



Factors associated with the technical, allocative and economic efficiency of Irish dairy farms

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Overview

Background

Objectives

Efficiency measurement

- Technical, allocative and economic efficiency
- Data Envelopment Analysis (DEA)
- Models
- Results

Conclusion



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Background



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Background

Rising costs of inputs

Volatile prices

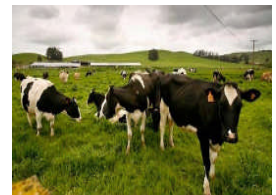
Policy changes

- Quota removal
- Subsidies

Need to increase efficiency

Management

- Widely regarded as associated with differences in efficiency



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Objectives



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Objectives

- Determine the levels of technical, allocative and economic efficiency of Irish dairy farms
- Investigate the associations of key management, qualitative and demographic characteristics on efficiency



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Efficiency measurement



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Definitions of Efficiency (Farrell 1957)

- **Technical:** ability to maximise output from the current level of inputs
- **Allocative:** ability to react to market changes when choosing inputs
- **Economic:** technical x allocative efficiency



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Data Envelopment Analysis (DEA)



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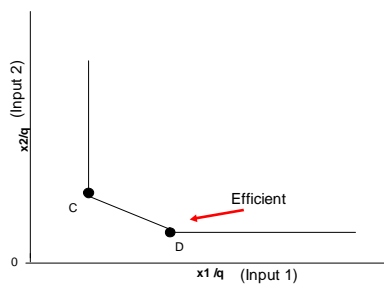
Data Envelopment Analysis (DEA)

- Developed by Charnes et al., (1978)
 - Non-parametric methods
 - Deterministic
 - Linear programming
- Efficiency scores range between 0 and 1



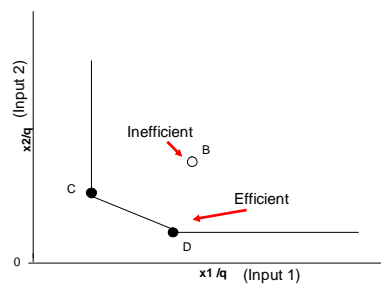
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DEA Frontier



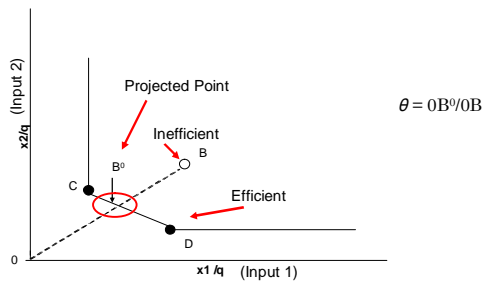
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DEA Frontier



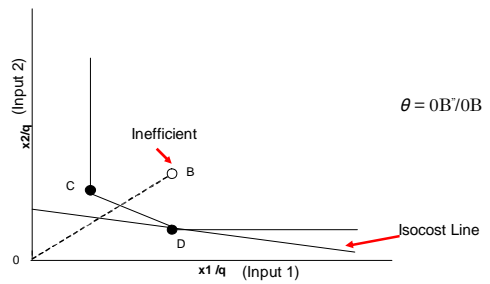
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DEA Frontier



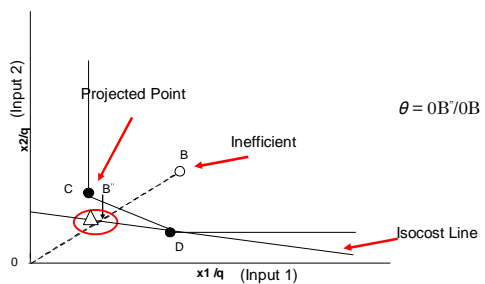
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DEA Frontier Economic Efficiency



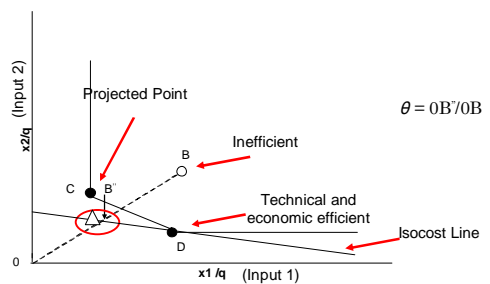
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DEA Frontier – Economic Efficiency



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DEA Frontier – Economic Efficiency



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Efficiency Models

- Dataset
 - National Farm Survey (NFS), 2008
 - Annual survey of Irish dairy farms
 - Over 300 farms
- Input Variables
 - Land, cows, labour, concentrate, fertiliser, other direct and overhead costs (Physical and financial)
- Output Variables
 - Milk Solids (MS) and other farm output (Physical and financial)
- Models
 - Variable Returns to Scale (VRS)



