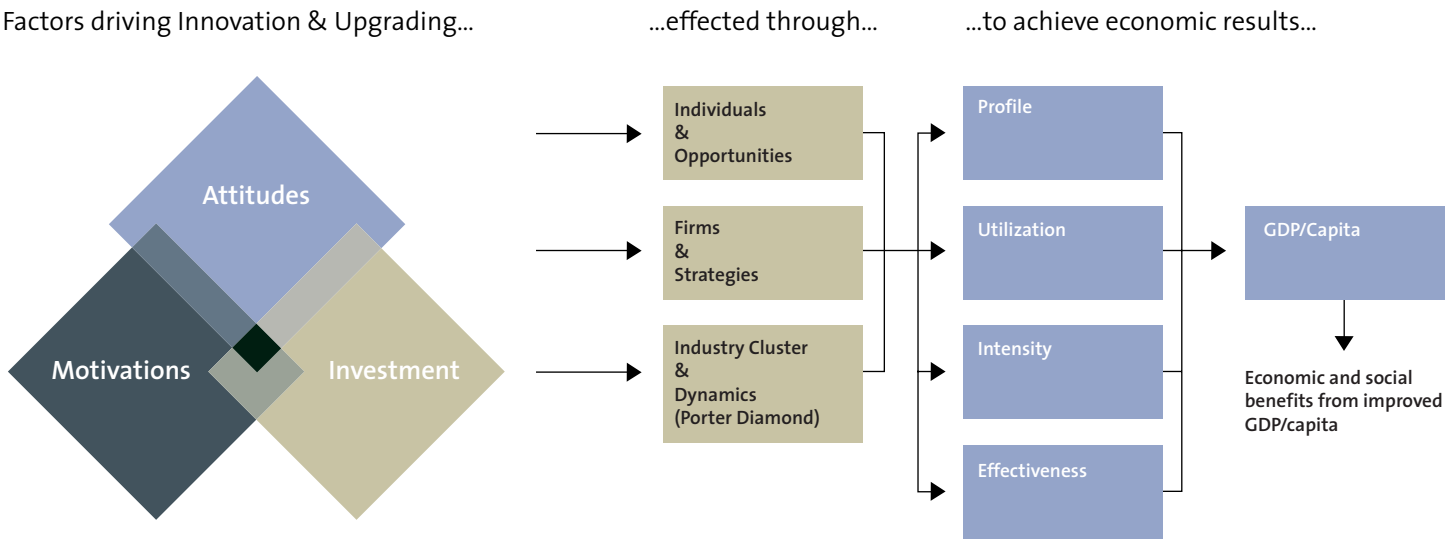
- **Be actionable:** the System should suggest practical policy recommendations on how to narrow this gap.

- **Focus on microeconomic factors:** the System should focus on forces that operate at the firm, individual, and cluster level.

Our Indicator System, as shown in Figure 1 below, has two elements: the descriptive and the explanatory. The descriptive set of measures (*profile, intensity, utilization* and *effectiveness*) shows Ontario's performance, relative to other North American jurisdictions. There is value in "telling the story" of Ontario's GDP per capita, but we recognize also that in order for the system to provide value to policymakers, there must be a set of measures that *explain* Ontario's economic performance (attitudes, investments and motivations).

GDP per capita is closely related to the kinds of outcomes desired by Ontarians – quality of life, healthy residents, educational opportunities, a clean environment, etc. At the national level there is strong evidence that higher GDP per capita correlates with quality of life measures, such as the United Nations Human Development Index.[2]

Figure 1: Regional Economic Competitiveness Indicator System



Source: Institute for Competitiveness and Prosperity

[2] We recognize that there is a degree of auto-correlation here as GDP per capita is a primary component of the HDI. For a discussion on the limitations of GDP as a measure, see Box 1: GDP as a Measure.

Why GDP Per Capita?

We are proposing GDP per capita as our key economic indicator of prosperity for two reasons.

First, GDP measures the output of an economy in terms of value added – that is to say, how well Ontarians have converted the province's natural, capital and labour resources into products and services that consumers will buy here and around the world. As a value-added concept it ties directly to productivity, which is an important element of our economic progress. GDP also includes government expenditures. Dividing GDP by population allows for comparisons with other jurisdictions as well as changes over time not generated solely by population growth. We acknowledge that while most observers and practitioners accept GDP as the best measure of economic growth, some prefer other measures. We point out, however, that GDP correlates quite closely with other measures that are offered as alternatives, for example, Gross National Product, Personal Income, and Personal Disposable Income.

Second, GDP allows for easy benchmarking against other jurisdictions. It is the most commonly reported statistic at national and state or province levels. Clearly, other jurisdictions have reached the same conclusion on the value of GDP per capita. As an important part of the Institute's mandate is to benchmark against other jurisdictions this availability takes on added importance. ●

Box 1: GDP as a Measure

Gross Domestic Product measures all the economic activity within a given country. Over decades of practice, economists have honed their techniques to make GDP per capita a robust and precise measure of all economic transactions in a nation. The word "transactions" is important here – GDP measures only activity that is recorded as an economic transaction, whatever that transaction may be.

But GDP is, simply, a gross measure of economic activity. It includes everything from restaurant meals to cigarette sales to new home sales to environmental clean-up. It does not differentiate between "good" and "bad" transactions. GDP also fails to capture the impact of unpaid work (which can include child care and elder care), volunteer work and other unpaid activities that clearly benefit society.

Mapping the Performance Gap

In this section we focus on describing Ontario's GDP per capita performance against other North American jurisdictions. Our goal is to measure Ontario's gap versus the peer group, and identify the key contributors to this gap. We begin with the four components of GDP per capita – *profile, intensity, utlization, effectiveness* – and further subdivide these measures to arrive at eight drivers that explain the differences between Ontario and other jurisdictions.

Taken together, these eight drivers (*profile*, *intensity*, the two components of *utilization*, the four components of *effectiveness*) describe Ontario's economic performance versus other jurisdictions. Table 2 describes these drivers and the specific data that are used to calculate them (we explore Ontario's particular performance on each driver in more depth below).

Our goal is to show how much of the GDP per capita performance gap with other jurisdictions can be explained by each of these drivers. To this end:

• We measure how much each jurisdiction under-performs or over-performs against the peer group as a percentage of its current GDP per capita.

• We apply this percentage to the GDP per capita to arrive at a dollar estimate of the driver's contribution to the jurisdiction's gap or lead.

• The portion of the gap or lead that is unaccounted for by the identified drivers is classified as "other *effectiveness* drivers." This measures *effectiveness* under- or over-performance after adjusting for a jurisdiction's degree of urbanization and its mix of traded clusters, natural resources, and local industries.

Table 3 on page 19 summarizes Ontario's current performance on the six of these drivers for which data are available. As shown previously, Ontario's GDP per capita is 13.8 per cent below median performance of these 16 jurisdictions.

By deconstructing the components of Ontario's lagging GDP per capita, we are able to identify some useful case studies.

One jurisdiction that stands out is Georgia. We're particularly interested in Georgia because, as seen in Figure 7 and Table 3, its degree of urbanization is similar to Ontario. Yet its *effectiveness* is higher. Like Ontario, the state's economy is dominated by a large metropolitan area. Its *profile* is the same as Ontario's. Unlike Ontario, however, its mix of clusters is not an advantage. However, its *utilization* and *effectiveness* exceed Ontario's. The state has achieved above-average economic growth over the last decade, moving from an under-performer to an above average jurisdiction in GDP per capita. One part of Georgia's experience is its efforts at strengthening the entire innovation process – from research through commercialization and this is discussed in Box 6: Georgia's Smart Investment in Innovation. The Institute intends to analyze other states for lessons learned that may be applicable to Ontario.

Table 2: Drivers of GDP Per Capita

GDP per Capita component	Sub-division	Definition	Indicates...
Profile		Proportion of all Ontarians who are between 15 and 64	• the demographic dependency of the population • attractiveness of Ontario as a place to work and live
Intensity		Average number of hours worked by typical employee	• attitudes of individuals – how do people value work/leisure trade-offs? • motivations for firms to employ people for more hours
Utilization	Participation Rate	Proportion of working aged people who are in the labour force (i.e., employed or seeking employment)	• Ontarians' willingness to work • firms' willingness to hire • buoyancy of the economy, as people will be encourged to enter the job market if more jobs are being created
	Employment Rate	Proportion of labour force (the numerator of the Participation Rate) who are employed	• the economy's strength in providing jobs • willingness of people to accept wages being offered and the kinds of jobs being created
Effectiveness	Mix of Ontario's clusters	How Ontario's *effectiveness* would vary if its mix of clusters of traded industries, natural resources industries, and local industries were the same as its peer group	• the attractiveness of Ontario's mix of industries to effect economic performance
	Content of Ontario's clusters	How Ontario's *effectiveness* would vary if the composition of its traded clusters were similar to its peer group (see p. 19 and pp 36-43 in first Working Paper)	• the existence of a systematic skew within our clusters toward sub-clusters that pay lower or higher wages
	The degree of urbanization	How Ontario's *effectiveness* would vary if its degree of urbanization were similar to its peer group	• the potential of agglomeration of people and industry to drive productivity (*effectiveness*)
	Other Effectiveness Drivers	Ontario's over- or under-performance not accounted for by the *effectiveness* drivers listed above	• Ontario's over- or under-performance, given the mix of clusters and degree of urbanization

Box 2: Mapping the Performance Gap

The attached "waterfall" chart displays the components of the performance gap which is the difference between Ontario's GDP per capita and the median of the 16 jurisdictions in our peer group.

