



EUROPEAN HEALTH CARE OUTCOMES,
PERFORMANCE AND EFFICIENCY

Costs and quality at the hospital level in the Nordic countries

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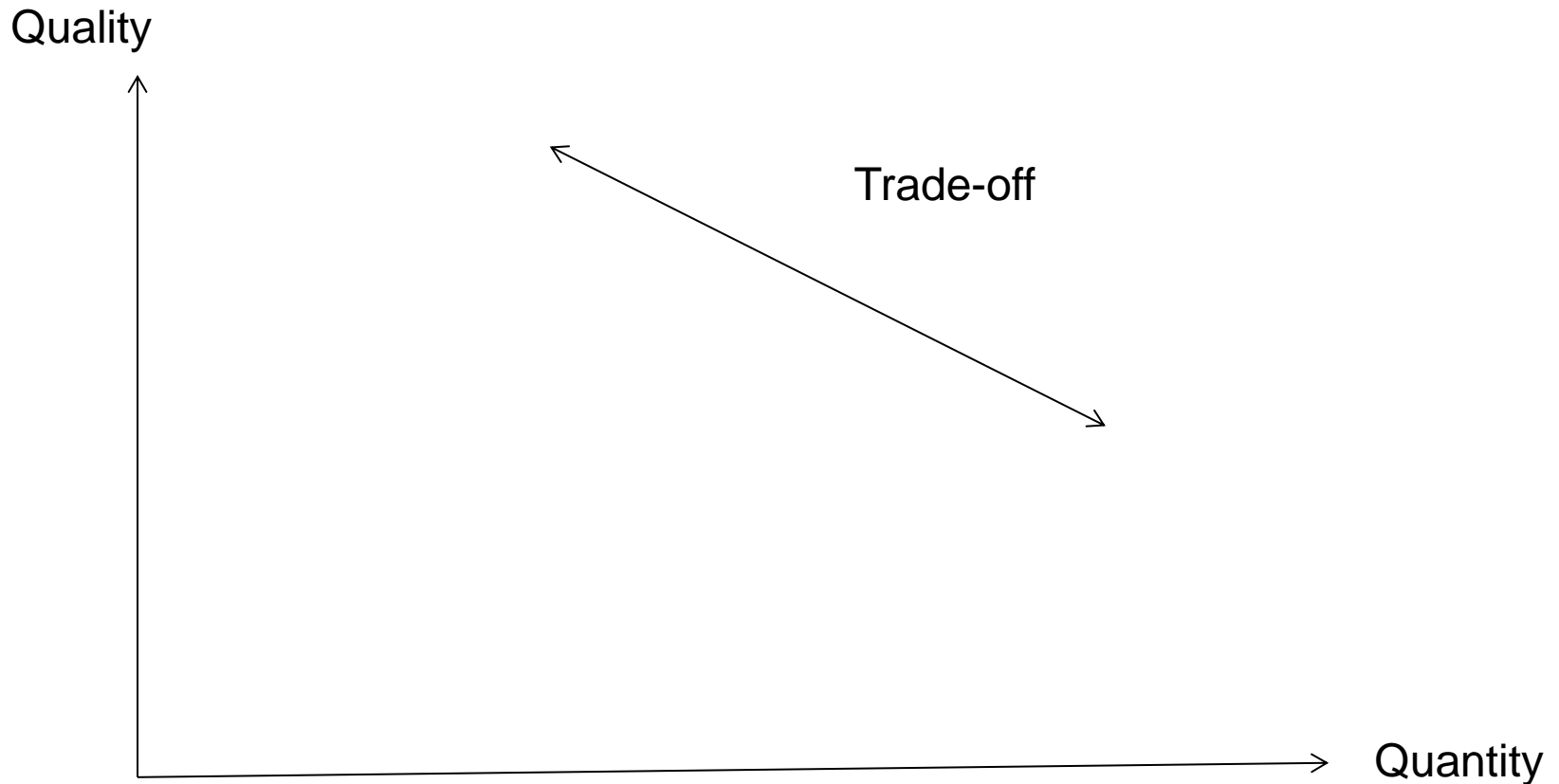
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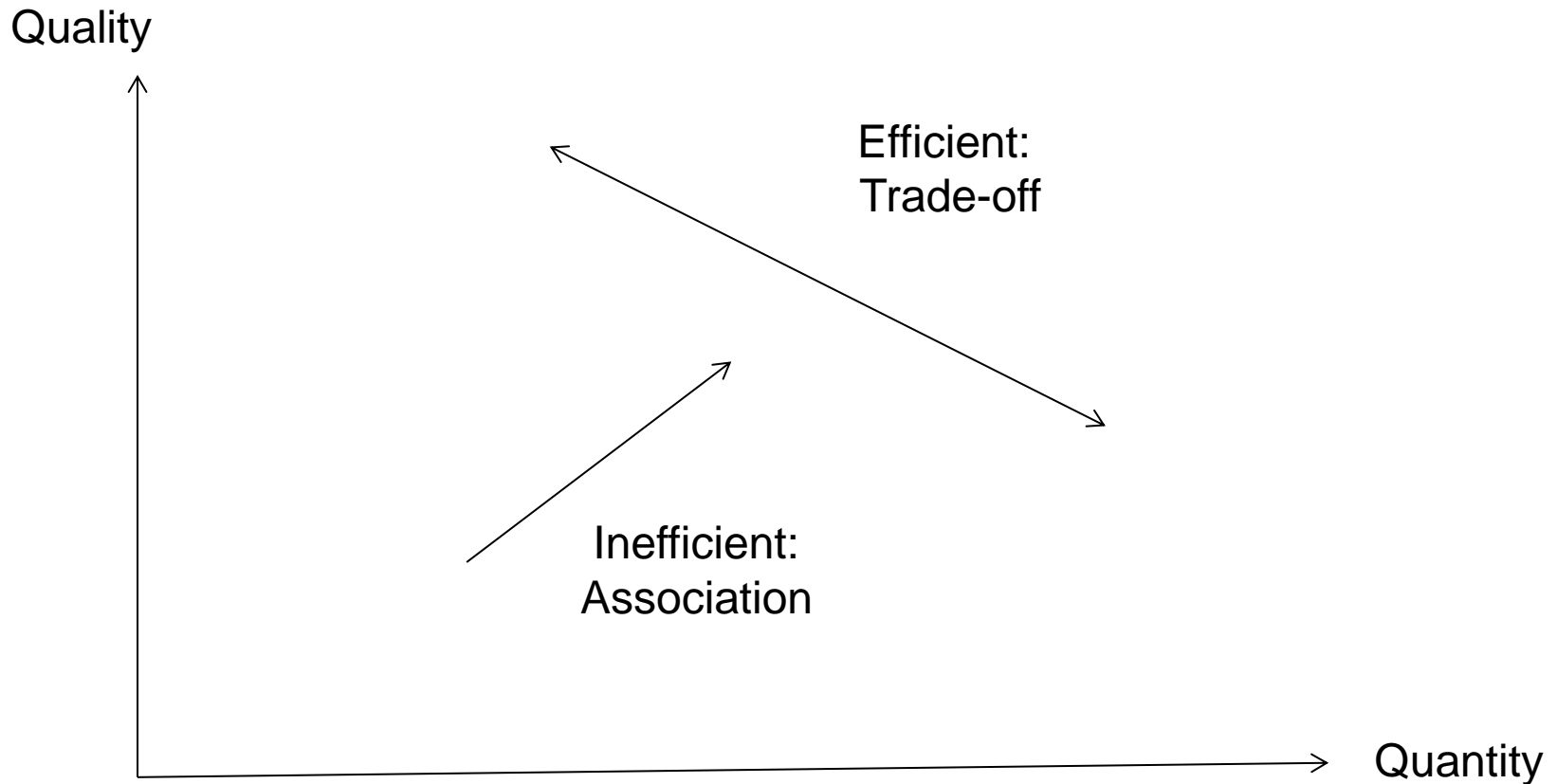
Motivation

