

From Industry Clustering to Regional Difference: Small Business Growth in 2010 Winter Olympics

What leads to the regional difference in the British Columbia Area?

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Why Small Business ?

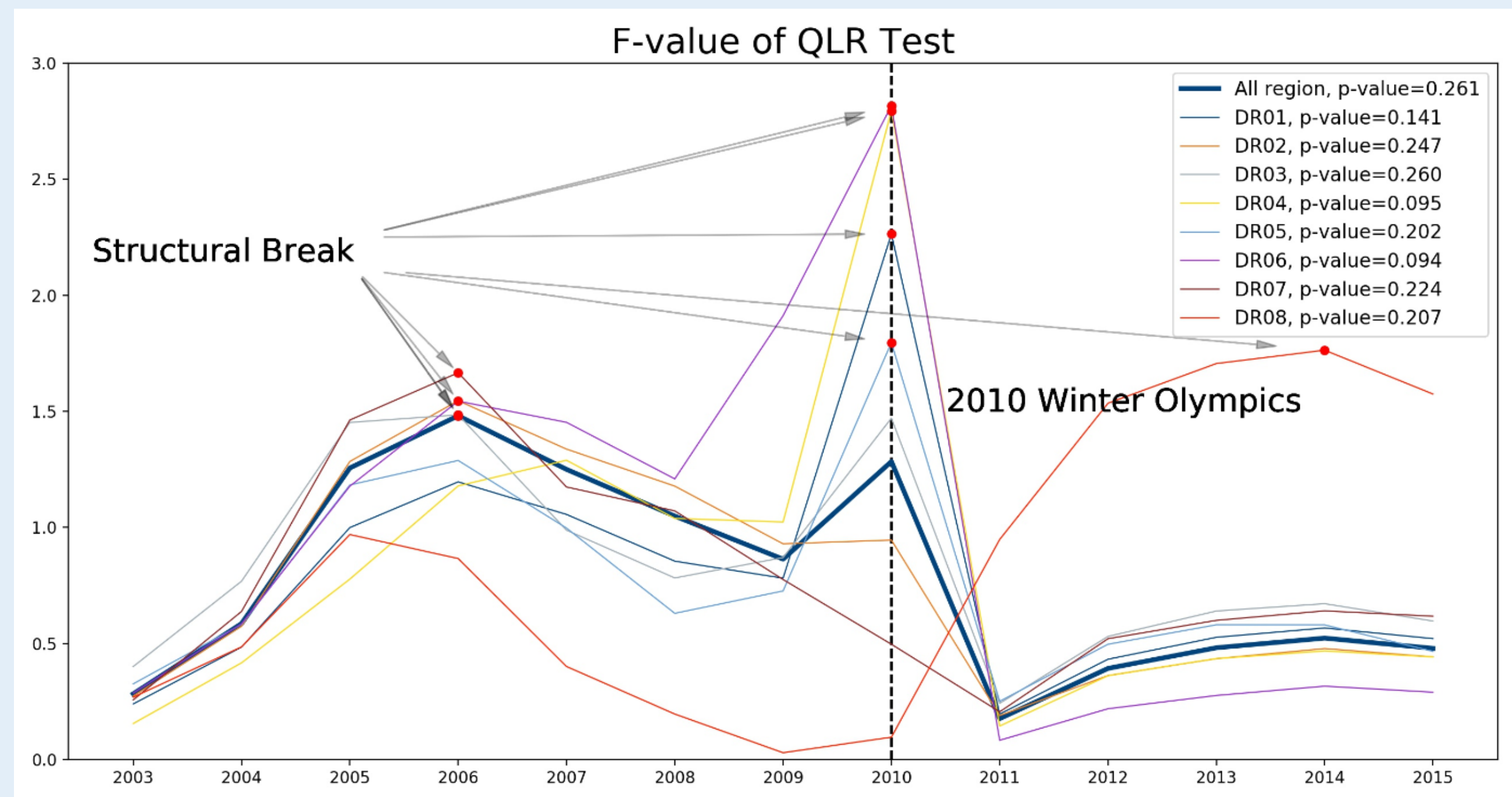
The small business sector in B.C. is a vital part (37%) of the economy, more so than in most other provinces, which is much larger than the large business sector (2%) in this area.