Ontario's GDP per capita of $30,420 is shown on the far left of the chart. The median of the peer group, $35,300 is shown on the far right. The intervening bars represent the contribution of each of the six[3] prosperity drivers to the $4,880 gap.

Our analysis indicates that, in fact, some of the drivers represent advantages for Ontario's economic performance. These drivers actually widen the performance gap and are shown as negative values in black. Taking each factor in turn:

• Our demographic *profile* is, in fact, an advantage for Ontario's economy as a higher percentage of our population is of working age. In effect, this expands the GDP per capita performance gap by about $800

Figure 2: Mapping the Performance Gap (US $000)

Source: Institute for Competitiveness and Prosperity

• Similarly, the participation component of *utilization* is also an advantage for Ontario's economy as more of our working age population is in the work force. This expands the performance gap by another $100.

• Strengthening our employment rate, the other component of *utilization*, to median performance would close the performance gap by about $700. The net effect of the two *utilization* drivers (which is not shown separately on the waterfall chart) is to account for about $600 of the total $4,880 performance gap.

• Turning to the first of the three components of *effectiveness*, our mix of clusters is an advantage to our economic performance, adding about $800 to the per capita GDP performance gap

• The second component of *effectiveness*, our relatively low degree of urbanization is a disadvantage to our economic performance with a negative impact of GDP per capita of about $2,700.

• Finally we show other effectiveness drivers. Ontario's *effectiveness,* after allowing for its degree of urbanization and cluster mix is $3,200 per capita below its peer group.

In summary, the waterfall chart displays the relative importance of the *effectiveness* drivers in Ontario's performance gap versus its peer group. Profile is in fact an advantage. *Intensity*, which is not shown here, is not likely a significant part of Ontario's performance gap given the closeness of results between Canada and the United States. *Utilization* is shown to be a modest part of the performance gap.

3 Currently we are unable to capture comparable data for two of the drivers: *intensity* and the *effectiveness* driver that measures the content of our traded clusters.

This analysis presents implications for Ontario and its aspirations. Do we want to achieve median performance and over what time horizon? Do we want to be in the top four of the 16 jurisdictions? Do we want to advance one place each year?

In setting aspirations we will most likely need to acknowledge that our target will be advancing as the peer group jurisdictions increase their GDP per capita (2.4 per cent annually based on real growth rates of the last five years).

In the remainder of this section, we describe the eight prosperity drivers in detail and compare Ontario's particular performance on the six drivers (for which data are available) against the 15 other North American jurisdictions. Table 3 shows the performance gaps and leads among the peer group. The eight jurisdictions with GDP per capita above median performance have a performance lead; the eight below median performance have a performance gap. The lead or gap is calculated as the difference from median performance. A lead is shown in black and a gap in red. The table also shows the make-up of each jurisdiction's performance lead or gap.

Numbers in black are advantages for the jurisdiction; red numbers are disadvantages. (Calculations for Ontario are shown in the following pages).

Only Massachusetts has all performance drivers pointing the in the same direction. All others are a combination of positive (black) and negative (red) drivers. The net effect of these drivers is the performance lead (black) or gap (red).

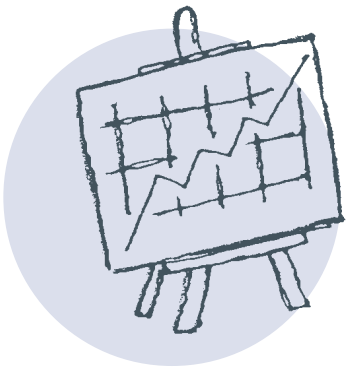


Table 3: Performance Gap Calculations, Ontario and Selected North American Jurisdictions

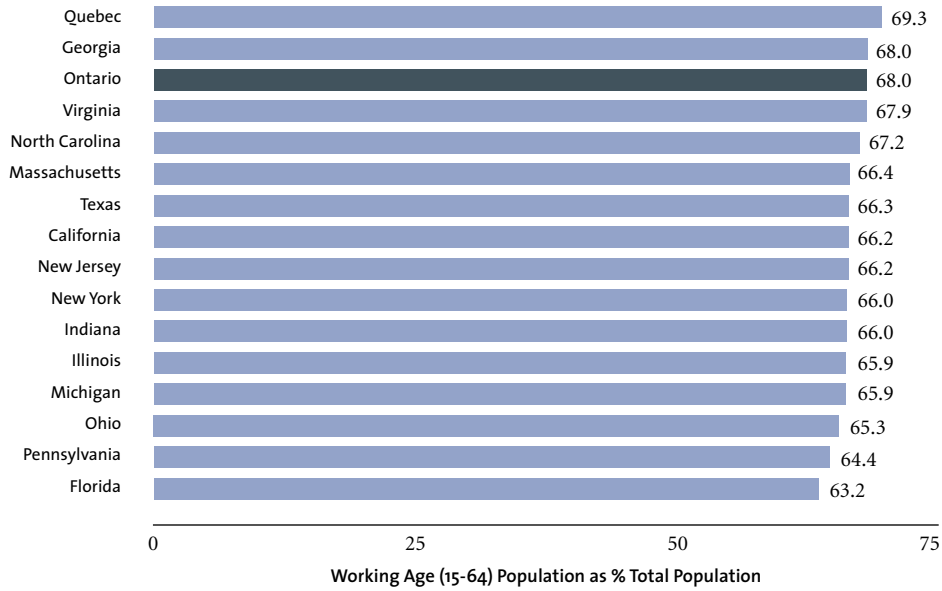
		PROFILE	UTILIZATION		EFFECTIVENESS			
	GDP per capita	Profile	Participation	Employment	Cluster mix	Urbanization	Other Effectiveness Drivers	Performance Lead or Gap
Massachusetts	$44,878	$135	$750	$656	$998	$4,448	$2,590	$9,578
New Jersey	$43,151	$0	$73	$48	$448	$916	$6,463	$7,851
New York	$42,115	$128	$2,952	$385	$288	$2,697	$7,295	$6,816
California	$39,698	$0	$98	$605	$316	$4,155	$630	$4,398
Illinois	$37,626	$171	$651	$42	$957	$885	$38	$2,326
Virginia	$36,922	$924	$51	$629	$173	$1,002	$1,194	$1,623
Georgia	$36,175	$958	$734	$172	$400	$3,362	$2,775	$875
Texas	$35,598	$54	$1,374	$159	$37	$906	$1,914	$298
N. Carolina	$35,002	$521	$49	$461	$908	$3,995	$3,673	$298
Pennsylvania	$32,895	$919	$1,926	$40	$146	$145	$771	$2,405
Ohio	$32,823	$452	$478	$120	$36	$1,377	$253	$2,477
Michigan	$32,740	$149	$250	$176	$55	$150	$2,432	$2,560
Indiana	$31,608	$96	$1,125	$512	$117	$4,122	$30	$3,691
Ontario	$30,420	$805	$103	$713	$825	$2,653	$3,247	$4,880
Florida	$29,539	$1,402	$2,086	$131	$1,000	$2,851	$4,255	$5,761
Quebec	$25,052	$1,121	$1,324	$1,430	$101	$4,082	$4,634	$10,248
median	$35,300	$0	$1	$1	$0	$3	$330	$0

Source: Statistics Canada; Bureau of Economic Analysis; Institute for Competitiveness and Prosperity

1. Profile

Our analysis of *profile* indicates that Ontario's economic performance is not negatively affected by its population profile. Sixty eight per cent of Ontario's population is between the ages of 15 and 64. The median performance of the 16 comparable jurisdictions is 66.2 per cent, suggesting that Ontario has relatively more people that are of working age, which is an economic advantage. Hence, our economic performance – as represented by GDP per capita – is 2.65 per cent higher than would otherwise be due to our favourable demographic profile. This widens our performance gap by $805 (2.65 per cent x Ontario's GDP per capita $30,420). Note that the values may vary slightly due to rounding.

Figure 3: Profile of Ontario and Selected North American Jurisdictions



Source: Statistics Canada, 2001 Census; U.S. Census Bureau, Census 2000

2. Intensity

Intensity is the number of hours worked, divided by the total number of jobs. A relatively high level of intensity is not necessarily desirable; high-value products and jobs are not created simply by working more hours. In addition, a highly productive economy allows its participants to choose more leisure thus reducing *intensity.* Nevertheless we need to measure the impact of *intensity* on Ontario's economic performance vs. the other jurisdictions.

This measure presents a significant data problem as comparable figures for hours worked at the provincial and state levels are simply not available. In Canada, the provincial data that are collected only represent hourly workers. In the United States, the available state data collected covers non-supervisory, production workers (which are mostly in manufacturing industries). This issue of comparability is significant because Canadian hourly workers typically work fewer hours than the American non-supervisory production workers. There is a systematic bias at the state/province level that makes direct comparison impossible.

At the national level, Figure 4 shows that in nearly every one of the last 20 years, Canadians worked fewer hours than their American counterparts. Canadian workers put in more hours than Americans in 1989, but presumably, the 1990-91 recession played a role in the sharp decrease in average weekly hours in the years following.

Indeed, it took a full ten years before the Canadian economy supported the same number of worker hours as the American economy. Again, the economic slowdown of 2001 coincided with a decrease in Canada's relative position.