- NHCSG (Nordic Hospital Comparison Study Group)
- Previous work shows considerable differences in hospital productivity,
 - within countries and
 - between countries.
- Can this be related to quality?
- Are best performing hospitals good at quality and costs?
 - Or, is there a trade-off between costs and quality
- EuroHOPE:
 - European Hospital Outcomes Performance and Efficiency
 - 5 diagnosis-specific work packages
 - This work package: hospital-level

For a given level of resource use:



For a given level of resource use:



EuroHOPE.WP 8: Cost and quality at the hospital level

■ Objectives

- To develop measures of patient-level indicators of the quality at the hospital level, based on patient register.
- To extend performance measurement methods to multi-level analysis of patient-level quality indicators and hospital level activity and cost data.
- To use such methods on Nordic data to show to what extent the multi-level analysis modifies the performance results and makes it possible to estimate the cost of quality.

■ Unlike the other EuroHOPE studies

- Need quality variables applicable to all or many patients across all diagnoses in each hospital
- Comparable outputs (patient classification systems – Diagnosis related groups) only in Nordic countries
- No individual patient costs, only hospital level operating costs

Discarded quality indicators

- **Amenable/Avoidable deaths**
- **Workforce participations**
- **Patient satisfaction**
- **Single rooms**
- **Corridor patients**
- **Hospital infections**
- **Discharge summary availability**
- **Dischargable patients**
- **Waiting time**
- **In-hospital waiting for procedures**

Quality indicators still included

- **Readmissions**
 - Emergency within 30 days (Not sweden)**
 - Inpatients within 30 days**
- **Mortality (not just in hospital)**
 - 30 days**
 - 90 days**
 - 180 days**
 - 365 days**
- **Patient safety indicators:**

PSI12_vt_pe	Pulmonary embolism/Deep vein thrombosis
PSI13_Sepsis	Sepsis
PSI15_AccidCutPunc	Accidental cut, puncture, or haemorrhage during medical care
PSI18_ObstTrauma	Obstetric trauma
BedSores	Bed-sores

Descriptives (raw rates):

Variable	Denmark	Finland	Norway	Sweden	All	
	Mean	Mean	Mean	Mean	Mean	Std. Dev
Number of observed discharges	15 753 686	12 395 963	11 124 765	18 884 433	58 158 847	
Quality indicators						
Readm30_Emergency ^a	4.76 %	5.52 %	6.96 %		5.62 %	23.04 %
Readm30_Inpatient	4.95 %	12.67 %	13.84 %	9.99 %	9.93 %	29.91 %
Mort30_LastAdmittance	0.44 %	0.34 %	0.41 %	0.51 %	0.43 %	6.58 %
Mort90_LastAdmittance	0.54 %	0.43 %	0.53 %	0.68 %	0.56 %	7.47 %
Mort180_LastAdmittance	0.61 %	0.46 %	0.62 %	0.79 %	0.64 %	7.96 %
Mort365_LastAdmittance	0.72 %	0.49 %	0.74 %	0.96 %	0.75 %	8.66 %
PSI12_vt_pe	0.123 %	0.053 %	0.090 %	0.104 %	0.096 %	3.119 %
PSI13_Sepsis	0.076 %	0.044 %	0.078 %	0.077 %	0.070 %	2.667 %
PSI15_AccidCutPunc	0.005 %	0.005 %	0.024 %	0.014 %	0.012 %	1.083 %
PSI18_ObstTrauma	0.028 %	0.007 %	0.021 %	0.035 %	0.024 %	1.558 %
BedSores	0.015 %	0.005 %	0.031 %	0.028 %	0.020 %	1.434 %

Case-mix adjusted performance measure

- Actual divided by norm (indirect standardisation):
 - Observed indicator (e.g. number of deaths), divided by
 - Norm or predicted indicator

- Prediction given patient case mix specified by
 - DRG-grouping
 - Age, gender
 - Transfers to/from hospital, length of stay, comorbidity
 - Socioeconomic characteristics of resident municipality
 - Travelling time
 - Estimated by DRG-specific logit regressions