Source: BC Stats using data supplied by Statistics Canada, 2018

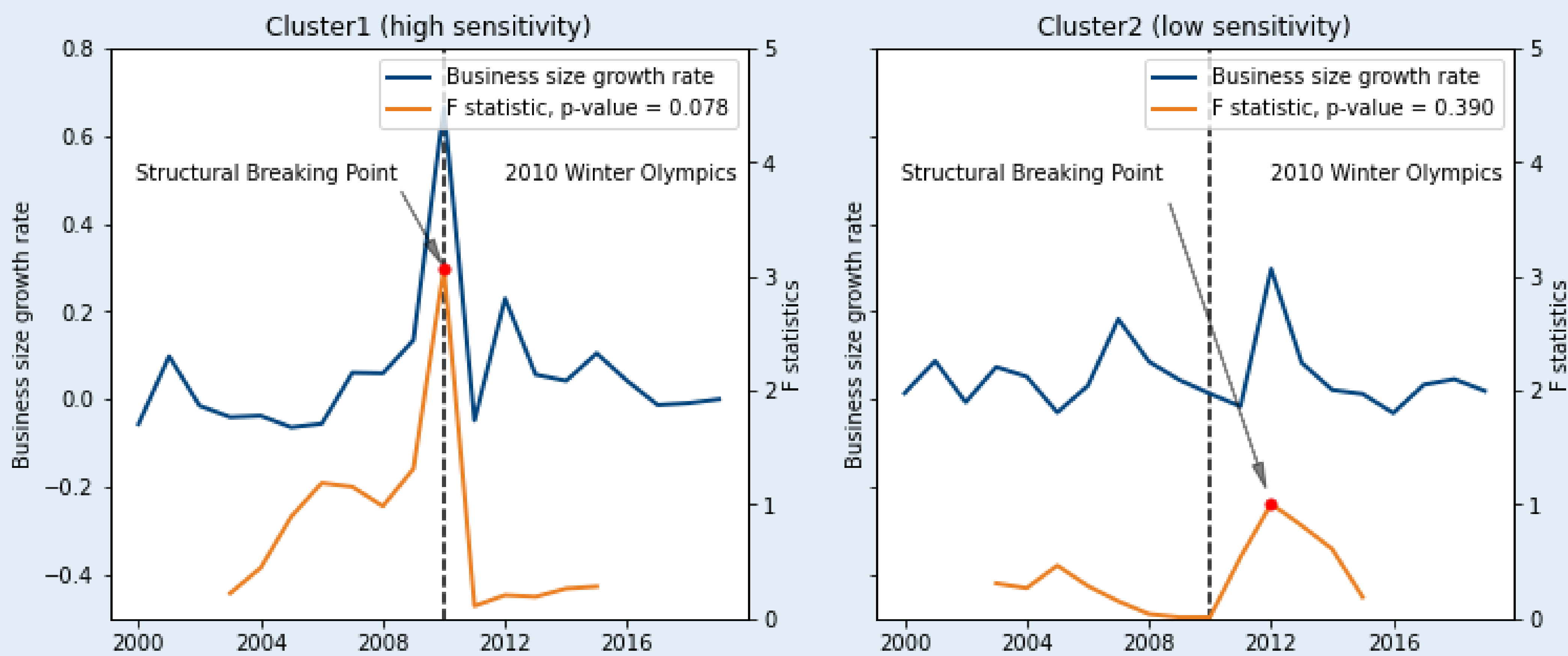
Regional Growth Difference Overview:

There exist significant differences among the 8 development regions (DR01 to DR08) in the B.C. area.



