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.

Introduction

This analysis discusses two indices of economic diversity. The first, a frequently used GDP distribution 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 the GDP distribution 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 distribution index paints an incomplete picture of diversity because it does not account for volatility or 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 growth volatility of that portfolio over a given time period. Using this total GDP growth volatility approach reveals that Edmonton's economy is among the most volatile in Canada, and the growth rates of our different industries are related in a way that suggests strong industry interdependence compared to other major cities. Combining the GDP distribution and GDP growth volatility measures portrays Edmonton's economy as one that is superficially diverse, but has deeper structural dependencies that have prevented it from achieving stable growth.

These two measures are inherently backward-looking, and by themselves do not suggest paths towards true economic diversity. One approach could be to start with two of Edmonton's most volatile industries, 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. The GDP growth volatility index captures the level of this interdependency.

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, diversification through selling different or similar products to customers in a wide range of industries could theoretically have a similar effect.

Measuring Local Economic Diversity

This analysis uses GDP as a measure of economic activity, and computes two separate indices of economic diversity – one GDP distribution index and one GDP growth volatility index. 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. The specific indices used here were chosen for ease of computation and data availability at the city level.

The first index used is the Herfindal Index, which captures the extent to which GDP is evenly distributed over different industry sectors. It computes the sum of squares of industry shares of GDP[1], with lower values of the index indicating a more equal distribution of GDP and therefore higher levels of economic diversity. The Herfindal Index comes from a widely used family of related diversity indices and is very similar, though not exactly equivalent, to the diversity index published by the Conference Board of Canada.

The second index captures a region's total GDP growth volatility by treating it's distribution of economic activity among industries as analogous to an investment portfolio, and measuring diversification by the level of total volatility in that portfolio. A region's total GDP volatility incorporates 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. Assuming that diverse

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

economies should exhibit lower levels of both industry volatility and interdependence, higher values of the GDP growth volatility index indicate lower levels of economic diversity. This framework paints a more complete picture of diversification than the Herfindal Index, as it considers not only how economic activity is distributed, but also the degree of interdependence between a region's different industries.

Caveats and Limitations

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 GDP growth 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 growth 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.

Conclusion

Both the indices used here have unfortunate limitations in substantiating a link between diversity and economic performance. For a variety of methodological and conceptual reasons, decades of economic research on the Herfindal and similar GDP distribution indices has not found a conclusive relationship between index ratings and economic growth or stability. The GDP growth volatility index cannot be used to estimate a link with growth or stability, because it does not measure diversity independent of them.

Despite their limitations, when analyzed together these two measures of diversity paint a clear picture of Edmonton's economy. It is superficially diverse, with GDP distributed more evenly across its various industry sectors than any other major Canadian city. Despite this it is also relatively volatile, and exhibits high levels of interdependence between its different industries. This is counter to the theory of diversification, which suggests that diverse economies should see less volatile and interdependent growth. There must be a deeper structural dependency at work in Edmonton's economy, but these indices do not offer an explanation on their own.

Though not directly supported by this analysis, the obvious explanation for Edmonton's volatility is the link between its economy and Alberta's energy industry. There are two facts in the GDP growth volatility data that indirectly suggest this: first, four cities commonly thought of as having natural resource economies – Calgary, Edmonton, Saskatoon, and Regina – have markedly higher GDP growth volatility index values than other Canadian cities. Second, within Edmonton's economy our most volatile industries have historically been manufacturing and construction, both of which are generally thought to be closely linked with the energy sector.

On their own these two indices do not clearly point towards a policy for improving Edmonton's economic diversity. In fact, whether decreasing GDP growth volatility through diversification at the expense of periods of very high GDP growth is a desirable policy goal is an important question to consider. However, if reducing volatility is a priority, then the data suggests that a logical starting point would be to decouple Edmonton's most volatile industries, manufacturing and construction, from Alberta's energy sector by diversifying their export markets and customer base.