Productivity and trade-off

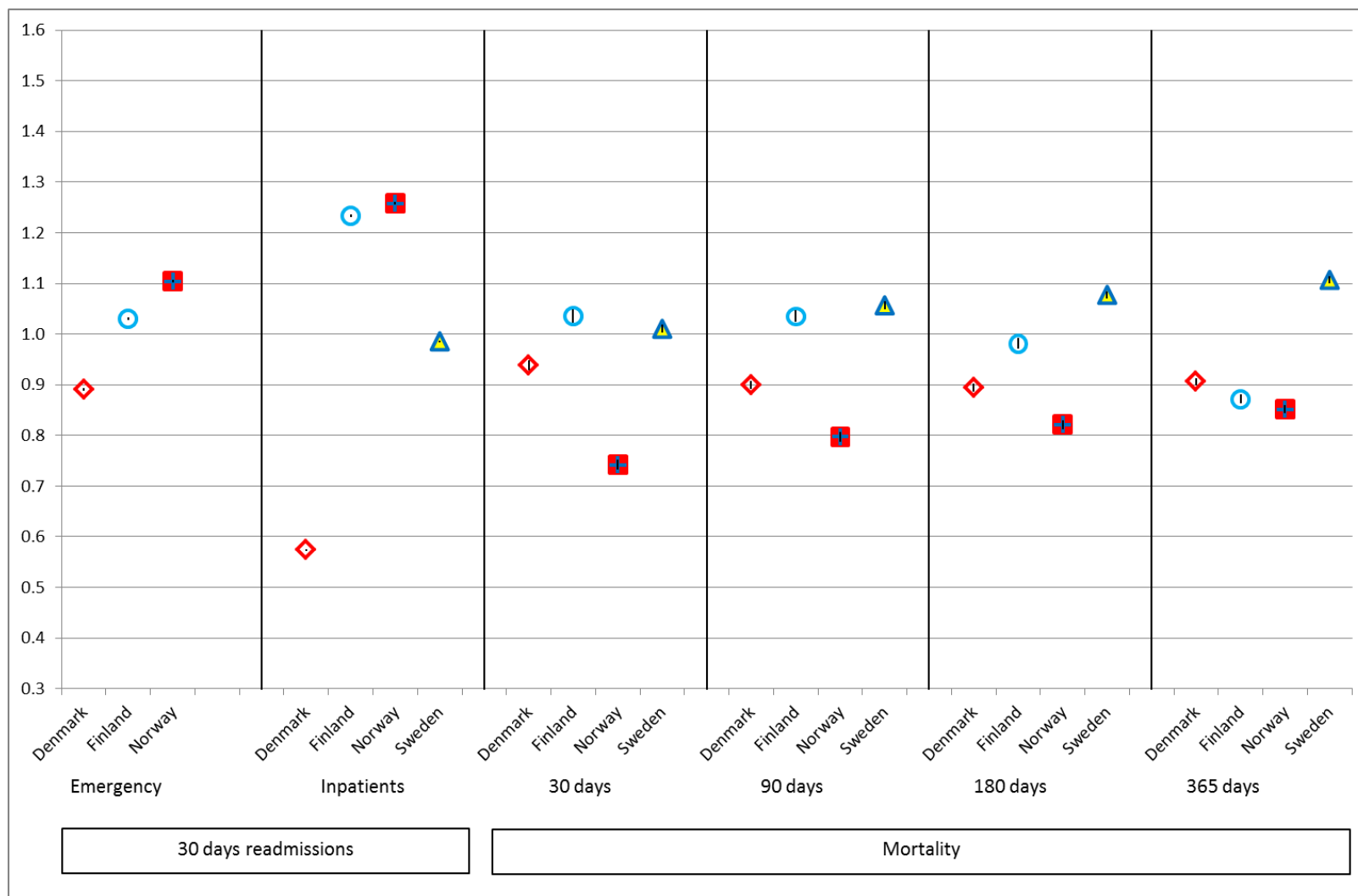
- Productivity estimated with Data Envelopment Analysis (DEA)
 - Bootstrapped to get bias-correction and confidence intervals
 - 1 input: Cost-level adjusted real operating costs
 - 3 outputs: DRG-points for
 - Medical inpatients
 - Surgical inpatients
 - Outpatients
- Trade-off in random effects regression
 - Dependent variable: Estimated productivity
 - Explanatory variables: Case-mix adjusted performance measures
 - Control variables: Hospital characteristics, country dummies

R-squared for case-mix adjustment of quality indicators

Model	0	1	2	3	4
Cummulative included variables	DRGs	Patient characteristics	Treatment variables	Municipal variables	Travel time
Readm30_Emergency	5 %	5 %	7 %	8 %	8 %
Readm30_Inpatient	7 %	8 %	10 %	13 %	13 %
Mort30_LastAdmittance	8 %	10 %	13 %	14 %	14 %
Mort90_LastAdmittance	8 %	11 %	13 %	14 %	14 %
Mort180_LastAdmittance	8 %	10 %	13 %	13 %	13 %
Mort365_LastAdmittance	7 %	10 %	12 %	13 %	13 %
PSI12_vt_pe	1 %	1 %	1 %	2 %	2 %
PSI13_Sepsis	2 %	3 %	6 %	7 %	8 %
PSI15_AccidCutPunc	1 %	2 %	4 %	6 %	7 %
PSI18_ObstTrauma	9 %	9 %	10 %	10 %	10 %
BedSores	0 %	1 %	2 %	4 %	4 %

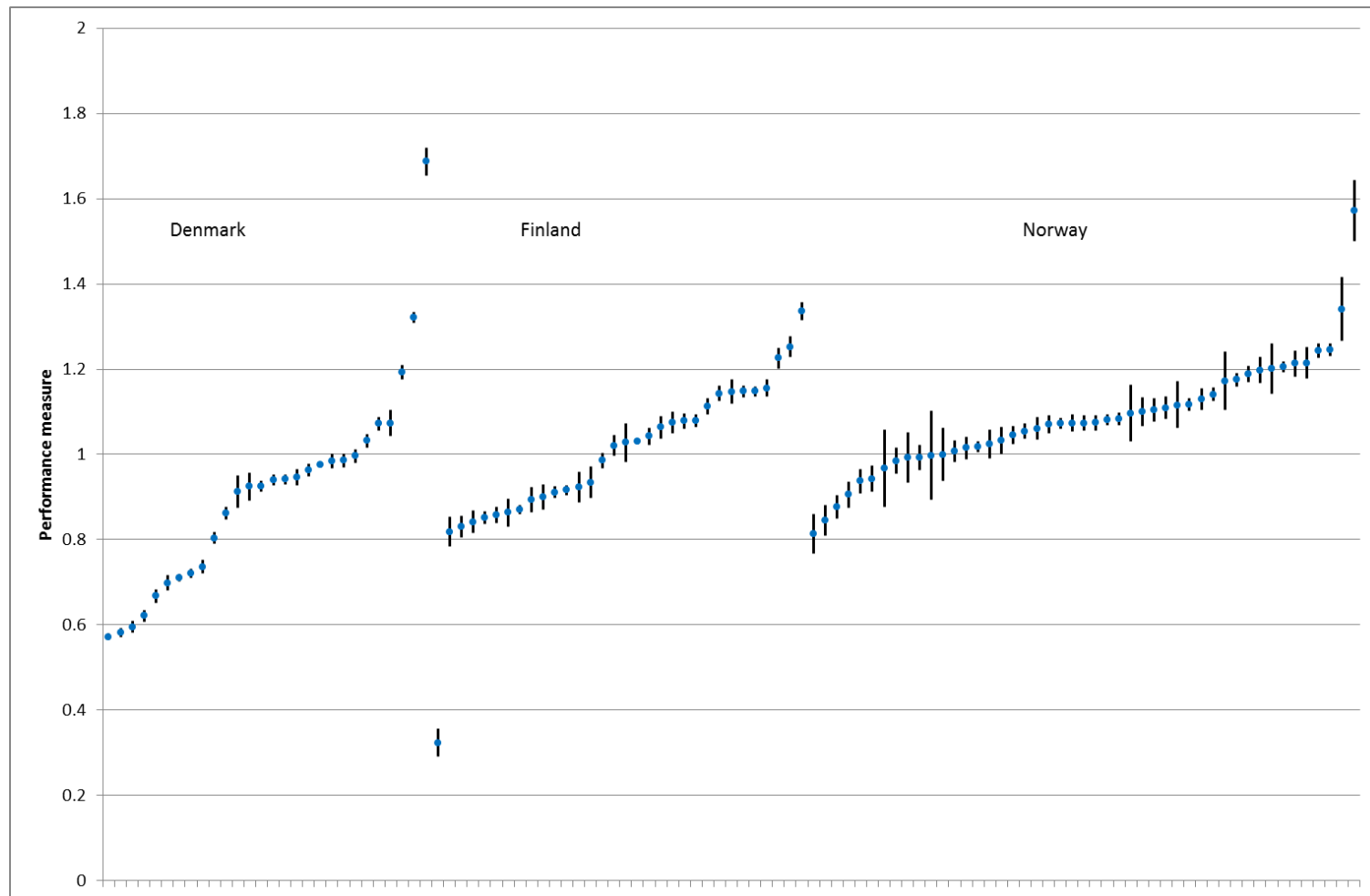


Case-mix adjusted performance measures. Country means and 99% Confidence intervals