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Second Stage Analysis

- Tobit Regression: Suitable as DEA efficiency scores bound between 0 and 1
 - Management Factors
 - Qualitative Factors
 - Demographic Factors



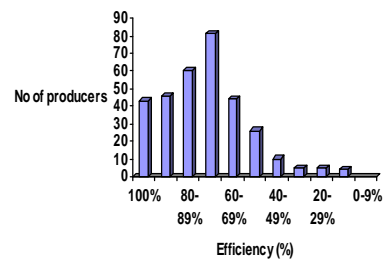
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Results



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Technical efficiency

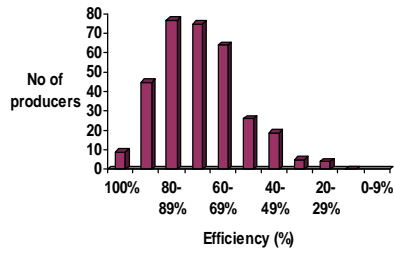


Average	0.771
Minimum	0.106
Maximum	1.000
St Dev	0.182



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Allocative efficiency

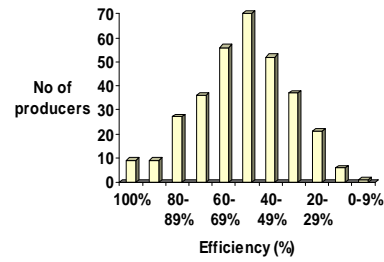


Average	0.740
Minimum	0.213
Maximum	1.000
St Dev	0.159



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Economic efficiency



Average	0.571
Minimum	0.089
Maximum	1.000
St Dev	0.195



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Results summary

- Potential to increase technical, allocative and economic efficiency
- More technically efficient than economically efficient producers
- 85% of sample had technical efficiency > 60% with 13% fully technically efficient
- 83% had allocative efficiency > 60% with 3% fully allocative efficient
- 42% had economic efficiency > 60% with 3% fully economic efficient
- Need to focus on key factors associated with efficiency



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Factors associated with technical efficiency



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Association of key factors with technical efficiency

Variable

Intercept

Grazing Days

Breeding Days

Dairy% Output

Milk Penalties €

Milk Bonuses €

Milk Recording

Discussion[†]

Calving[‡] sFeb14th

Calving sMarch1st

Soil[§] 1

Age

* Significance PROC LifeReg SAS *** <0.001, **0.001-0.01, *0.01-0.05

[†] Discussion Group Member.

[‡] Mean calving Date: Dummy variable, 1 if calving ≤14th February, 2 if calving ≤ 1st March, 3 if calving ≤17th March, 4 if calving ≤31st March and 5 if calving ≥ April 1st

[§] Soil quality ranges from 1-6 with 1 an indication of best soil with widest range of use and 6 the poorest soil quality with most limited range of use



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Factors associated with allocative efficiency



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Association of key factors with allocative efficiency

Variable

Intercept

Grazing Days

Breeding Days

Dairy% Output

Milk Penalties €

Milk Bonuses €

Milk Recording

AI use

Discussion[†]

Calving[‡] sMarch 17th

Soil[§] 1

Soil 2

Age

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[†] Discussion Group Member.

[‡] Mean calving Date: Dummy variable, 1 if calving ≤14th February, 2 if calving ≤ 1st March, 3 if calving ≤17th March, 4 if calving ≤31st March and 5 if calving ≥ April 1st

[§] Soil quality ranges from 1-6 with 1 an indication of best soil with widest range of use and 6 the poorest soil quality with most limited range of use



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Factors associated with economic efficiency



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Association of key factors with economic efficiency

Variable

Intercept

Grazing Days

Breeding Days

Dairy% Output

Milk Penalties €

Milk Bonuses €

Milk Recording

AI use

Discussion[†]

Calving[‡] sMarch1st

Soil[§] 1

Age

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§ Soil quality ranges from 1-6 with 1 an indication of best soil with widest range of use and 6 the poorest soil quality with most limited range of use



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Conclusions



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Conclusion

Greater efficiency associated with

- Mean calving date
- Grazing days
- Breeding season length
- Milk quality
- Discussion group membership
- Milk recording
- AI use
- Dairy specialisation
- Land Quality
- Age



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Conclusion

- Potential to increase efficiency at farm level
- Identified KPI at farm level that are causing differences in efficiency among producers
- These factors can be used for the benchmarking of producers



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Future work

- Scale efficiency of Irish dairy producers
- Measure productivity over a longer period of time



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Acknowledgements

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Thank you for your attention!



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