Diversity in Edmonton's Economy

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All city names in this document refer to Census Metropolitan Areas (CMAs). In Edmonton, the CMA contains the same municipalities as the Edmonton Capital Region, with the exception of Lamont and Lamont County.

Summary

This analysis discusses two indices of economic diversity. The first, a frequently used index similar to that used by the Conference Board of Canada, measures how evenly a city's GDP is spread across different industries. By this measure, as of 2014 Edmonton has the most diversified economy among major Canadian cities. Edmonton's largest industry sector, primary and utilities, comprises only 17% of GDP (compared to 32% of GDP in Calgary).

The composition of Edmonton's GDP has not drastically changed since 1994. The primary and utilities sector makes up a slightly smaller share of GDP (19% in 1994 compared to 17% in 2014) while construction makes up a larger share (7% compared to 12%). Like most major Canadian cities, Edmonton's economic diversity, as measured by this index, has been relatively constant since 1987. The exception is Calgary, which has become significantly more diverse over the same time period.

However, if the goal of diversification is to reduce volatility and risk in a city's economic growth, then the GDP by industry index paints an incomplete picture of diversity because it does not account for interdependence between industries.

An alternate, less widely used diversification index accounts for interdependence by relating a region's economic structure to an investment portfolio and calculating the total volatility of that portfolio over a given time period. When using this approach, Edmonton rates among the least diversified economies in Canada, and has become less diverse over time. The two most volatile industries in Edmonton are construction (12% of GDP in 2014) and manufacturing (9% of GDP in 2014), both of which are closely tied to oil sands activity. Diversifying the customer and product base of these two industries and decoupling them from the energy sector could be an effective way to improve Edmonton's economic stability.

Defining Economic Diversity

An economy is typically considered to be diverse if its economic output is spread evenly over a variety of industry sectors. Conventional wisdom suggests that a diversified economy will see more stable and sustainable growth, because risk is spread more evenly over a greater number of industries. While this relationship makes intuitive sense, empirical results from studies on the link between diversity and growth have been inconsistent despite over 50 years of research.

This definition of diversification has been criticised for two major reasons. First, the selection of an equal distribution of activity across industries as the 'ideal' reference point is essentially arbitrary. Second, it only considers how output is distributed across industries; it does not take into account the degree to which different industries are interrelated. For example, a hypothetical economy with 10 industries, each with 10% share of output, would be considered highly diverse even if 9 industries existed solely to sell

inputs to the remaining one. Despite being technically 'diverse', this economy is still dependent on one industry and exposed to high levels of risk. Alternate definitions of economic diversity which take into account inter-industry supply and demand relationships have been proposed but a lack of necessary data, especially at the city level, prevents their widespread use.

It is important to recognize that diversity is only one aspect of a region's economic structure. Natural resources and comparative advantage are important contributors to economic growth, and diversification for diversification's sake could be counter-productive. Rather, the pursuit of economic growth and stability can be considered a balance between the stability of diversification and the growth potential of exploiting comparative advantages.

Finally, diversity of output is not the only type of diversity that can affect regional economic performance. Diversity of export markets can also theoretically improve economic stability even in regions with highly concentrated output, because risk is spread over multiple export 'customers'. And within the broad industry categories typically used to categorize output, diversity of products could theoretically have a similar effect.

Measuring Local Economic Diversity

Over the years a wide variety of diversity measures and indices have been developed, from extremely simple (the percentage of manufacturing activity accounted for by nondurable goods) to more complex measures using input-output models. Due to ease of computation and data availability, the most widely used are a related set of indices that define diversity as the level of equal distribution of economic activity across industry sectors.

A separate, less common type of index treats a region's distribution of economic activity among industries as analogous to an investment portfolio, and measures diversification by the level of total volatility in that portfolio. This framework paints a more complex picture of diversification, as it considers not only the return and stability of a region's industry 'portfolio', but also the degree of interdependence between its different industries.

This analysis computes measures of both GDP distribution and total GDP growth volatility. For GDP distribution, the specific mathematical formula used is the Herfindal index, which computes the sum of squares of industry shares of economic activity[1]. Lower values of this index indicate higher levels of economic diversity as defined above. The Herfindal and similar indices have been the subject of decades of research that has not found a conclusive relationship between index ratings and economic growth or stability.

The index used for GDP growth volatility is based on the definition of total portfolio variance from portfolio theory. The index measures the total variance of GDP growth, considering each industry's share of GDP, the historical variance in their growth rates, and the historical covariance (the degree to which different industries tend to change together) between all industry growth rates. Unfortunately this diversity index cannot be used to estimate a link with growth or stability, because it does not measure diversity independent of them.

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[1] $Herfindal_{region} = \sum \left(\frac{Output_{region,industry}}{Output_{region}} \right)^2$

The two most common values used to measure industry shares of output are employment and GDP. In this case real GDP estimates from the Conference Board of Canada were used to compute the Herfindal and volatility indices. These estimates are unofficial (Statistics Canada does not publish GDP estimates for metropolitan areas) and are a source of error in the analysis. The basic process used by the Conference Board is to estimate a city's GDP in a given industry by multiplying that city's share of province-wide industry employment by province-wide industry GDP. This process will very likely over-estimate city GDP in industries where capital is used in a separate geographic area from labour, for example the oil and gas industry.

The specific values of the GDP volatility index for each city are sensitive to the chosen time period. Here the overall diversity rankings are calculated using GDP growth from 1987 to 2014, the longest time period available. The index was calculated for various other time periods (see Figure X. for 1987 to 1996, 1997 to 2004, and 2007 to 2014), but the overall rankings did not change significantly.