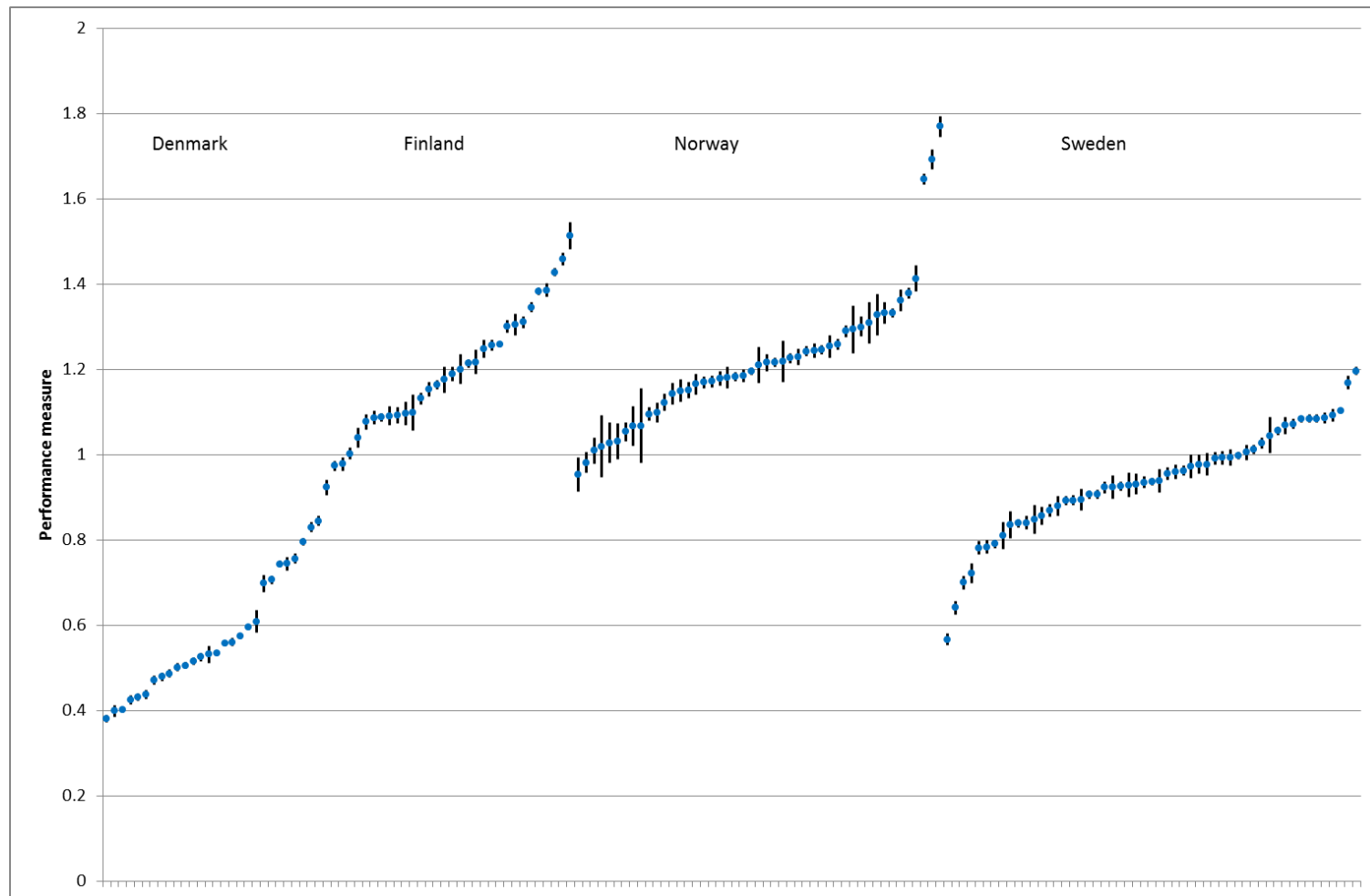
Hospital case-mix adjusted performance measures for emergency readmissions within 30 days.

Hospital means and 99% Confidence intervals



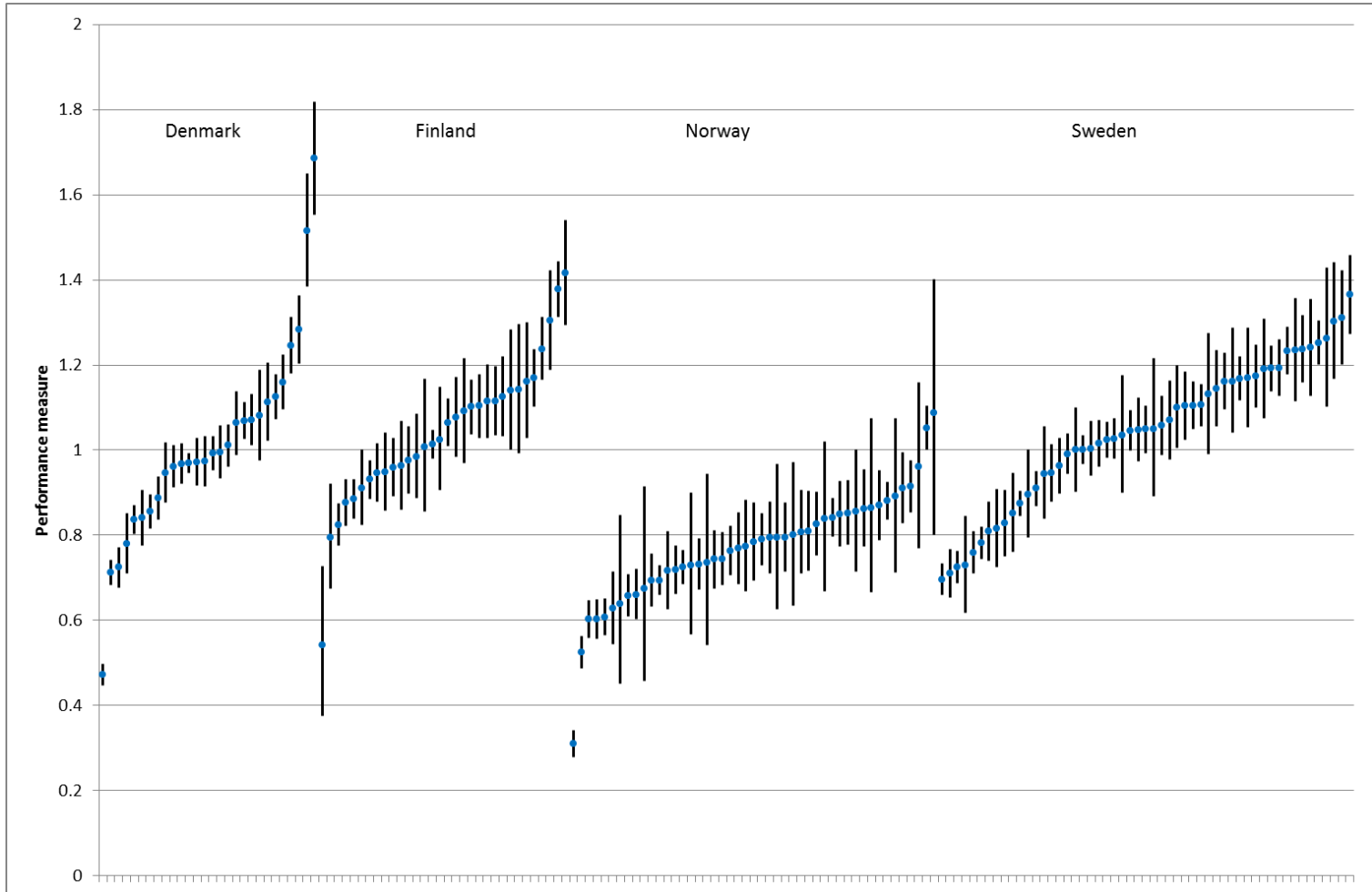
Hospital case-mix adjusted performance measures for inpatient readmissions within 30 days.