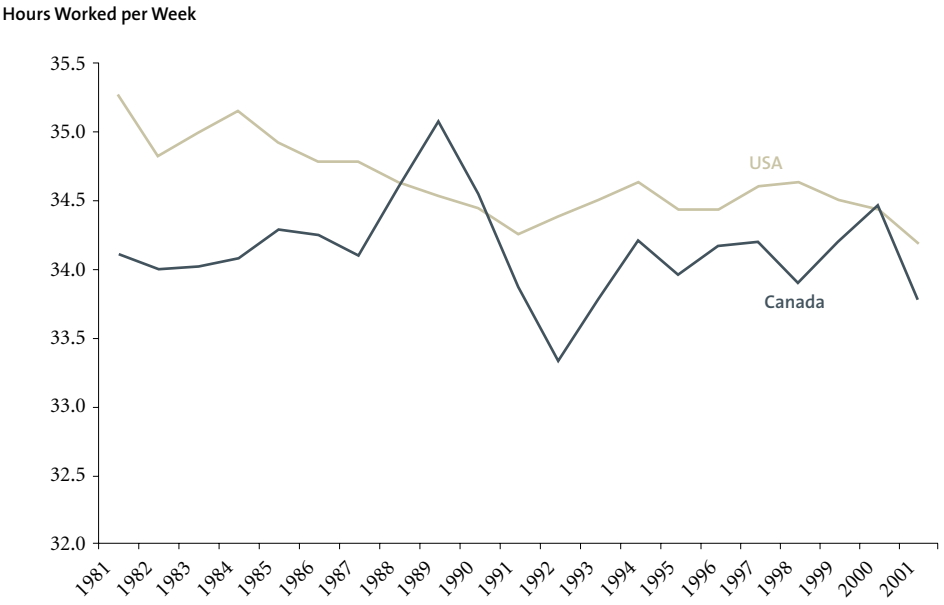
This suggests that while Canadian workers were making steady gains in hours worked throughout the 1980s, these gains were lost in the 1990s. It suggests that Canada's *intensity* level is vulnerable to the business cycle, as seen by the deep impact of the 1990-91 recession in Canada.

The chart also indicates a slightly steeper long-term decline in hours worked in the U.S. – possibly indicating a preference for greater leisure made possible by better productivity performance.

Both Americans and Canadians worked fewer hours by the end of the 1990s, with Canadians working only slightly fewer hours than the Americans. *Intensity*, at least at the national level, is not a significant factor in explaining Canada's gap in GDP per capita.

If Ontario's actual *intensity* were the same as Canada's and the U.S. peer group's average were the same as the U.S. average, *intensity* would be shown to reduce our GDP per capita by 1.1 per cent. However, since comparable results are not available for the peer group we are making no adjustment for *intensity* in this Working Paper. We will continue our efforts at deriving comparable measures and make changes to the Indicator System if we are successful.

Figure 4: Average Weekly Hours Worked, U.S. vs. Canada



Source: Centre for the Study of Living Standards. (2002). *Tables on Personal Income and Productivity.* Available online: http://www.csls.ca/ipt1.html.

$$\text{Participation} \quad \frac{\text{Workers + Job Seekers}}{\text{Working Age Population}} \times \text{Employment} \quad \frac{\text{Employed people}}{\text{Workers + Job Seekers}} = \text{Utilization} \quad \frac{\text{Employed people}}{\text{Working Age Population}}$$

3. Utilization: Participation rate

The participation rate and the employment rate (which is analyzed below) combine to make up *utilization*, as described in the identity equation above.

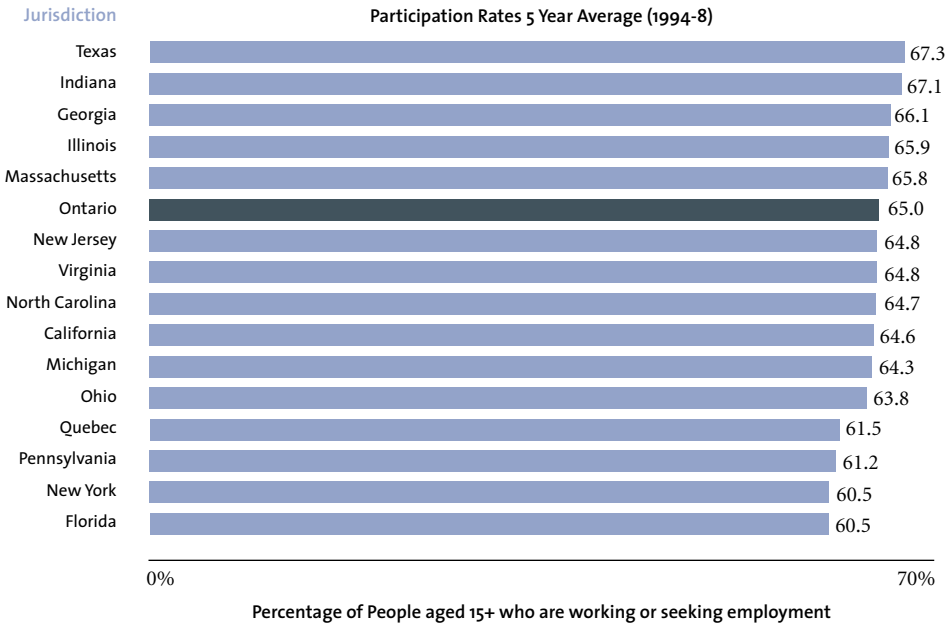
Ontario's participation rate compares favourably with the other 15 jurisdictions we are analyzing. In Figure 5 we show a five-year simple average for the years 1994-8 (the most recently available data at the U.S.-state level).

Ontario's average participation rate is 65.0 per cent, 0.34 per cent above median performance. Consequently this positively affects our GDP per capita performance by the same percentage (or $103). This indicates that efforts to improve our participation rate may have limited impact on our overall economic strength.

4 Utlization: Employment rate

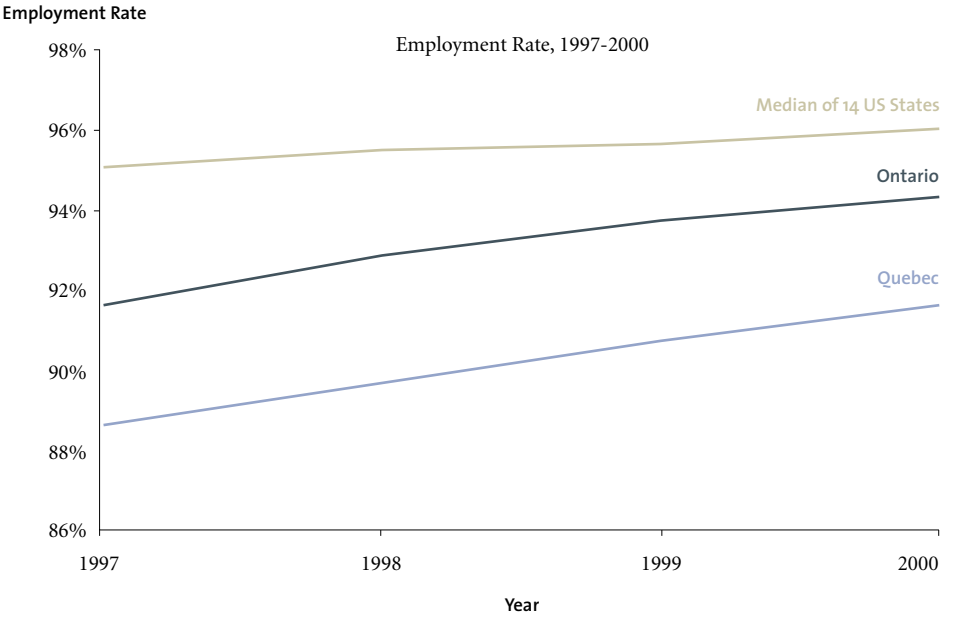
Ontario's performance in its employment rate – the other half of *utilization* - is shown in Figure 6. These results indicate that Ontario's employment rate is somewhat lower than median performance of the U.S. peer group. Some definitional and measurement differences between jurisdictions may account for this small difference. The other conclusion from Figure 6 is that Ontario's gap in employment rate against the U.S. peer group has been closing over the past few years. Ongoing improvement in the employment rate represents an opportunity for closing the GDP per capita performance gap. Based on the most recent four years' results, the under-performance currently represents 2.3 per cent of Ontario's GDP per capita, or $713.

Figure 5: Participation Rates, Ontario and Selected North American Jurisdictions



Source: Statistics Canada, Labour Force Historical Review; Bureau of Labor Statistics, Current Employment Statistics; U.S. Census Bureau, Census 2000.

Figure 6: Employment Rates, Ontario and Selected North American Jurisdictions



Source: Statistics Canada, Labour Force Survey; Bureau of Labour Statistics
Note: U.S. states figure represents the median employment rate, for each year listed, for the 14 peer-group states.

5. Effectiveness: Degree of Urbanization

City regions are increasingly important geographic entities because of their capacity to create economic activity and drive productivity.

Firms located in dense urban areas have customers that are located nearby and can therefore save on shipping costs. Firms in large rural areas must pay these shipping costs even for their local customers, and, chances are, many of their customers are located in larger, distant cities.

