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# Measuring the Efficiency product output: An Application to Food Industry in Canada

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## Objective:

- Obtain a reliable and up-to-date measure of performance
- Investigate the efficiency and the productivity of food processing
- Use two different Methodology
  - Input Distance Function
  - Translog production Function

## Method

The input distance function is:

$$(1) \ln D_{it} = \alpha_0 + \alpha_i \ln y_i + \frac{1}{2} \alpha_{ii} \ln y_i \ln y_i + \sum_k \beta_k \ln X_{mi} + \frac{1}{2} \sum_m \sum_k \beta_{ki} \ln X_{ki} \ln X_{mi} + \sum_m \sum_k \delta_m \ln X_{mi} \ln y_i + \lambda_t t + \frac{1}{2} \lambda_{tt} t^2 + \sum_k \lambda_k \ln X_{ki} t + \sum_m \lambda_m \ln y_i t + v_{it} - u_{it}$$

Production Function without time trend:

$$(2) \ln Y_{it} = \alpha_0 + \sum_k \alpha_k \ln X_{mi} + \frac{1}{2} \sum_m \sum_k \beta_{ki} \ln X_{ki} \ln X_{mi} + \delta_t t + \frac{1}{2} \delta_{tt} t^2 + \sum_k \lambda_k \ln X_{ki} t + v_{it} - u_{it}$$

## Data and Variable:

Statistic Canada's website

Provinces in this study are: Quebec, Ontario, Alberta and British Columbia

The data are from 1983-2003.

X variables

- Production Workers
- Investment
  - Building and Engineering
  - Equipment and machinery
- Input
  - Energy
  - Materials

Y variable

Output

## Results

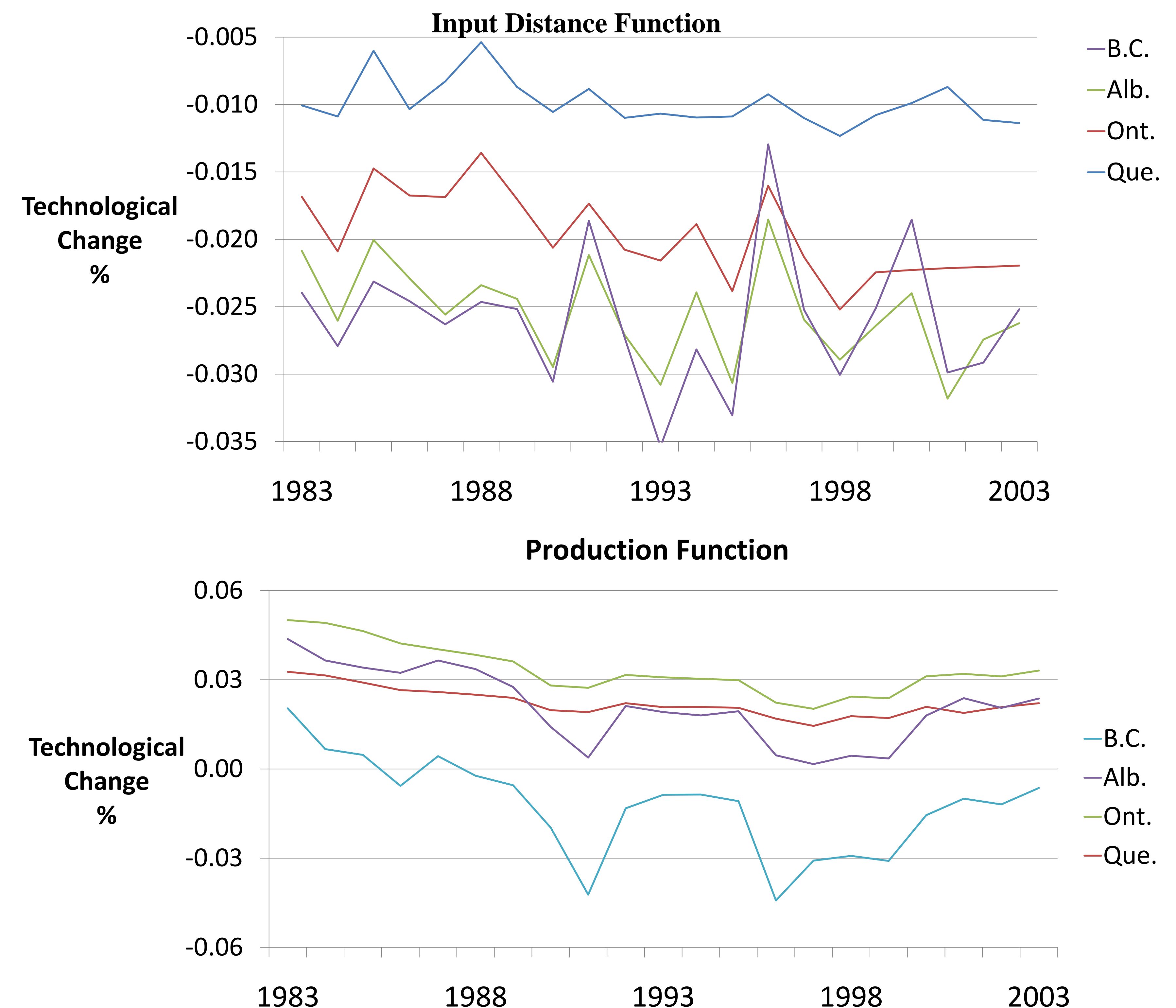
Change in Productivity ( $U_{it}$ ) 1983-2003

Year	Que.		Ont.		Alb.		B.C.	
	Input	Prod	Input	Prod	Input	Prod	Input	Prod
Mean	0.024	0.0872	0.147	0.0856	0.234	0.0901	0.291	0.0873

Malmquist index 1983-2003

	Que.		Ont.		Alb.		B.C.	
	Input	Prod	Input	Prod	Input	Prod	Input	Prod
Mean	1.336	0.891	1.375	0.873	1.462	0.865	1.462	0.874

## Result



## Conclusion

- All provinces are :
  - Almost efficient using production Function method
  - Not efficient using input distance function
- Malmquist indexes are
  - Production Function method denotes regress or deterioration in performance
  - Input Distance Function indicates improvements in the relevant performance
- Technological Changes
  - Same trends
  - Decreasing under both functions