



A health warning about health production and modelling the socioeconomic determinants of health across countries

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Or...



Introduction (1)

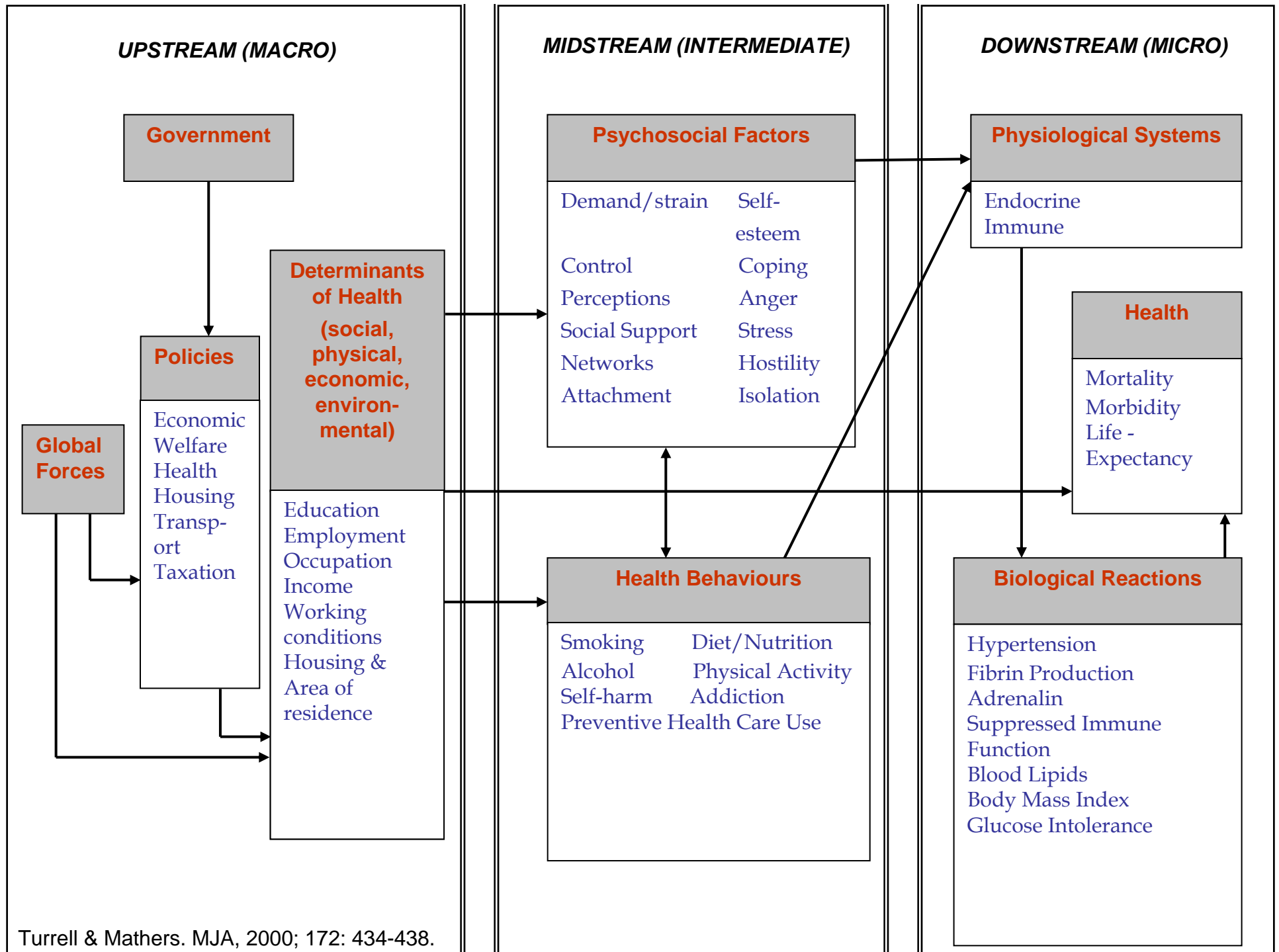
- **Production of health**
 - multifactorial, complex
- **Socio-economic determinants of health in cross country analysis**
 - data, techniques
- **Policy information**
 - potential?