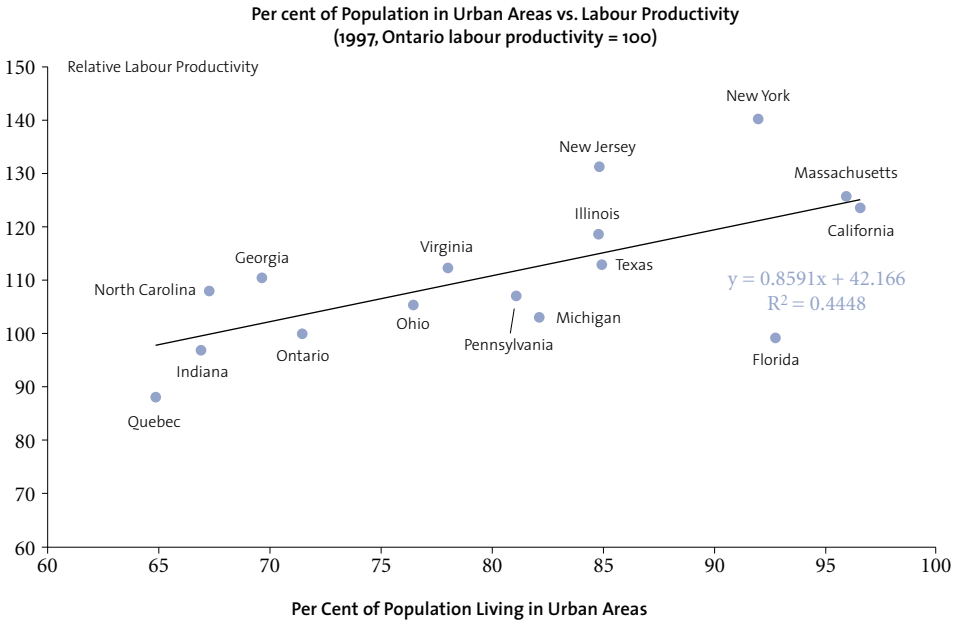
Cities are also "thick"labour markets with greater concentration and variety of skilled personnel. This serves both firms and employees. Firms locate in urban areas in order to draw on this pool of skilled labour. Likewise, individuals have a form of "labour market insurance" when they live in a city where there is more than a single employer (Glaser, 2000).[4]
In Figure 7, we map productivity of the 16 jurisdictions against the percentage of their populations living in city areas (Census Metropolitan Areas in Canada, Metropolitan Statistical Areas in the U.S.) greater than 100,000.
The figure shows three important findings.

First, there appears to be a relationship between urbanization and productivity. As we discussed in our first Working Paper, much of the economic benefit of urban areas stems from the physical proximity of the various players in an industry cluster. When highly skilled people, competitive firms, and related research institutes are all located near each other, the number of social and economic interactions increase. This constant opportunity for interaction spurs innovation and the further development of economic clusters.
The correlation between urbanization and productivity indicates an r-squared of 0.44, which means 44 per cent of the variance in productivity between jurisdictions is related to their degree of urbanization.

Second, the figure shows that Ontario is significantly less urban than most other states, especially the highly productive Massachusetts and California. Obviously the degree of urbanization does not explain all differences in productivity – but it is a factor.

Third, the figure shows that Georgia and North Carolina have a similar degree of urbanization as Ontario but have productivity about 10 per cent higher than Ontario. Further investigations into those jurisdictions should yield insight into their economic performance success relative to their low degree of urbanization.
Our analysis indicates that if Ontario's degree of urbanization were equal to the median of the sixteen jurisdictions our *effectiveness*, and hence GDP per capita, would be 8.7 per cent higher. The urbanization drivers therefore account for $2,653.

Figure 7: Per Cent of Population in Urban Areas vs. Labour Productivity



Source: Letourneau, R. (2000). *A Regional Perspective on the Canada-US Standard of Living Comparison.* Occasional Paper No. 22. Ottawa: Industry Canada.; Statistics Canada, 2001 Census; U.S. Census Bureau, Census 2000.

[4] For a more complete overview of urbanization and economic development see our Working Paper No. 1.

Table 4: Ontario's Mix of Clusters

	Ontario's Mix of Clusters (% of employment, 2000)	Average Mix of Clusters of the 14 US Jurisdictions (% of employment, 1999)	Average Wage/Cluster (US$, 1999)
Aerospace Engines	0.05%	0.08%	$49,894
Aerospace Vehicles and Defense	0.20%	0.29%	$57,477
Agricultural Products	0.35%	0.26%	$38,813
Analytical Instruments	0.30%	0.77%	$32,814
Apparel	0.54%	0.67%	$25,061
Automotive	2.92%	1.36%	$38,942
Building Fixtures, Equipment and Services	1.01%	0.61%	$38,346
Business Services	5.43%	4.33%	$47,827
Chemical Products	0.44%	0.40%	$49,665
Communications Equipment	0.52%	0.48%	$39,799
Construction Materials	0.15%	0.18%	$29,742
Distribution Services	1.81%	1.89%	$50,682
Education and Knowledge Creation	2.66%	2.20%	$31,739
Entertainment	1.41%	0.94%	$42,321
Financial Services	4.21%	2.93%	$64,115
Fishing and Fishing Products	0.03%	0.03%	$42,545
Footwear	0.05%	0.02%	$27,892
Forest Products	0.58%	0.26%	$34,543
Furniture	0.33%	0.34%	$26,159
Heavy Construction Services	1.70%	1.55%	$32,073
Heavy Machinery	0.56%	0.32%	$38,124
Hospitality and Tourism	2.37%	2.08%	$20,315
Information Technology	0.74%	0.83%	$73,258
Jewelry and Precious Metals	0.75%	0.16%	$36,265
Leather Products and Sporting Goods	0.14%	0.19%	$27,958
Lighting and Electrical Equipment	0.24%	0.33%	$34,639
Medical Devices	0.29%	0.64%	$36,055
Metal Manufacturing	2.18%	1.39%	$40,382
Motor Driven Products	0.32%	0.32%	$35,742
Oil and Gas	0.26%	0.30%	$48,508
Pharmaceuticals	0.26%	0.29%	$53,286
Plastics	0.55%	0.88%	$39,171
Power Generation	0.26%	0.27%	$49,351
Power Transmission and Distribution	0.10%	0.06%	$49,769
Prefabricated Enclosures	0.24%	0.28%	$35,899
Processed Food	1.54%	1.16%	$32,567
Production Technology	0.88%	0.64%	$39,696
Publishing and Printing	1.56%	0.95%	$40,504
Textiles	0.27%	0.42%	$25,870
Tobacco	0.04%	0.05%	$33,199
Transportation and Logistics	1.94%	1.53%	$36,476
Total Clusters of Traded Industries	**40.18%**	**32.70%**	**$41,396**
Local Industries	**58.51%**	**66.76%**	**$27,540**
Natural Resource Industries	**1.31%**	**0.54%**	**$28,931**
Total	**100.00%**	**100.00%**	**$32,078**

Average (US) wage given Ontario's current mix	**$33,257**
Average (US) wage given average mix of 14 US jurisdictions	**$32,078**
Ontario's Over Performance given its attractive mix	**3.7%**

Source: Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard Business School, Institute for Competitiveness and Prosperity
Note: Wage data are for U.S. clusters only; Canadian data not available

6. Effectiveness: Mix of Clusters

As shown in our first Working Paper, clusters of traded industries achieve much higher productivity and wages. In addition there are differences between these clusters in their productivity and wage performance. We assess Ontario's cluster/local/ resource industry make-up against its peer group to estimate the impact of this mix to our performance gap. Table 3 shows Ontario's mix of clusters against the typical mix of clusters for the 14 U.S. jurisdictions. It also shows average wages in each of the 41 clusters of traded industries, local industries, and natural resources. Finally it shows how Ontario's average wage would differ if our mix of clusters mirrored the 14 U.S. jurisdictions. Two points need to be kept in mind in reviewing this analysis. First our primary goal is to measure the impact of mix on *effectiveness* – value added per employee or hour of work. However, value added per employee is not easily available at the cluster level in the U.S. or Canada. We are turning to average wages as a proxy. There is a strong correlation between value added and wages and we are applying that relationship to wage differences to derive impact on *effectiveness*. Second, we are applying U.S. wage results to Ontario's and its peer group's mix to isolate the wage difference – and therefore the effectiveness – difference that is attributable to mix.

This analysis indicates that Ontario's mix of clusters raises average wages by 3.7 per cent above what could be expected if our mix were the same as our peer group. This derives from our strength in Automotive, Business Services, Financial Services, Metal Manufacturing, and other traded clusters. Based on the relationship between wages and productivity (*effectiveness*) this translates to a 2.7 per cent over-performance in *effectiveness* – and hence in GDP per capita. In other words Ontario's attractive mix of clusters of traded industries boosts our GDP per capita by 2.7 per cent (or $825) versus what it would be if our mix were similar to the 14 U.S. jurisdictions we are studying. This is already a strength of the Ontario economy – attempts to improve our overall cluster mix may have limited leverage for improvement.

7. Effectiveness: Cluster Content

One of the current issues being discussed by business analysts and economists is "hollowing out." Some observers believe that Ontario is losing the high value-added components of its industries as head offices and decision making relocate outside of Canada. We intend to measure this phenomenon at the cluster level by analyzing Ontario's sub-cluster mix in a process similar to the analysis conducted in Table 3. This particular data analysis requires extensive recalibration of data from existing sources – a significant undertaking that is months long. Consequently, this is an ongoing research commitment for the Institute, the results of which we will report as the requisite steps are completed.

At this stage of our research, we cannot attribute a portion of the performance gap to cluster content.

