

Empirical well-being measurement

On composite indicators, life satisfaction,
and equivalent income

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Motivation

- Measuring well-being is a central issue in (social) policy making.
- Well-being is multidimensional (Stiglitz et al. 2009).
- Some questions:
 - Can we construct an (operational) multidimensional well-being measure?
 - Does the choice between the measures matter empirically?

Roadmap

Part 1. Measuring well-being on a crossroads

- Building blocks for a well-being measure
- Principles for a well-being measure
- An inconvenient result

Part 2. Three well-being measures

- Composite well-being index
- Life satisfaction
- Equivalent incomes

Part 3. Estimating trade-offs between dimensions

- Life satisfaction approach
- Discrete choice approach

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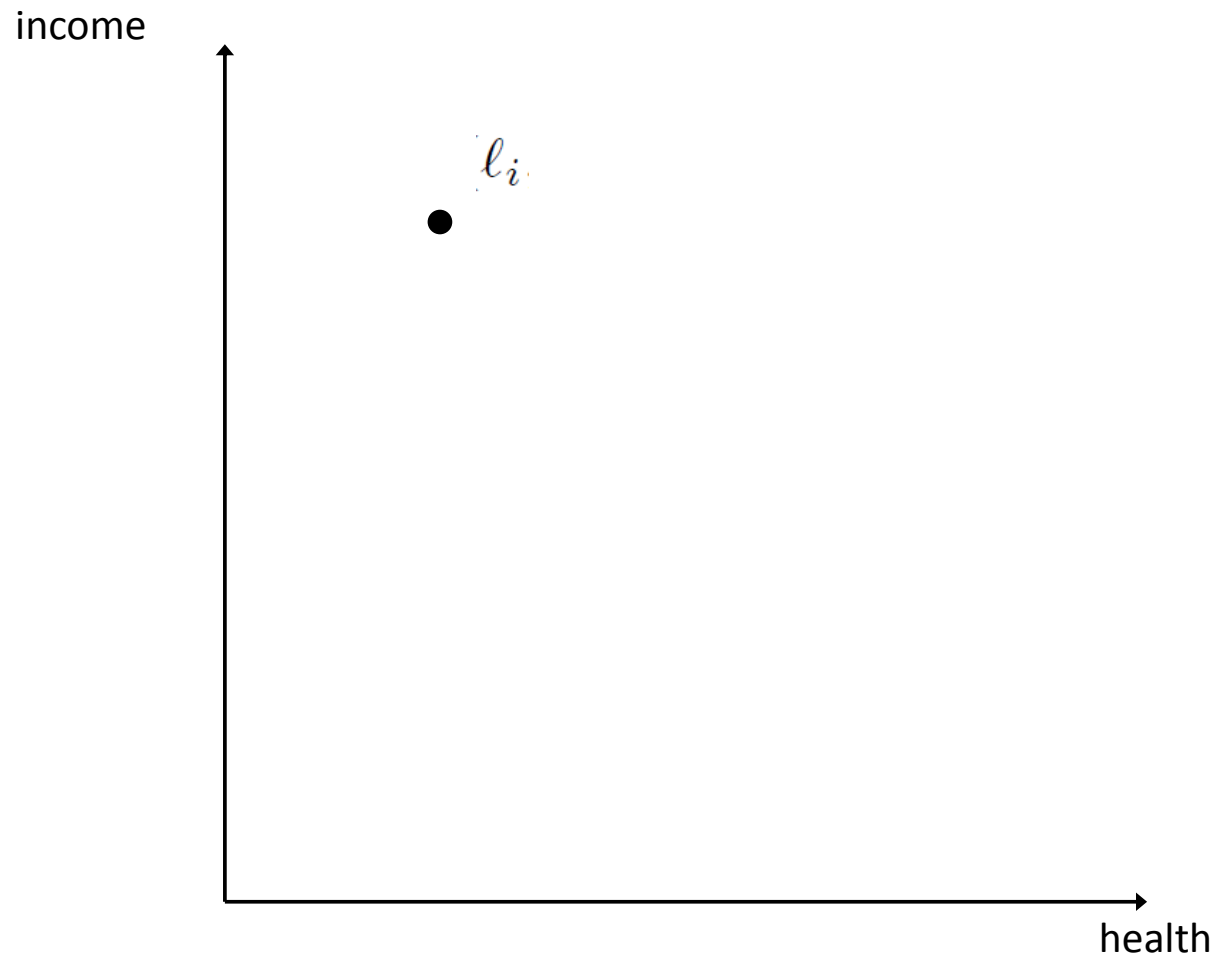
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- Life satisfaction approach
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Building blocks of a well-being measure