Introduction (2)

- **Causal pathways between determinants and health outcomes**
- **Life expectancy linked to health spending?**
- **Lifestyle, social class etc better explanatory factors of health differentials?**
- **Policy mix and efficient production of health**

Introduction (3)

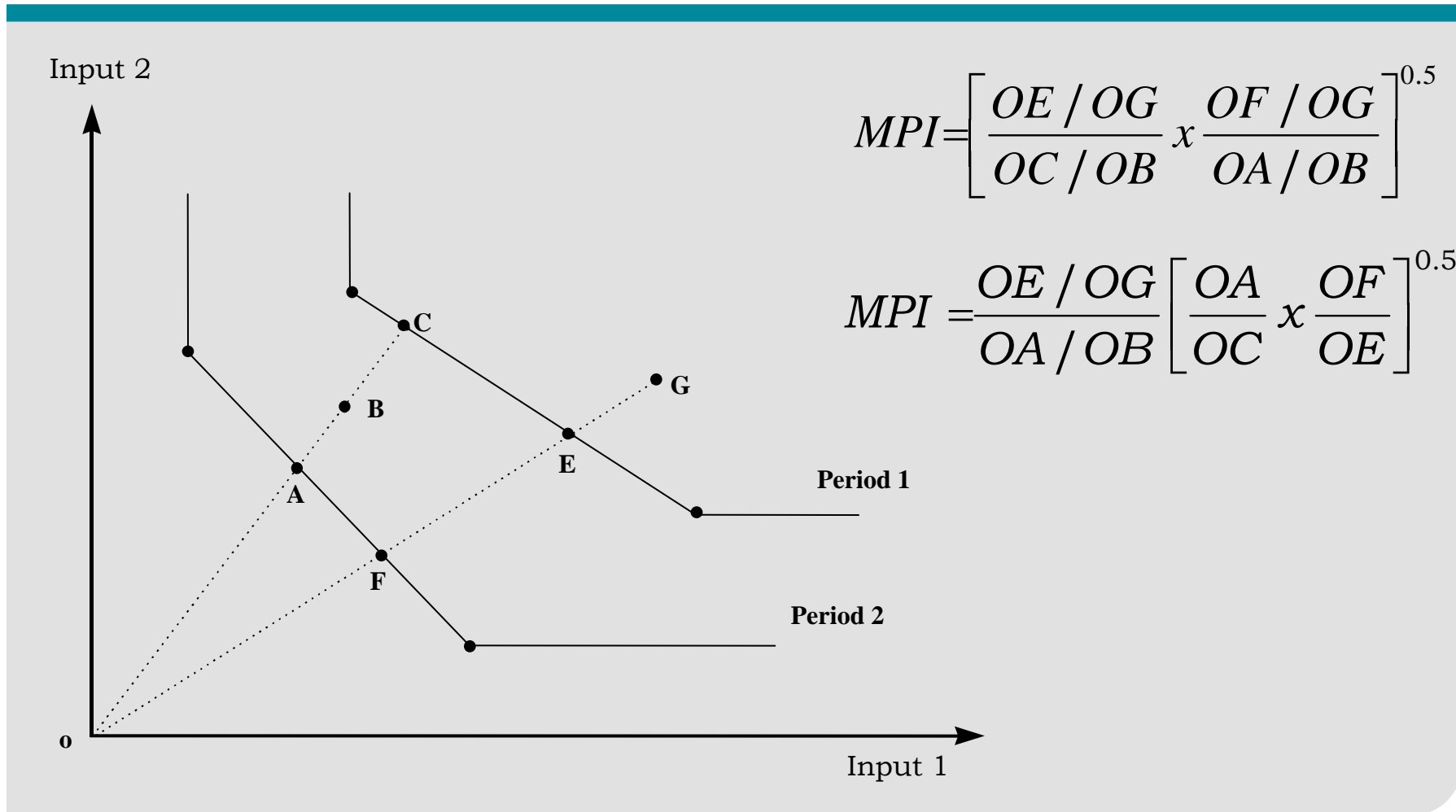
- **Technical efficiency**
 - Identification of inputs and outputs
 - Conceptual framework to guide choice of variables



Introduction (5)

- **Technical efficiency**
 - Identification of inputs and outputs
 - Conceptual framework to guide choice of variables
- **Data, quality of life**