8. Effectiveness: Other Drivers

As Box 2: Mapping the Performance Gap shows the most significant part of the performance gap is attributable to *effectiveness*. We have been able to account for *profile* and *utilization* and estimate that *intensity* has limited impact. We have accounted for some elements of *effectiveness* – related to urbanization and to our clusters of traded industries. The remaining part of the performance gap, or $3,247, is therefore related to *effectiveness* on a basis of like-to-like urbanization and cluster mix. At this point, however, we are unable to be more precise about the specific factors at play. The analytical challenge is to understand the other *effectiveness* drivers that have leverage for shrinking the performance gap.

We intend to measure GDP per capita and map our performance gap periodically and report to Ontarians our collective progress.

As important as they are, these measures are only descriptive. We think it important to develop measurements around innovation and upgrading factors that drive our performance. We propose an approach in the next section. ●

The Capacity for Innovation and Upgrading:

- Attitudes
- Investments
- Motivations

The Capacity for Innovation and Upgrading: AIM

In the previous sections of this Working Paper we have described how we propose to tell the story of Ontario's economic performance, over time and against other North American jurisdictions. We now turn to the part of the Indicator System that describes our capacity for innovation and upgrading which is the driving force behind our economic performance.

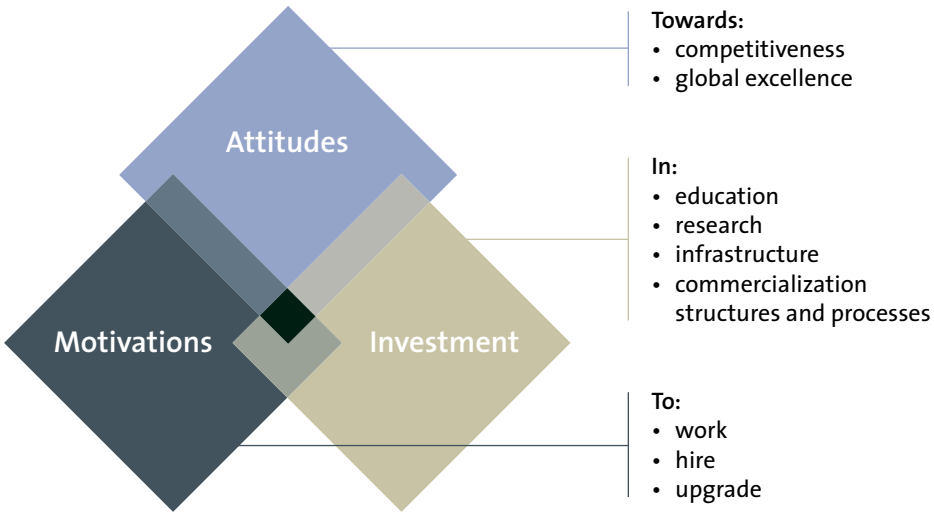
A region's ability to increase its prosperity is dependent on many factors including its macroeconomic environment, its microeconomic foundations for business and individual success and its social and environmental health. In successful regions these factors interact to create self-sustaining systems that promote innovation and upgrading.

The capacity for innovation and upgrading is the core component of our Indicator System.

It represents an integrated system of the following three elements:

- **Attitudes** towards competitiveness, growth, and relative global excellence
- **Investments** in education, research and development, and commercialization
- **Motivations** for hiring, working, and upgrading.

Figure 8: Factors Driving Innovation & Upgrading: The AIM Model



These three components of this AIM system are represented in Figure 8.

Although the presence of each one of these elements in a region is essential for building a region's capacity for innovation and upgrading, it is their ongoing interaction that ensures the region's ability to sustain economic prosperity.

These elements work at the level of the individual and organizations, which in turn can be stand-alone firms or parts of industry clusters. Our first Working Paper showed the importance of clusters of traded industries – applying the work of Michael Porter and the Institute for Strategy and Competitiveness to Ontario. Porter's diamond model (see Figure 9, below) for clusters is well established and we propose to build on it within AIM.

We discuss the three elements of AIM and their interaction at these three levels the individual, the firm, and the cluster.

Attitudes

Success in any field of endeavour is often predicated on attitudes – the "loftiness" of aspirations, the self-confidence to succeed, the search for challenge and competition, etc. This is true for the economic results for individuals and organizations and we intend to build this in to our measurement system for Ontario's economic success. Some examples of what and how we propose to measure at each level – the individual, the firm, and the cluster follow.

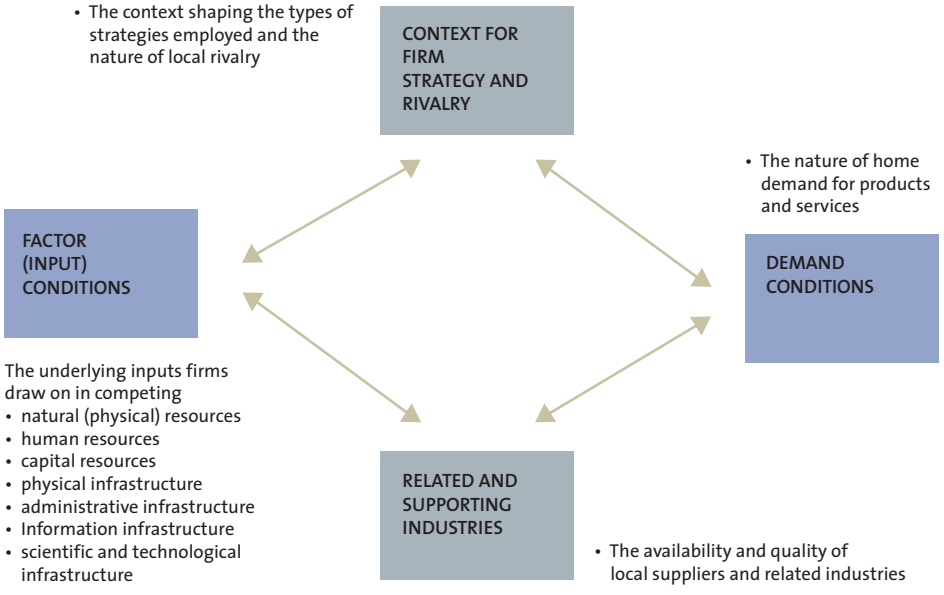
With respect to **individuals' attitudes,** work completed for the U.S.-based Council on Competitiveness by a team lead by Michael Porter, points to the importance of people's attitudes towards competition in the development of regional economic strength. International studies by Michael Fairbanks and others have shown attitudes toward competitiveness – such as aspirations for business excellence that go beyond using low-cost labour and raw materials – to be key drivers of economic growth. We propose to develop measures of Ontarians' attitudes in these areas relative to individuals in the peer group jurisdictions.

From another perspective on attitudes, Richard Florida, a professor of regional economic development at Carnegie Mellon University has demonstrated the importance of the "creative class" in local economies and the role attitudes play in their desire to work. These creative people are motivated to excel in their chosen field and desire to be judged on their merits. Regions that are more open to creative individuals and to immigration in general have been shown by Florida to perform better economically (see Box 3: The Creative Class and Economic Growth for more detail on Florida's recent research and the Institute's collaboration with him).

At the **firm level,** attitudes, particularly business leaders' aspirations for global competitiveness, are critical determinants of our success. Work done by the Clusters of Innovation Initiative and others points to the importance of attitudes towards the desirability of growth and expansion of international competitiveness as important conditions for economic success. Attitudes towards collaboration may also be important sources of innovation and upgrading. For example, Porter and his research team found that relatively more business leaders in San Diego considered the transfer of knowledge from universities to be a competitive advantage than did those in Wichita or Atlanta. This suggests the attitude toward industry-university collaboration differs between regions and may play a role in the relative strength of knowledge-intensive industries in the San Diego region.

Attitudes within clusters of traded industries towards relentless improvement and upgrading are forged by the pressure from "firm strategy and rivalry" and from "demanding customers" (see Figure 9). We intend to develop a measurement system to measure attitudes towards these pressures within specific clusters in Ontario.

Figure 9: The Porter Diamond



Investments

In the second part of AIM we focus on public and private investments in strengthening Ontario's capacity for innovation and upgrading. We are proposing not simply to measure the level of investments, but also how these investments build capacity. We will explore opportunities for measuring barriers to private sector involvement in funding and creating value in these areas. We discuss measuring investments at the individual, firm, and cluster levels.

The importance of public and private **investments** to strengthen **individuals'** capacity for upgrading and innovation is well appreciated. Returns on investment from education and training are well documented and the Indicator System would track such investments – over time and against other jurisdictions. Our intent is to develop measures of smart spending – identifying those that measure *effectiveness*, not just absolute spending.

Public and private **investment** in education also benefits **firms** by ensuring availability of skilled labour, researchers, and managers. To the extent possible we need to measure innovative practices at the firm level – as enabled by public research and development spending and firm-level training and knowledge management practices. We also need to measure Ontario's firms' success relative to our North American peer group in areas such as patents granted, venture capital raised and R&D as a percentage of GDP. Many of these statistics are gathered at the national level; our challenge will be to gather them at the provincial and state levels. In Box 4, we discuss investment in postsecondary education and its impact on economic development.

Public and private **investments** in human resources, physical infrastructure, scientific and technological infrastructure, and other elements of "factor (input) conditions" (see Figure 9) are critical to the success of traded **clusters**. As with attitudes we are proposing to develop cluster-specific measures for investments.

Box 3: The Creative Class and Economic Growth

In Working Paper No. 1, we referred to the work of economic development Professor Richard Florida about the interplay between cities, people, and economic growth and we continue to believe it is of great relevance to Ontario's competitiveness.