1. The outcome vector l_i

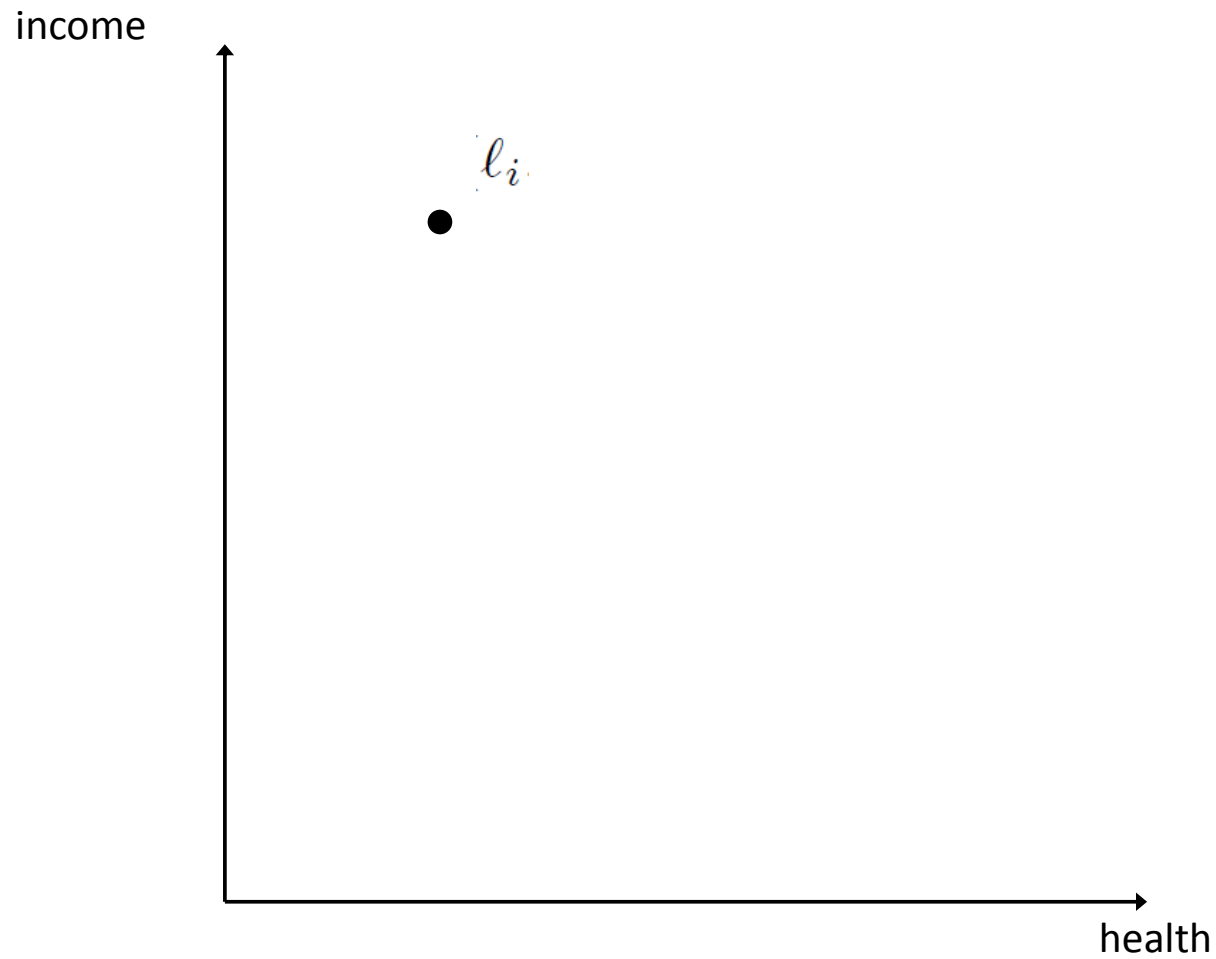
Building blocks of a well-being measure



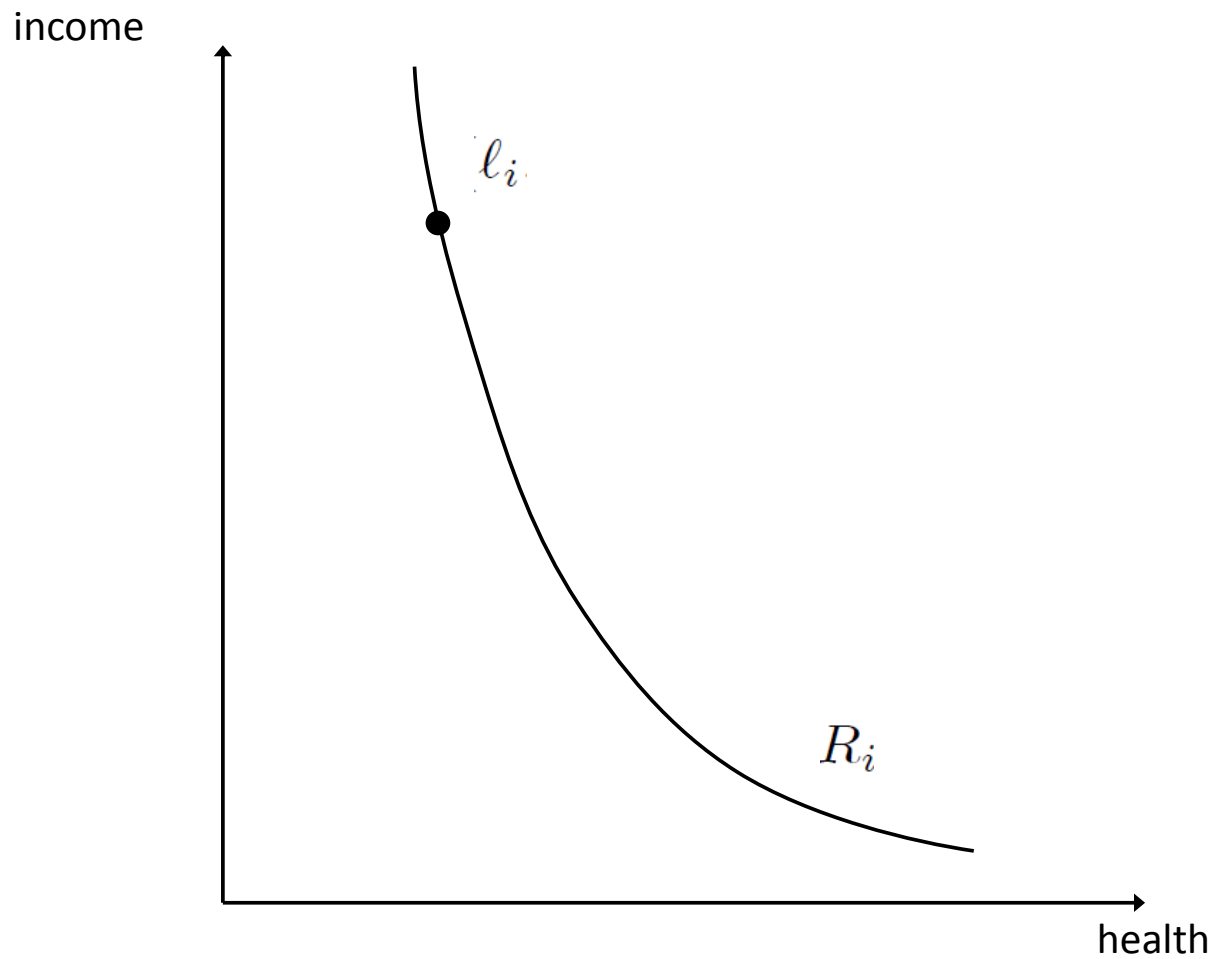
Building blocks of a well-being measure

1. The outcome vector l_i
2. Informed opinion on the good life R_i
(aka “preference ordering”)

Building blocks of a well-being measure



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Building blocks of a well-being measure

1. The outcome vector l_i
2. Informed opinion on the good life R_i
(aka “preference ordering”)
3. Satisfaction function S_i , (so that $s_i = S_i(l_i)$.)

B20 CARD 9 All things considered, how satisfied are you with your life as a whole nowadays? Please answer using this card, where 0 means extremely¹² dissatisfied and 10 means extremely satisfied.

