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

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

Production Function without time trend:

(2) $\operatorname{Ln} Y_{it} = \alpha_0 + \Sigma_k \alpha_k \ln X_{mi} + \frac{1}{2} \Sigma_m \Sigma_k \beta_{ki} \ln X_{ki} \ln X_{mi} + \delta_t t + \frac{1}{2} \delta_{tt} t^2 + \Sigma_k \lambda_t \ln X_{ki} t + v_{it} - u_{it}$

## Data and Variable:

Statistic Canada's website

Provinces in this study are: Quebec, Ontario, Alberta and British Columbia
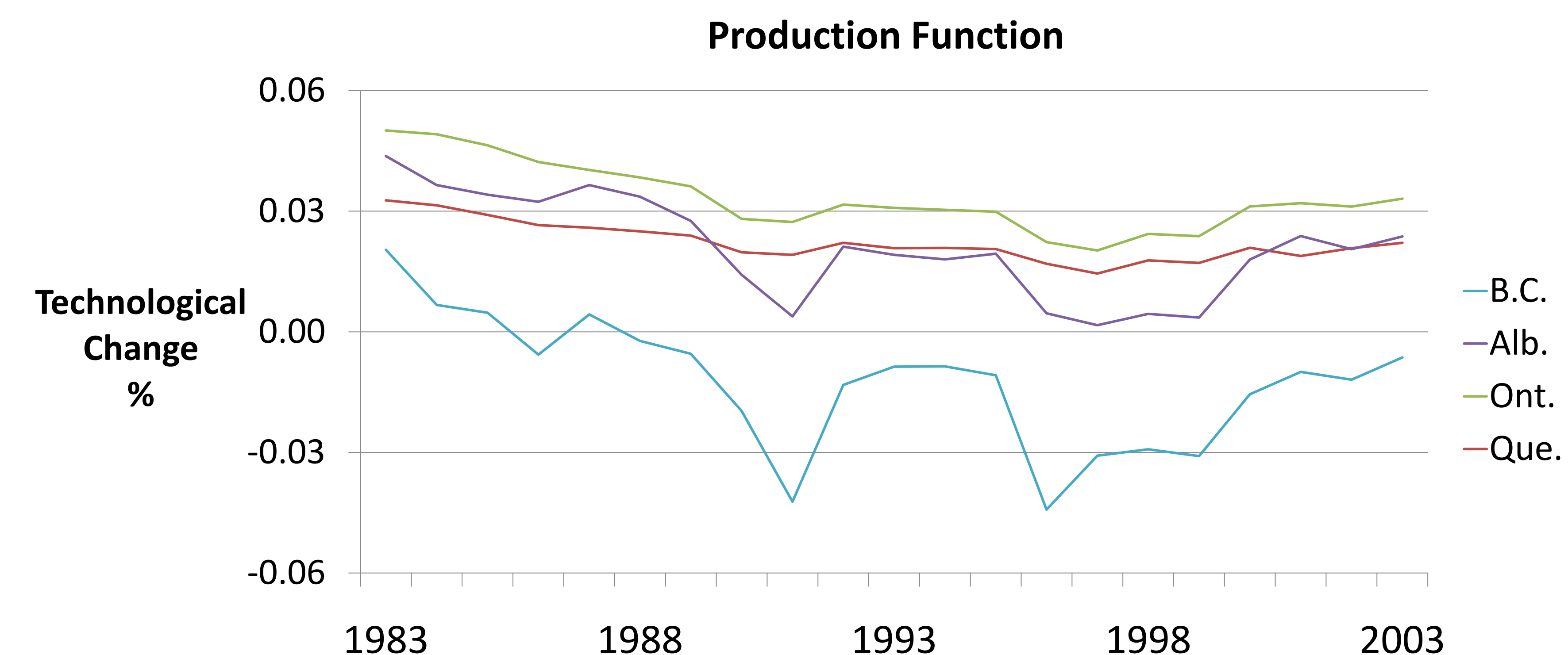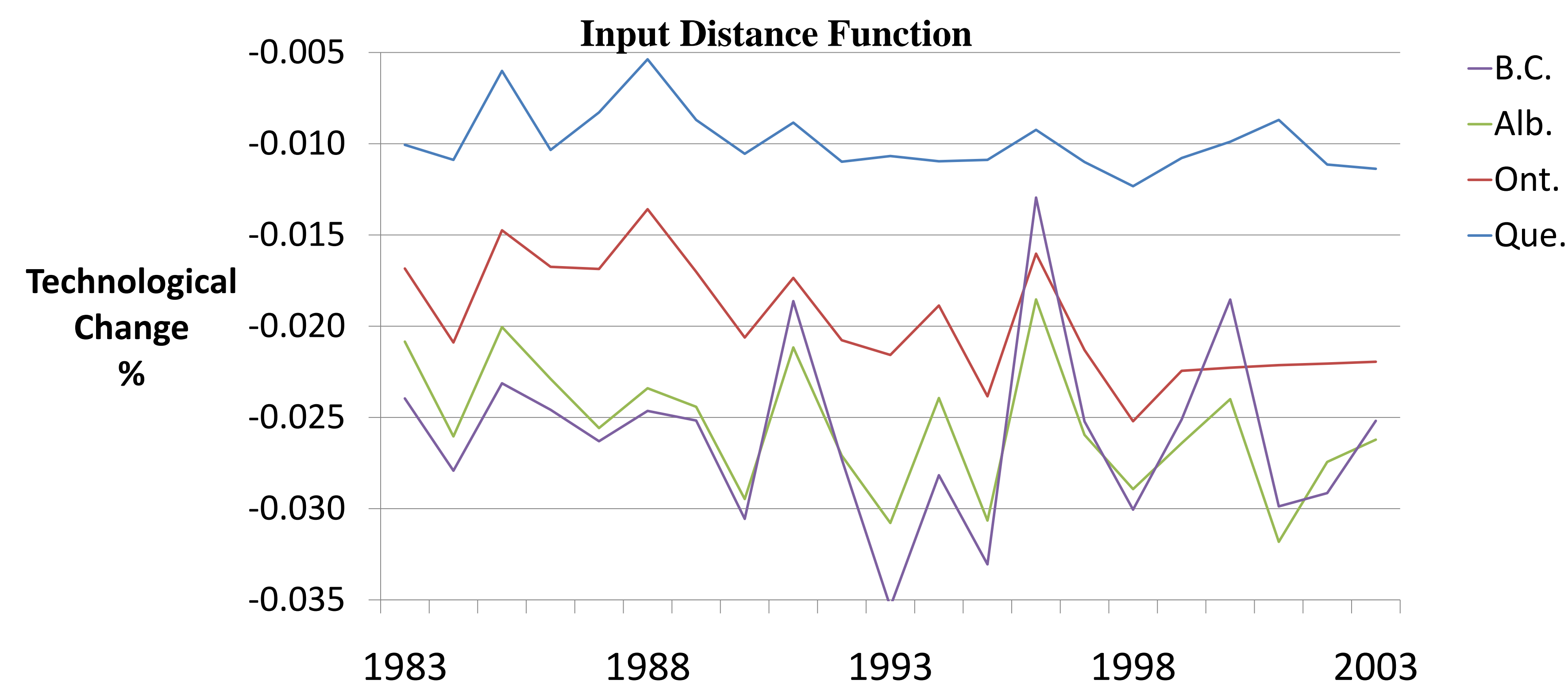
The data are from 1983-2003.

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

Y variable
Output

## Result



Input Distance Function — Technological Change % (B.C., Alb., Ont., Que.)



Production Function — Technological Change % (B.C., Alb., Ont., Que.)

## Results

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

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

Malmquist index 1983-2003

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

## 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