People and cities have long been considered important factors for economic success. Florida, however, goes a step further to suggest that a discernable group of highly creative people , which he calls the "creative class," is now the main determinant of a region's economic growth. This group gravitates to cities that are diverse, open to people of different backgrounds and orientations, and have strong artistic communities.

The idea that the basis for a region's competitiveness has evolved from its geographical assets, such as a deep harbour or its proximity to natural resources to the less tangible assets, such as the sophistication of its workforce, is not altogether new. Florida, however asserts that it is not merely the skill of a region's workforce that drives economic growth but its creativity.

Florida defines the creative class as any people who are creative in their approach to work. As such, people working in fields not traditionally thought of as creative, such as engineering or finance, might still belong to the creative class. Their creativity drives economic growth across all sectors of the economy.

Although the creative class seems heterogeneous on the surface, Florida suggests that they share similar attitudes and preferences in how and where they want to work. His research indicates that centres of innovation tend to be highly correlated with measures of demographic and cultural diversity. Florida has developed a "Creativity Index," incorporating such measures as his own Bohemian index and Gary Gates's Gay Index, to rank U.S. cities according to their appeal to the creative class. Not surprisingly, cities such as San Francisco, Austin, and Boston fare quite well on this index – all cities with thriving knowledge-based economies and cultural scenes.

This has significant potential ramifications for how cities and regions should go about encouraging economic growth. In subsequent papers, we will examine the findings of a joint study currently being undertaken by the Institute, the University of Toronto, and Professor Florida that will apply Florida's methodology to Ontario's and Canada's cities.

Box 4: Postsecondary Education and Prosperity

Traditionally, the inputs for economic growth have been understood to be capital and labour. But some economists believe the shift toward knowledge-intensive economic activity has made the process more complex. The role that knowledge plays in economic growth is a growing debate in economic circles. Human capital – the ideas, skills, and expertise of people – is garnering attention as a fundamental input into the economic process.

This suggests that the education of the workforce is a fundamental driver of economic growth. Ample research has shown that level of schooling is one of the best predictors of the relative wealth of individuals. Highly educated *individuals* have higher wages and experience less unemployment. They even are healthier, live longer, and are less likely to be involved in crime than those with fewer years of schooling (Riddell, 2001).

At the national level, recent research has tied investment in postsecondary education to economic growth. In an international study by the Organization of Economic Co-operation and Development, researchers found a positive and significant relationship between number of years of schooling and per capita growth in output (Bassanini and Scarpetta, 2001). Riddell found a strong correlation between labour force quality (as measured by test scores) and per capita economic growth rates (Riddell, 2001).

Spending on postsecondary education is also believed to have several kinds of spillover effects on regions.[5] The university has been shown to be the source of direct economic spillover effects by generating new business, and spinning off billions in economic activity. In 1999, for example, the University of Waterloo in Waterloo, Ontario accounted for over $1 billion in economic activity in the local region and $1.6 billion province-wide (PriceWaterhouseCoopers, 2001). Graduates of the Massachusetts Institute of Technology have created over 4,000 companies worldwide, with total sales of US $232 billion (Bank Boston, 1997).

The university indirectly stimulates economic growth through the spillover of knowledge. As a centre for discovery, the university's express purpose is to generate ideas. In this way, the university engenders an environment in which continual learning is supported. The leagues of graduates that enter the local economy interact with university-based researchers, thereby allowing the flow of tacit knowledge and ideas from industry, to university, and back again (Wolfe, 2000).

In addition to providing for a better educated workforce, spending on postsecondary education has been positively correlated with both innovation and high-technology industrial activity (Florida, 2001). But investing in universities also results in more basic research. If the university is embedded within what researchers call the regional innovation system, this research flows to the private sector, where it can be commercialized and drive economic progress.

This phenomenon of knowledge flow is facilitated by linkages between universities and industry. Cooperative education programs, industry-sponsored research, joint industry-university research organizations are a few examples of such linkages. The result is a network of people that share knowledge continuously. The presence of such a network is a critical component to the culture of relentless upgrading and innovation. Innovation at the firm level is reinforced by the firm's interactions with university researchers, whose primary function is to discover new ideas. Spin-off companies and technology transfer are common results of university-industry relationships.

An excellent example of a successful regional innovation system is the high-tech powerhouse of California's Silicon Valley. Local institutions Stanford University and the University of California at Berkeley were the birth places of many successful start-up companies. Sun Microsystems (so named for the Stanford University Network) was founded by three Stanford graduates and one Berkeley graduate. The social connections between university researchers and local entrepreneurs were one of the factors responsible for creating the high-tech boom in the region.

The university is one of many actors in the innovation process, but its role as a knowledge generator makes it a critical source of new knowledge. Spending on postsecondary education can be viewed as investing in one of the components of increasing productivity.

The challenge for the Indicator System is to gather postsecondary education data that can be compared across the peer group.

Measurement difficulties include capturing:
- state and federal spending on a comparable basis

- private spending (from tuition, private research, and the like) in each state to complement public spending

- endowment income

The Institute will be working at addressing these challenges in future Working Papers.

[5] It has been noted, however, that there is no direct evidence that increased spending on university education leads to economy-wide productivity growth. For a complete discussion of the economic evidence on this issue, see Laidler, D. (ed.) (2002). *Renovating the Ivory Tower: Canadian Universities and the Knowledge Economy.* C.D. Howe Institute Policy Study No. 27.

Box 5: Taxes and Motivations

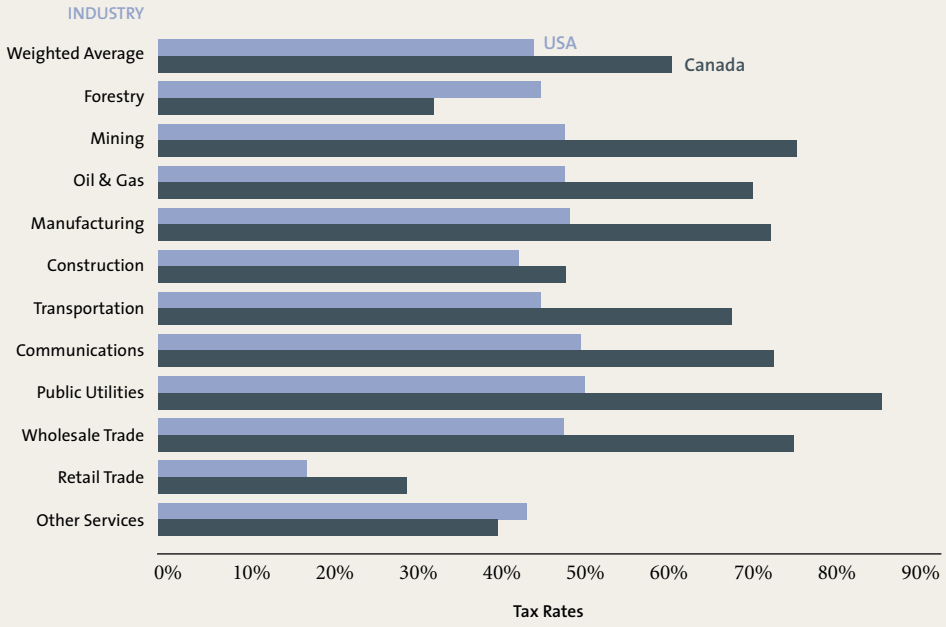
Taxes on business and individuals are important elements of the motivations in our AIM model. In our view the framework developed by Jack Mintz in his book, *Most Favored Nation* sets out a useful approach for comparing Ontario to other North American jurisdictions. Mintz's approach captures both the taxes and the services provided by government to arrive at a net cost of doing business.

In summary, his approach separates out the net tax on labour and on capital and shows differences between Canada and the U.S. in various sectors of the economy.

To arrive at the net tax on labour, Mintz calculates personal and payroll taxes at the margin. He chooses marginal rates – the rate on the last dollar earned – instead of average rates to measure individuals' incentives for working the extra hour and employers' incentives to hire the next employee. From there, he subtracts government subsidies for health care, social security, and education. This approach captures the taxes paid by individuals and firms, as well as the benefits from government support for health care and education. He concludes that overall Canada's net tax on labour for 2000 was 58.8 per cent versus 42.8 per cent in the U.S. In other words, for every wage dollar paid, net of taxes, to a Canadian employee, the employee and the employer between them pay 58.8 cents in taxes (net of subsidies). This is a full 16 cents higher than in the U.S.

Figure 12 shows the overall average and the results across 11 sectors. Our tax rate on labour is higher in 9 of the 11 (the exceptions being forestry and other services). There are also dramatic differences in the actual rates between sectors.

Figure 12: Marginal Effective Tax Rate on Labour, Net of Subsidies



Source: Mintz, J. (2001). *Most Favored Nation: Building a Framework for Smart Economic Policy.* C.D. Howe Institute Policy Study No. 36

Mintz finds a similar disadvantage for Canada in net taxes on capital concluding that overall Canada's effective tax rate on capital net of subsidies is 24.0 per cent versus an average U.S. rate of 15.3 per cent. To arrive at the net tax on capital, Mintz captures corporate income taxes, capital taxes, and sales and excise taxes on capital before netting out capital subsidies provided by governments including grants and tax credits for investments such as R&D and infrastructure. This approach captures the tax, net of subsidies, on the marginal dollar of income as a percentage of the marginal investment dollars invested by firms.