Hospital means and 99% Confidence intervals

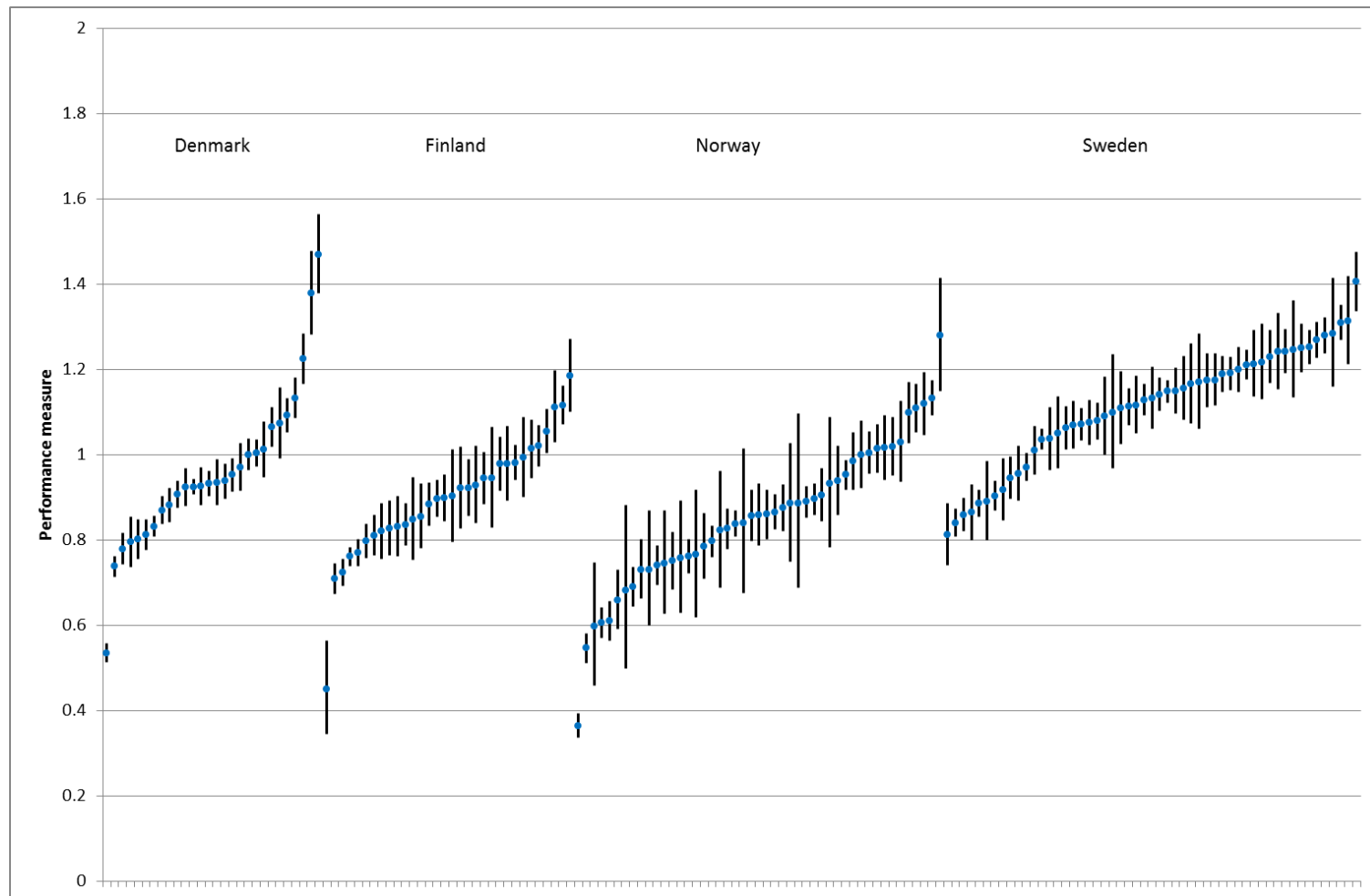




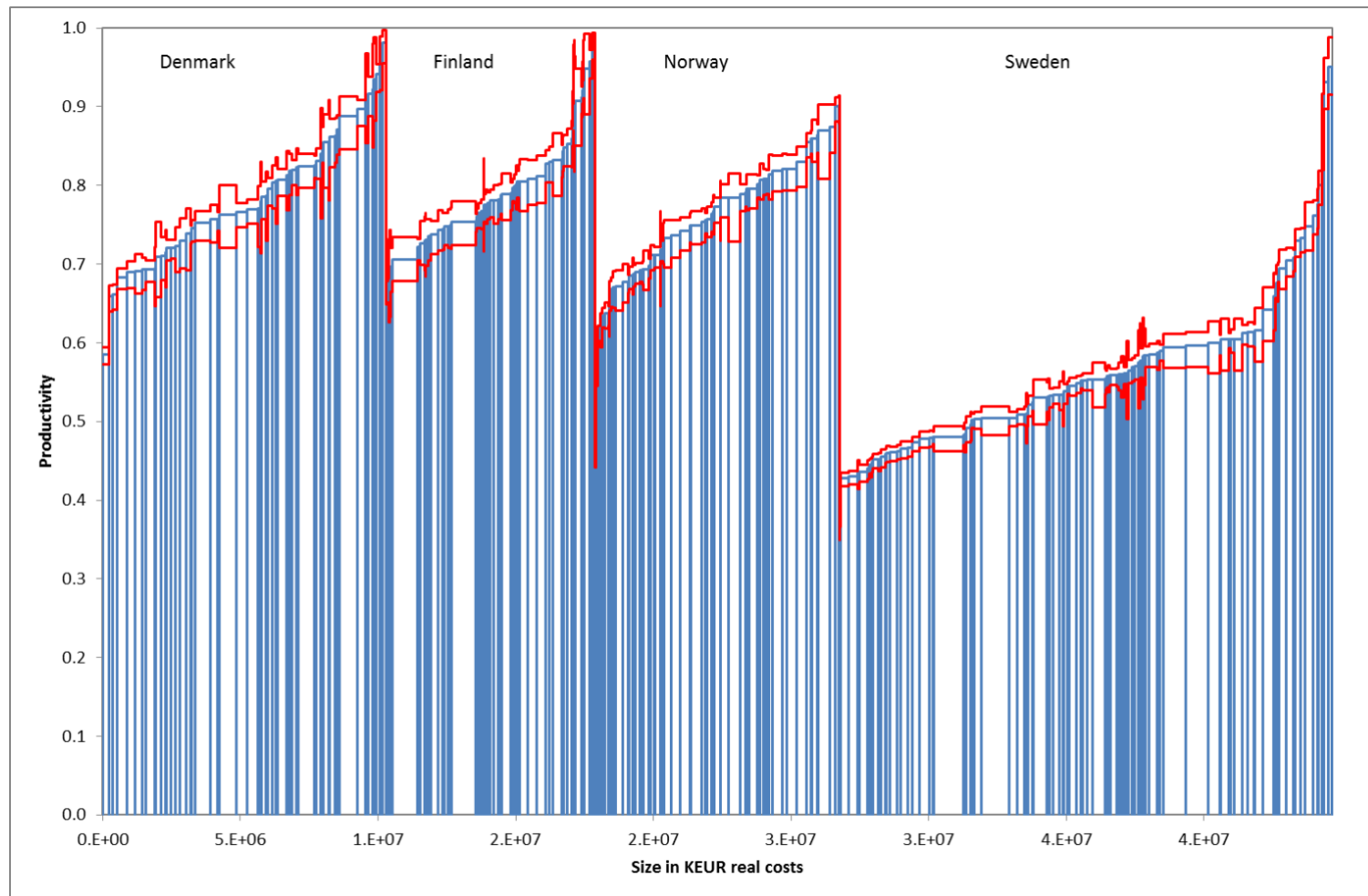
Hospital case-mix adjusted performance measures for mortality within 30 days of last hospital admission. Hospital means and 99% Confidence intervals