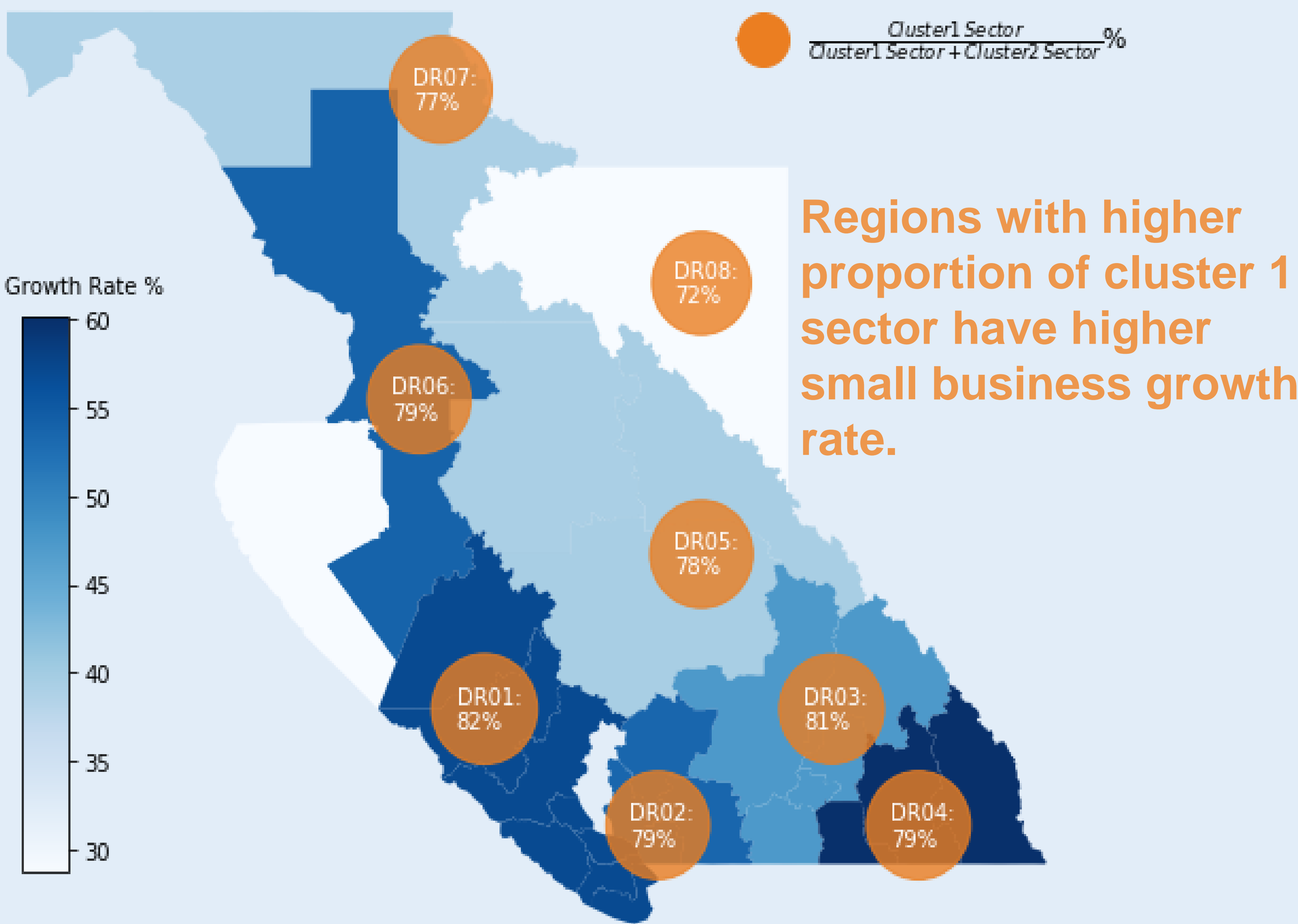
- DR01, DR04 and DR06 experienced a significant structural break in 2010 with p-value around 10%. Other regions, including the whole British Columbia, didn't significantly change in terms of time series structure, with p-value more than 0.20.
- If structural break did happen in these insignificant regions, some of the break points should have occurred in 2006, 4 years prior to the 2010 Winter Olympics.

Causality Study and Clustering Analysis:



The smaller p-value of cluster 1 provides us with a significant evidence that growth rate jumped in the 2010 Winter Olympic games. From the graph above, it is obvious that industry cluster 1 is more sensitive to 2010 Winter Olympics than cluster 2.

Small Businesses in British Columbia (2010)



Source: British Columbia

Highlights

- Visualized the impact of 2010 Winter Olympics on small business growth.
- Confirmed there are structural breaks in some specific regions via rigorous statistical test of time series.
- Utilized spectral clustering algorithm to identify clusters (industry groups) sensitive & insensitive to the 2010 Winter Olympics, which accounts for the regional growth difference.

➤ Hypothesis:

The difference of regional business growth rates are caused by the different industrial composition.

➤ Interpretation model:

$$g_r = \sum_{c=1}^n w_{r,c} g_c$$

- g_r : Small business growth rate in region r
- c : Industry cluster c formed by industries whose small business sizes are highly correlated with each other
- $W_{r,c}$: The weight of Cluster c in region r
- g_c : Small business growth rate of cluster c

Conclusion:



Our spectral clustering results (industry groups) have **higher correlation (0.8463)** with small business growth in 2010 compared to the official standard (0.7727), which verifies our model's effectiveness.