Mintz's work shows that in all 11 sectors Canada's tax rate on capital is higher. It also shows the significant differences between sectors in both countries, especially in Canada

Mintz's conclusions from his work on tax rates are as follows:

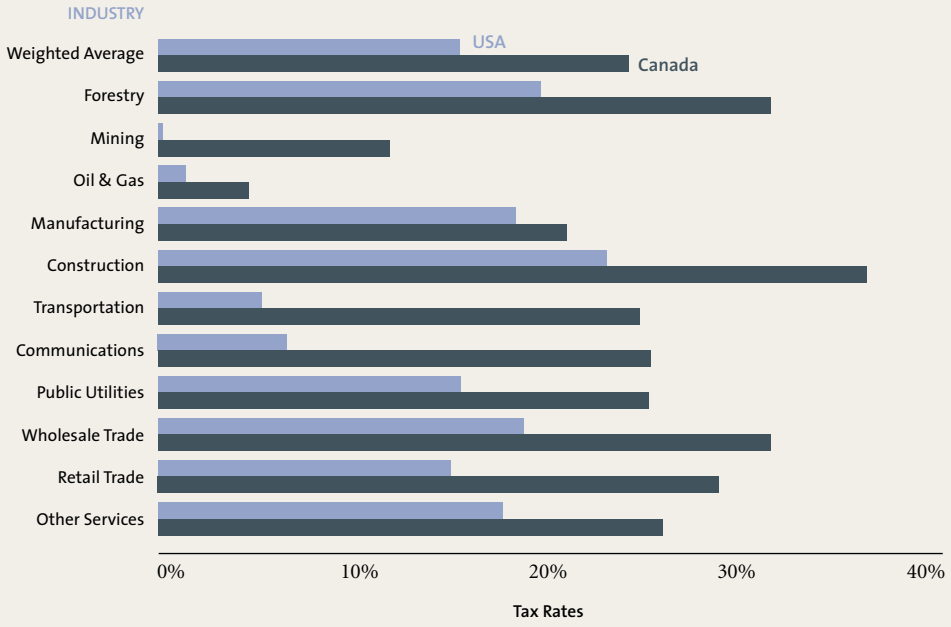
• Canadian governments impair competitiveness of the business sector... [T]he Canadian tax disadvantage is much greater, swamping any gain from [Canada's higher health care and education] subsidies...

• The tax/subsidy system is far from neutral in both countries, thereby impairing their comparative advantage and productivity. Thus Canada's tax/subsidy regime is a barrier to growth.

Mintz's observations on the relative disincentives of Canada's higher taxes relate to our indicators of innovation and upgrading. Noting the paradox of Canada's high subsidies for corporate research and development and its low uptake, he suggests that higher taxes overall reduce the incentive to invest even if specific R&D subsidies are attractive.

The Institute believes that this avenue of investigation is fruitful and will be exploring Ontario's tax rates against the selected U.S. jurisdictions.

Figure 13: Marginal Effective Tax Rates on Capital, Net of Subsidies



Source: Mintz, J. (2001). *Most Favored Nation: Building a Framework for Smart Economic Policy.* C.D. Howe Institute Policy Study No. 36

Motivations

The final element of AIM refers to the external drivers that shift or strengthen attitudes and leverage investments – the system of motivations, or incentives, in our economy.

The importance of **motivations** for **individuals** is a cornerstone of economic theory and practice. Marginal tax rates, the features of employment insurance, subsidies for education and training are among the many extrinsic or economic motivators that can stimulate individual economic behaviour that promote or diminishe economic progress.

At the **firm** level, **motivations** relating to hiring decisions (e.g., payroll taxes, regulations, minimum wage) and investing for expansion (e.g., marginal tax rates net of subsidies) have been shown to be critical factors. In Box 5: Taxes and Motivations, we compare current marginal tax rates as calculated by Canadian tax expert, Professor Jack Mintz.

Another type of firm-level **motivation** can be measured by factors such as rates of absenteeism. Research has shown that firm-level decisions or workplace practices can affect productivity (Gunderson, 2002).

Motivations, to innovate are important to the success of industry **clusters** – driven by the pressure (as discussed above in attitudes) and support from "high quality specialized inputs" and "related and supporting industries." In other words cluster participants are motivated by being forced to innovate and upgrade but also have better chances of success from such motivations given the support they receive from within the cluster.

Table 5 sets out the measures we are proposing for each element of the Capacity for Innovation and Upgrading.

Table 5: Measuring the Capacity for Innovation and Upgrading

	Potential measures	Data sources
Attitudes	Views on entrepreneurial activity – benchmarked against other jurisdictions	Specially commissioned and existing surveys
	Richard Florida's creativity indices	Development of Ontario-specific indices
	Views on competitiveness by individuals, as demonstrated by commitment to training and upgrading	Specially commissioned and existing surveys
	Views on competitiveness by firms, as demonstrated by commitment to global excellence, collaboration with industry-university organizations, and other indicators of competitive firm strategy	Special studies commissioned by the Institute
	Individuals' views on importance of economic growth	Special studies commissioned by the Institute
	Attitudes of competitiveness in industry clusters, as evidenced by number and strength of collaborations	Government and industry association statistics
Motivations	Tax, net of subsidy, on labour and capital • vs other jurisdictions • over time in Ontario • by industry or cluster	Special analyses commissioned by the Institute
	Employment regulatory burden, relative to other jurisdictions	Adaptation of OECD framework to assessing the impact of regulatory burdens on productivity growth
	Social safety net relative to other jurisdictions	Government statistics
	Tax benefits for training and upgrading	Best practices by other jurisdictions
Investment	Spending on higher education	Government statistics
	Patents registered	Government statistics
	Venture capital investment as per cent of GDP	Venture capital associations statistics
	Private spending on R&D	Government statistics and proprietary data sources
	Government and university spending on R&D	Government statistics
	Government investment in transportation and communications networks	Government statistics
	Number of university spin-off companies	Government statistics
	Cluster / industry association investment in university-based research	Government and industry association statistics

How the Capacity for Innovation and Upgrading Drives Performance

As stated above, the eight drivers in the descriptive part of the model differ in how they can be affected by different policies and strategies. In this section we describe the interaction between AIM and GDP per capita performance.

AIM is most closely aligned with *effectiveness* and *utlization* measures.

Effectiveness. Attitudes, investments, and motivations work together to make our individuals, firms and clusters more productive and competitive. We shall be developing measures that affect clusters of traded industries as well as local industries and natural resources.

Utilization. The first part of this factor, **participation rate** is driven by attitudes towards work and material well-being and by motivation to work as represented by economic factors such as marginal tax rates and employment insurance and welfare. The second part, **employment rate** is driven by firms' motivations for hiring as represented by taxes on labour and employment regulatory burden.

The interaction *intensity and profile* will be more limited. The kinds of interaction in this area include:

Intensity. Some of the measures of attitudes towards work and of motivations to work and to hire have significant impact on people's willingness to work more hours and employers' capacity for providing more hours' work.

Profile. Parts of the Creativity Index measure the openness of a region to outsiders and will be useful indicators of Ontario's ability to attract working age immigrants, thereby improving its profile. Average personal tax rates will also be used to assess the attractiveness of Ontario relative to other jurisdictions.

Going forward, we intend to develop the measures in each of the three areas – attitudes, investments, motivations – along with an approach to developing a specific index number or grading scheme that relates Ontario to the other North American jurisdictions. ●

Box 6: Georgia's Smart Investment in Innovation

Building an effective innovation process – translating research into commercial opportunities – is challenging. Although innovation obviously requires researchers and money, these alone are not sufficient. Some jurisdictions, such as the city of Pittsburgh, invest in research capabilities in a number of areas, but are generally unable to commercialize their research. Others, such as Detroit and St. Louis, have exceptional research strength in a particular cluster but have had limited success at commercializing their research investments because of low levels of venture capital. Recent studies of Ontario's innovation process, such as the Munroe-Blum Report and the Ontario Jobs and Investment Board, focus on the need for more investment in R & D and infrastructure in Ontario (Lindsay et al., 1999; Munroe–Blum, 1999). While these investments are undeniably necessary, our investigation into Georgia points to some lessons for Ontario in investing intelligently in a commercial innovation process.

For much of the twentieth century, Georgia's economy held little apparent promise. The state was largely agrarian and low-wage, and its Gross State Product per capita was among the lowest in the U.S. Georgia's largest clusters have been (and still are) textiles, tobacco, and construction materials (Combs et al., 1996; Porter et al., 2001).

In the 1990s, however, Georgia's economy blossomed. Its GSP per capita grew so quickly that it now surpasses the national average. Along with strong growth in supporting clusters such as Business Services, Financial Services, and Transportation and Logistics, a significant portion of this GSP growth may be attributed to growth in technology clusters. In particular, Georgia's share of the national Information Technology Cluster, the highest wage cluster in the U.S.A. for 1990-99, grew by 75 per cent (Porter et al., 2001). Part of its Information Technology cluster's growth was undoubtedly been fueled by Georgia's impressive rate of start-ups and new investment. Its leading research university, the Georgia Institute of Technology (Georgia Tech), placed in the 95th percentile for start-ups formed (Gray et al., 2002).

Its metropolitan areas, especially Atlanta, have become centres for vibrant, competitive high-wage technology clusters: from 1995-1999, Atlanta took in venture capital at a rate almost twice the national per capita average (Cortright et al., 2001). Perhaps most tellingly, Georgia's research commercialization, which has been historically weak, leapt forward with year-to-year patent growth from 1990-98 at double the national average (Porter et al., 2001).