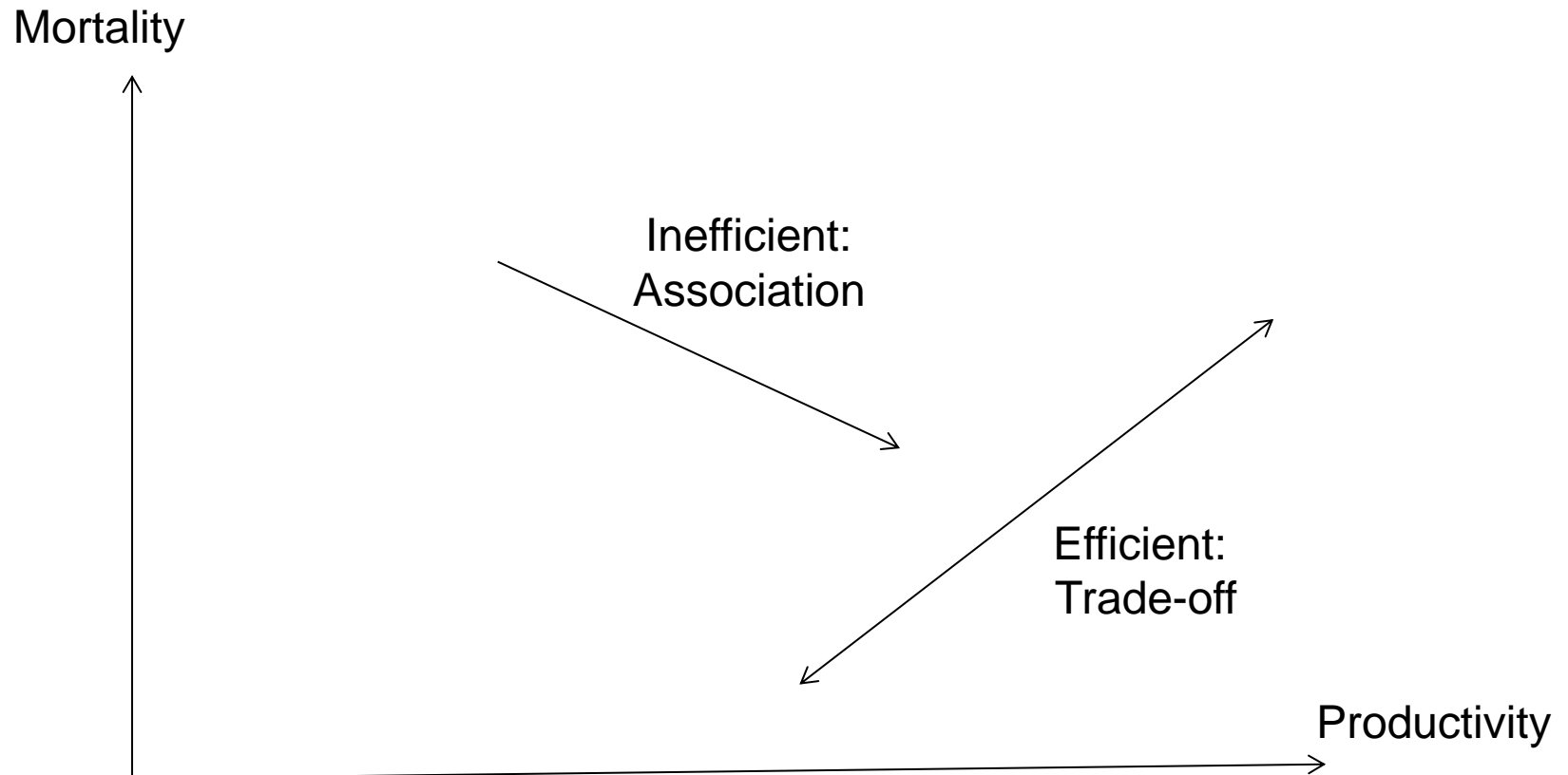
Hospital case-mix adjusted performance measures for mortality within 365 days of last hospital admission. Hospital means and 99% Confidence intervals



Salter diagram of bootstrapped DEA hospital productivity estimates sorted by country with 95% confidence intervals.