Methods – Malmquist Productivity Indices



Data and variables

<i>INPUTS</i>	<i>OUTPUTS</i>
OECD Dataset	
gross domestic product (GDP) per capita; school expectancy; total unemployment rate; total health expenditure per capita	life expectancy
WHO Dataset	
gross domestic product (GDP) per capita; schooling (average in adult population); total unemployment rate; total health expenditure per capita	disability adjusted life years (DALE)

Variables – summary statistics *OECD*

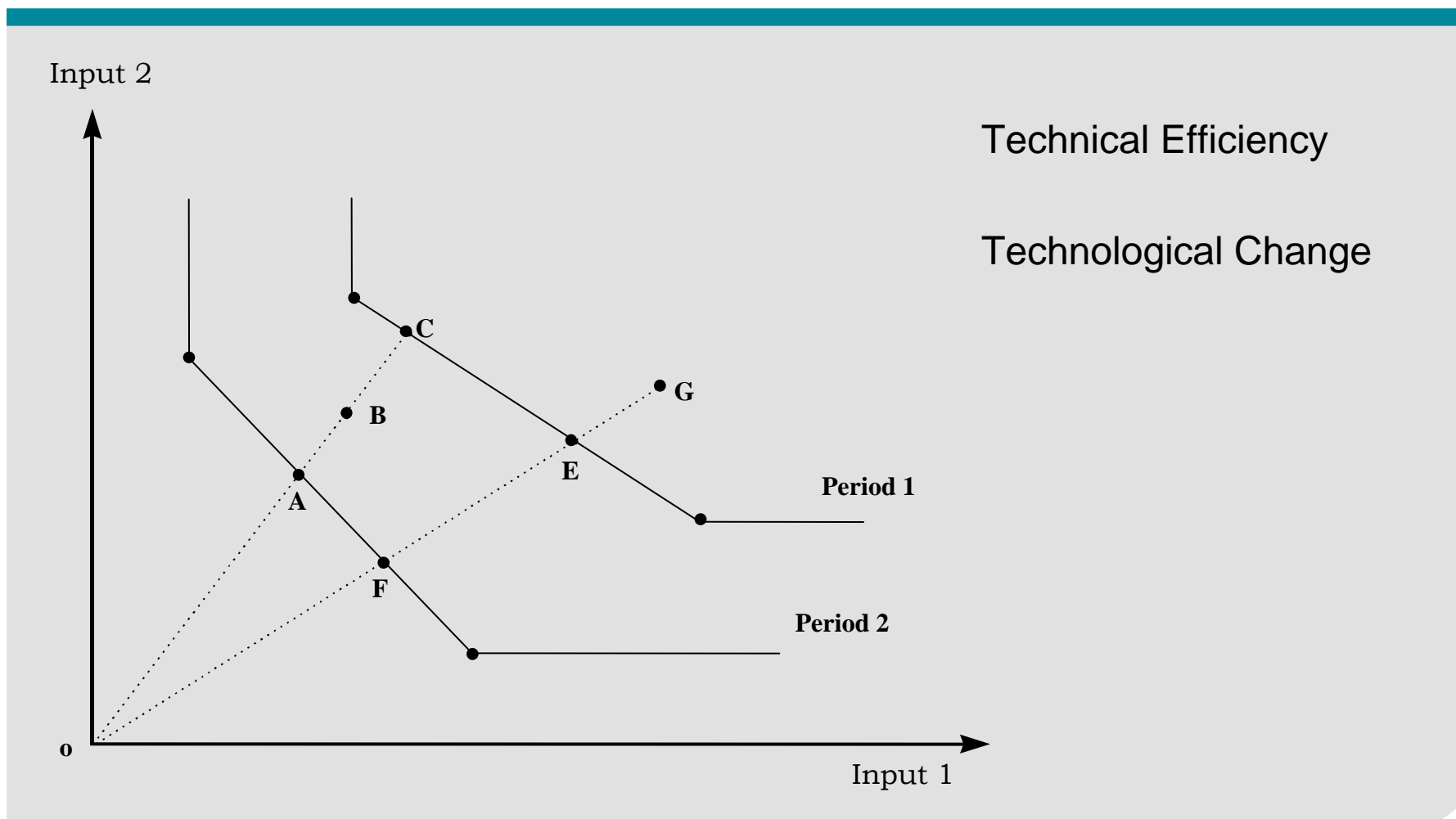
Variable	Year	Units	Mean	St. Dev.
Life expectancy	1995	years	76.00	2.85
	2000		77.30	2.77
Gross domestic product (GDP) per capita	1995	US\$, PPP	18,114	6,019
	2000		22,833	7,566
School expectancy	1995	years	15.15	1.67
	2000		16.74	2.07
Total unemployment rate	1995	% labour	8.22	4.39
	2000	force	6.46	3.47
Total health expenditure per capita	1995	US\$, PPP	1503	733
	2000		1923	886