Georgia's success is all the more remarkable, and puzzling, given that they have overcome significant historical weaknesses in innovation to become an innovation leader at a time when virtually every jurisdiction in North America was seeking similar technology-driven growth.

A closer look reveals that one critical element in Georgia's becoming a magnet for technology growth lies in how the state approached upgrading its innovation process. While some jurisdictions poured money into R & D, the front end of the innovation process, Georgia methodically strengthened each step in the innovation process with funding and a cooperative effort between the public, private, and academic sectors. By funding world-class research, focusing on its commercialization, and sharing academia's technology knowledge with smaller businesses across the state Georgia realized greater benefits from its innovative capacity.

Education: Governor Carl Sanders' (1963-67) mission to upgrade Georgia's university system was a catalyst in the state's transformation from a rural economy to a knowledge-based economy. His election is widely viewed as a turning point for Georgia. After taking office, Sanders substantially grew Georgia's university system, devoting 56 per cent of the 1963 budget to education, a significant increase from previous administrations (Cook, 1993). Sanders' education initiative was launched with Georgia's future prosperity as its end goal; he viewed a superior university system as critical to Georgia's attracting high tech industries and federal research grants (Cook, 1993). Without Sanders' farsighted efforts, little of Georgia's progress would have been possible.

Georgia ensures wide access to higher education. In Georgia in 1992 the public voted in a referendum to create a lottery (the state previously did not have a lottery), expressly for the purpose of raising funds for postsecondary scholarships. The result is the Hope Scholarship, now ten years old, that guarantees tuition at any state university for any high school senior with at least a B average. The scholarship also can be used toward the tuition at any private institution in the state.

Research: The Georgia Research Alliance (GRA) was formed in 1990 to address the first step in the innovation process, research. A group of prominent Atlanta businessmen provided the initial impetus for the GRA, and were committed enough to the idea to successfully make it a priority for both of Georgia's gubernatorial candidates in 1990 (Combes et al., 1996). The GRA is a public body with a mandate to hire researchers, upgrade facilities, and buy new equipment. Through its Eminent Scholar Program, the GRA has relocated 32 leading scientists to Georgia. Funded by both the state and the private sector, the GRA's efforts have resulted in over $600 million in sponsored research and placed two of Georgia's universities in the top 20 for non-federal R & D funding (for 2000) (National Science Foundation, 2000).

Commercialization: The superiority of Georgia's innovation strategy grows sharper in light of Pittsburgh's experience. Although Pittsburgh spends more than twice the per capita national average on research, from 1990-98 patents in Pittsburgh grew at only one third the national rate (Porter et al., 2001). Pittsburgh's leading-edge tissue research facility, for example, has yielded little commercial innovation. Poor commercialization mechanisms account for much of Pittsburgh's relative underperformance (Porter et al., 2001). A steep decline in available venture capital, specifically, accounts for its lack of commercialization success in biotechnology (Smith et al., 2001). Even notable innovations which were successfully commercialized did not stay in the area ,which points to the importance of a specialized work force in any innovation process. Professor Richard Florida, whose ideas are discussed elsewhere in this paper, has drawn attention to Pittsburgh's difficulty in retaining high tech startups, such as Lycos, given the region's lack of appeal to the creative class (Florida, 2002).

This pattern is more directly observable at the cluster level, in particular, the Biotechnology Cluster in Detroit, St. Louis, Houston, and Chicago. These jurisdictions have exceptionally strong research capabilities, each averaging more than $500 million in Federal R & D funding (Cortright et al., 2001).

Commercialization, however, has been weak, with low levels of startups and venture capital. Clearly, a critical piece is missing from the innovation process in these jurisdictions.

Georgia has avoided the pitfalls of Pittsburgh, Detroit, and St. Louis, by understanding that attention to the commercial innovation process does not end at research. The state and the private sector have made a concerted attempt to strengthen the linkages between research and the business community through a well-integrated network of organizations. The Faculty Research Commercialization Project offers support and funding to researchers at Georgia universities who are seeking to commercialize their research. The Advanced Technology Development Center, now a highly regarded incubator, was established in 1980 to ensure that the resulting start-ups are given the necessary funding, infrastructure, and support, to thrive, and has graduated 90 companies to date (Advanced Technology Development Center, 2002). Finally, the Economic Development Institute helps disseminate the engineering and technology know-how of the university system's faculty to smaller and medium sized firms in more traditional industries across the state.

All three programs are headquartered at Georgia Tech, and are recognized by their peers as a model for university-technology industry partnerships. They have been ranked as the best out of similar programs across the top 164 U.S. research universities for university-industry technology partnerships (Gray et al., 2002).

Critically, much of the drive to upgrade the innovation process in Georgia has come from the business sector itself (Combs et al., 1996). This has helped ensure that the organizations and innovation systems implemented by the state are useful and relevant to the end goal of commercialization.

Venture Funding: While venture funding may not be a strength for Georgia, neither does it seem to be a weakness. Venture funding for Atlanta (the primary locus of innovation in Georgia) is not among the U.S. leaders, but was still a robust $2.6 billion from 1995 – 2000. Unpublished research on the venture funding process in Canada, by contrast, indicates gaps in the venture funding available to startup companies as they mature (Choy et al., 2001).

Georgia's innovation system is obviously not flawless; despite the Economic Development Institute's best efforts, much of the commercial innovation is contained within the Atlanta area. Their K-12 education system is still a relative weakness. Nevertheless, Georgia gives us some direction on how to invest intelligently in a commercial innovation process. We see the importance of a cooperative approach between government, research institutions, and business, as well as the necessity of planning with a longer timeline in mind.

Georgia's success demonstrates the importance of approaching innovation with an understanding of how to leverage existing institutions, such as research universities and venture capitalists, into an improved commercial innovation process. Admittedly, the linkages between the steps in the innovation process in Georgia / Atlanta are not yet as strong as in the likes of a jurisdiction such as San Jose or Boston. It must be kept in mind, however, that Georgia is comparatively new to the knowledge economy and does not have the hundreds of years of history of private and public research institutions of a Boston or the unique advantage of a world-class cluster as a San Jose.

Indeed, Georgia's historical weakness at innovation and their past reliance on rural industries makes their transformation into an innovation-driven economy all the more impressive, and worthy of study. Georgia's experience demonstrates that with cooperation, planning, and an appreciation of the different linkages involved in the innovation process, jurisdictions can significantly improve their innovative capacity. While Ontario has made strides in establishing stronger commercialization mechanisms, it can still learn from Georgia.

Identifying Environmental and Social Measures

The notion of competitiveness refers to a region's capacity for wealth creation and the well-being of its people. A competitive region can support a rising standard of living because of its ability to create and expand opportunities. Many observers argue that various non-economic indicators, such as quality of life and the health of the environment, should be included in measurement of regional competitiveness.

Monitoring systems in other jurisdictions include non-economic measures to provide a fuller view of quality of life. The Michigan Economic Development Corporation measures air and water quality because it argues that fresh air and clean water are attractive to the highly skilled workers a competitive region requires. Ireland's National Competitiveness Council measures income inequality in its annual Competitiveness Report because, the Council argues, social consensus drove Ireland's recent growth; income inequality presents the potential of undermining that consensus.

We recognize that poor environmental performance and social costs have a negative effect on Ontario's relative position. These issues represent a system of checks and balances to rising economic activity. Economic growth in inefficient and polluting industries can lead, if left unchecked, to environmental degradation, for example. As noted by recent research at the University of Victoria, Canada's environmental performance, when compared to the OECD, needs improvement (Boyd, 2002).[5] In terms of quality of life, Canada ranks consistently high, according to the UN Human Development Index.

Our Indicator System has as its focus the comparison of Ontario's economic performance to U.S. states of similar population. Social and environmental fundamentals are important in supporting a rising standard of living. Our framework presupposes that a sound economic platform can support a rising quality of life. An economic analysis, therefore, is our point of departure.

As a system of monitoring, our Indicator System is designed to capture the level of economic activity. We will rely, therefore, on other quality-of-life indicator systems to provide a check on the ability of economic growth to support a better environment and social benefits.

[5] For more information on Canada's ranking on environmental indicators relative to the OECD, please read the entire report at http://www.environmentalindicators.com/htdocs/PDF/CanadavsOECD.pdf.

Conclusion

This Working Paper outlines an indicator system that will serve as a guide for the selection and measurement of specific data that explain the performance gap between Ontario and its 15 peer-group jurisdictions in North America. The selection and measurement process will inevitably present data collection challenges but it is hoped that the Institute's Indicator System will provide a conceptual framework that is sufficiently robust to mitigate the impact of these challenges.

The descriptive part of the Indicator System pinpoints both Ontario's strengths and its opportunities for improvement. Ontario's beneficial mix of industry clusters, participation rate in the labour market, and its demographic profile are all advantages. But Ontario's *effectiveness* and rate of employment are its disadvantages.

Our ability to close this gap lies in the capacity to innovate and upgrade, the drivers of which are related to the AIM model (attitudes, investment and motivations).

Next Steps and Further Research

The Indicator System provides a framework for future research initiatives, based on the eight drivers of GDP per capita, and three drivers of innovation and upgrading. Consultations and future Working Papers will focus on issues such as:

- To what level of economic performance do Ontarians wish to aspire? Median performance? Top quartile? Steady improvement in our ranking among the peer group?

- What are the specific measures for attitudes? For investments? For motivations?

- Are there opportunities to improve Ontario's innovation performance based on lessons learned from other jurisdictions such as Georgia and Massachusetts?

- How do we assess natural resource industries within the cluster approach?

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