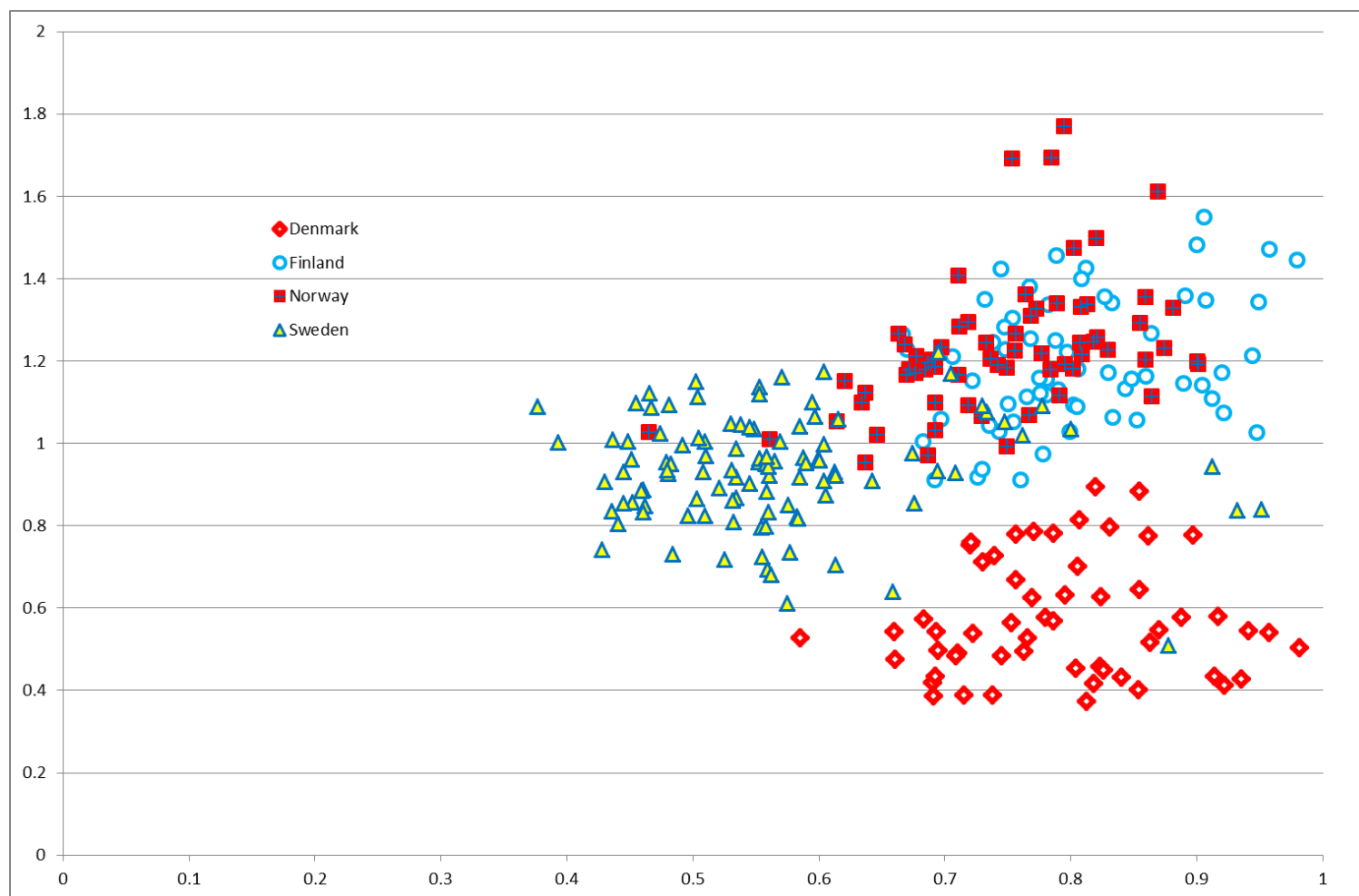


For a given output (DRG-production):



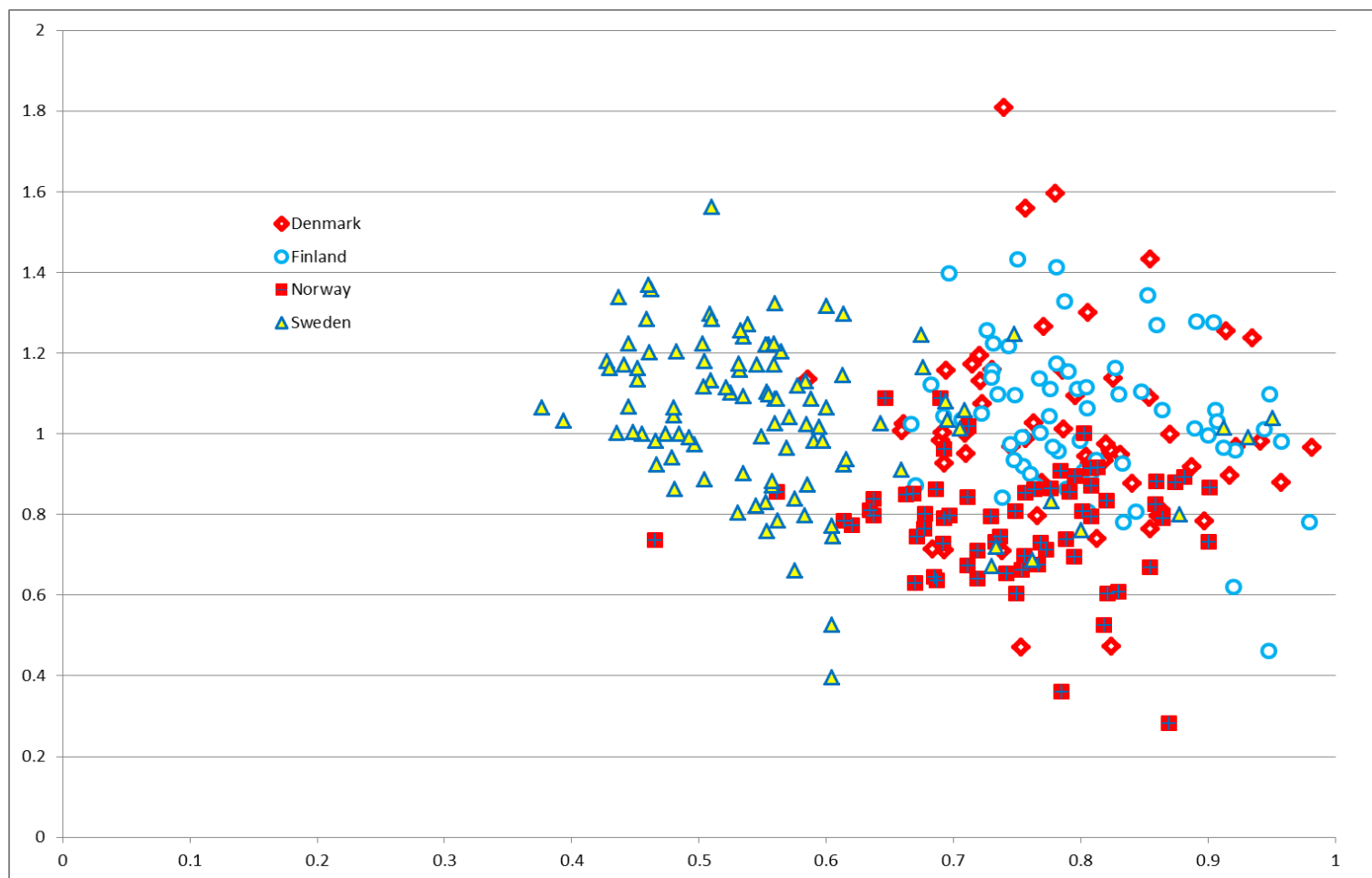


Hospital productivity estimates (horizontal axis) plotted against hospital performance measures for inpatient readmissions within 30 days (vertical axis).