Variables – summary statistics *WHO*

Variable	Year	Units	Mean	St. Dev.
disability adjusted life years (DALE)	1993	years	69.48	3.23
	1997		70.35	3.03
gross domestic product per capita	1993	US\$, PPP	16,506	5,585
	1997		19,905	6,479
Schooling (average in adult pop.)	1993	years	8.78	1.67
	1997		8.98	1.56
total unemployment rate	1993	% labour force	8.69	4.00
	1997		7.59	3.38
total health expenditure per capita	1993	1997	1,377	722
	1997	International \$	1,512	765



Methods – *Malmquist Productivity Indices*



	OECD '95-'00			WHO '93-97		
	TE change	Technol. change	Total change	TE change	Technol. change	Total change
Australia	0.832	1.048	0.872	1.123	0.982	1.103
Czech Republic	0.787	1.042	0.820	1.001	0.949	0.949
Denmark	0.954	1.062	1.013	1.291	0.958	1.237
Finland	0.944	0.974	0.920	1.058	1.042	1.102
France	1.054	0.978	1.031	0.926	1.047	0.969
Germany	0.951	1.027	0.977	0.947	0.977	0.925
Greece	0.890	0.969	0.863	0.940	1.036	0.973
Iceland	1.126	1.028	1.158	1.113	0.948	1.055
Italy	1.084	0.948	1.028	0.891	1.062	0.946
Japan	0.889	1.083	0.963	1.000	0.873	0.873
Korea	0.780	1.022	0.797	1.000	0.985	0.985
Mexico	1.000	0.987	0.987	1.000	0.967	0.967
New Zealand	0.917	1.054	0.967	1.178	0.972	1.145
Norway	0.872	1.092	0.952	1.193	0.953	1.137
Poland	1.046	0.722	0.778	0.848	0.903	0.766
Portugal	0.982	1.063	1.044	0.921	0.985	0.907
Spain	1.001	0.933	0.934	1.039	0.936	0.973
Sweden	0.864	1.039	0.898	1.051	0.966	1.016
Switzerland	0.995	1.045	1.040	1.057	0.940	0.993
Turkey	1.000	0.647	0.647	1.000	0.975	0.975
United Kingdom	0.891	1.040	0.927	1.179	0.995	1.173
United States	0.940	1.074	1.010	1.177	0.945	1.113
<i>mean</i>	<i>0.961</i>	<i>0.995</i>	<i>0.956</i>	<i>1.041</i>	<i>0.974</i>	<i>1.014</i>

	OECD 1995-2000		WHO 1993-1997		
	<i>GDP per capita</i>	<i>Tech Effic. '95</i>	<i>Tech Effic. '00</i>	<i>Tech Effic. '93</i>	<i>Tech Effic. '97</i>
Turkey	5,471	1	1	1	1
Mexico	6,727	1	1	1	1
Poland	7,557	0.987	0.990	1	1
Korea	11,451	1	1	1	1
Czech Republic	12,015	0.980	0.984	0.997	1
Greece	13,182	1	1	1	1
Portugal	13,214	0.980	0.987	1	1
Spain	15,720	1	1	1	1
New Zealand	17,163	0.988	0.992	0.936	0.949
Finland	19,031	0.970	0.970	0.950	0.952
United Kingdom	19,998	0.971	0.966	0.969	0.986
Italy	20,652	0.986	0.985	1	1
Australia	21,079	0.982	0.977	0.967	0.966
France	21,283	0.981	0.973	1	1
Sweden	21,290	0.993	0.982	0.981	0.983
Germany	21,411	0.964	0.964	0.942	0.949
Iceland	22,040	0.981	1	0.964	0.971
Japan	22,396	1	1	1	1
Denmark	22,462	0.946	0.949	0.936	0.930
Norway	23,868	0.977	0.979	0.968	0.991
Switzerland	26,304	0.986	1	0.968	0.972
United States	27,559	0.951	0.951	0.941	0.940