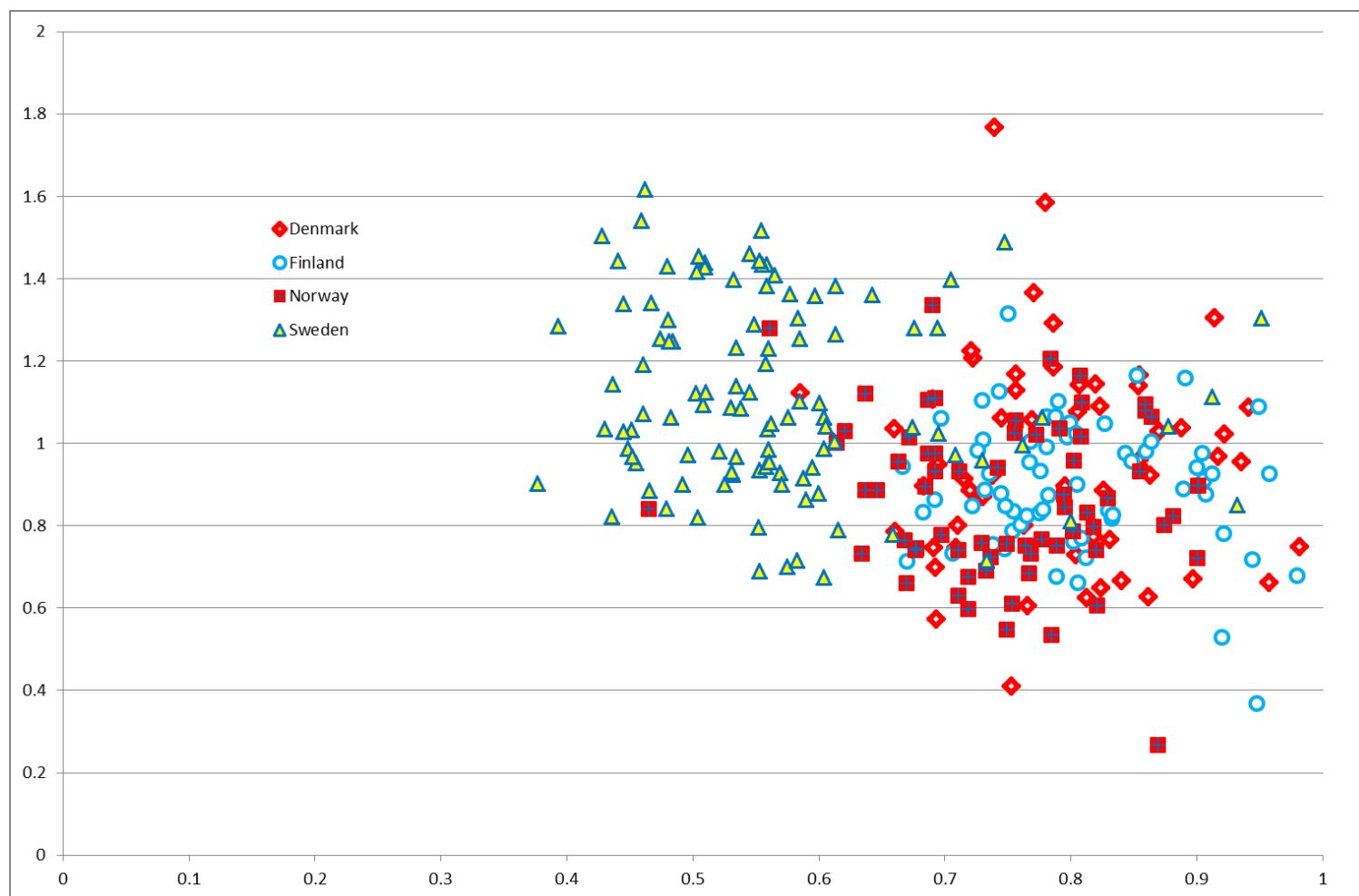


Hospital productivity estimates (horizontal axis) plotted against hospital performance measures for mortality within 30 days of last admittance (vertical axis).





Hospital productivity estimates (horizontal axis) plotted against hospital performance measures for mortality within 365 days of last admittance (vertical axis).



Productivity-performance correlations and trade-off regressions (GLS random hospital effects models)

	Pairwise correlations with estimated productivity	Linear regression on dependent variable estimated productivity					
		I. All countries	II. Without Sweden	III. Denmark	IV. Finland	V. Norway	VI. Sweden
Constant		0.934 *** (0.092)	0.944 *** (0.102)	1.281 *** (0.335)	0.852 *** (0.159)	0.693 *** (0.158)	0.743 *** (0.192)
Performance measures							
Readm30_Emergency	0.674 ***		-0.002 (0.038)	0.107 (0.083)	-0.142 ** (0.066)	0.044 (0.065)	
Readm30_Inpatient	0.123 **	0.069 * (0.040)	0.130 *** (0.043)	0.027 (0.121)	0.196 *** (0.076)	0.144 ** (0.072)	-0.086 (0.097)
Mort30_LastDischarge	-0.229 ***	-0.107 *** (0.028)	-0.142 *** (0.036)	-0.288 *** (0.079)	-0.067 (0.057)	-0.096 (0.086)	-0.036 (0.047)
Hospital variables.....							
Hospital average of municipal variables.....							
Travelttime	-0.079	-0.064 *** (0.025)	-0.073 *** (0.023)	0.096 (0.209)	-0.058 (0.092)	-0.055 ** (0.025)	-0.057 (0.087)
Country dummies							
Denmark		-0.012 (0.062)	0.057 (0.067)				
Norway		-0.070 (0.044)	-0.057 (0.047)				
Sweden		-0.213 *** (0.035)					
R-squared							
Within		0.046	0.191	0.480	0.059	0.263	0.034
Between		0.604	0.348	0.125	0.519	0.443	0.297
Overall		0.613	0.283	0.151	0.476	0.400	0.279
Number of observations		292	186	56	64	66	106