	OECD 1995-2000		WHO 1993-97		
	<i>Health expen. per capita</i>	<i>Tech. Effic. '95</i>	<i>Tech. Effic. '00</i>	<i>Tech. Effic. '93</i>	<i>Tech. Effic. '97</i>
Turkey	184	1	1	1	1
Mexico	380	1	1	1	1
Poland	423	0.987	0.990	1	1
Korea	500	1	1	1	1
Czech Republic	876	0.980	0.984	0.997	1
Portugal	1,080	0.980	0.987	1	1
Spain	1,195	1	1	1	1
New Zealand	1,238	0.988	0.992	0.936	0.949
Greece	1,269	1	1	1	1
United Kingdom	1,393	0.971	0.966	0.969	0.986
Finland	1,428	0.970	0.970	0.950	0.952
Italy	1,524	0.986	0.985	1	1
Japan	1,530	1	1	1	1
Sweden	1,733	0.993	0.982	0.981	0.983
Australia	1,737	0.982	0.977	0.967	0.966
Denmark	1,843	0.946	0.949	0.936	0.930
Iceland	1,853	0.981	1	0.964	0.971
Norway	1,892	0.977	0.979	0.968	0.991
France	2,025	0.981	0.973	1	1
Germany	2,263	0.964	0.964	0.942	0.949
Switzerland	2,555	0.986	1	0.968	0.972
United States	3,655	0.951	0.951	0.941	0.940

Discussion (1)

- *In theory*, application of DEA techniques to determine optimal indicators of social policy holds promise
- *However*, methodological issues and underlying assumptions may make it *unsuitable at this time to inform policy makers*
- **Why?**

Discussion (2)

- DEA is *data driven*
- It assumes an identified set of *inputs* are largely responsible for the production of given *outputs*
- This contrasts with the *high level of uncertainty* surrounding the *inputs* that produce health

Discussion (3)

- A number of methodological issues are highlighted by this research
- *DEA assumes that inputs and outputs are isotonic*, that is, increased input reduces efficiency, whilst increased output increases efficiency
- Methods for handling non isotonic data have been proposed - invert the non isotonic variable, subtract the value of the variable from a large number, or move the variable to the opposing side of the model
- But *no clear protocol exists*



Discussion (4)

- The use of *panel data* has clear advantages over the use of cross-sectional data
- Data were limited to five year time periods in this analysis due to missing data
- However, as the amount of complete data increases over time, the opportunity to produce more detailed results also increases

Discussion (5)

- The *OECD health dataset* provides one of the best cross-country sources of comparative data available, however...
- *Level of uncertainty* surrounding the sources and methods of data collection
- *Missing data* often limits analysis
- *Not all variables of interest are collected routinely*

Discussion (6)

- Another limitation in the OECD database (and other cross-country comparisons) at this time is *lack of an objective measure of quality of life* status
- Such a measure could be used as a second output for DEA purposes, providing a more proximal measure of the impact of social policy change
- Life expectancy measured from five years of age, rather than birth, would also be a useful measure

Conclusions (1)

- *It is unclear how applicable DEA is to determining the countries most efficiently producing health*
- Researching production of health using frontier methods is to be encouraged, *methods are not yet robust enough to translate into potential policy implications*
- The use of this analytical technique is emerging, with a number of questions of how best to use the technology still to be answered

Conclusions (2)

- As Smith and Street (2004) note, “somewhat arbitrary choices may have an undue bearing on the efficiency judgements for individual organisations”
- The real advantage of DEA based techniques is the ability to handle a *multiple input, multiple output model*
- If only one output used, it is difficult to argue beyond using econometric techniques, with DEA perhaps used more as an additional validity measure

So...is your enthusiasm curbed?



Working Paper 151

Spinks J & Hollingsworth B

*Health Production and the Socioeconomic Determinants
of Health in OECD Countries: the use of efficiency models*