**Extremely
dissatisfied**

**Extremely
satisfied**

**(Don't
Know)**

00 01 02 03 04 05 06 07 08 09 10 88

Building blocks of a well-being measure

1. The outcome vector l_i
2. Informed opinion on the good life R_i
(aka “preference ordering”)
3. Satisfaction function S_i , (so that $s_i = S_i(l_i)$.)

A well-being measure:

$$WB(l_i, R_i, S_i)$$

A first well-being measure (the non-starter)

- We split the outcome vector

$$l_i = (y_i, x_i)$$



“income”

non-income

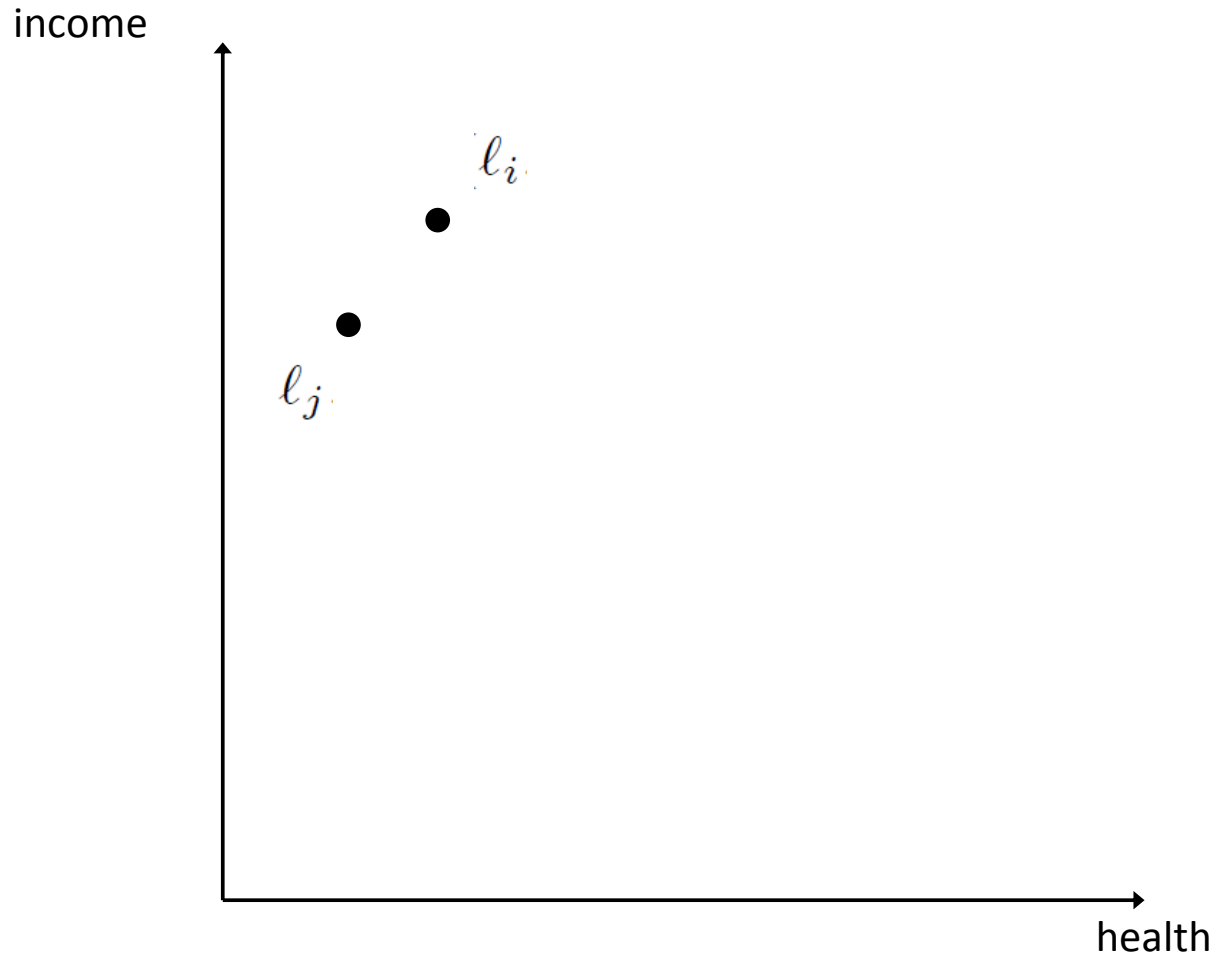
- Where $x_i = (x_i^1, \dots, x_i^m)$ is again a vector
- A first (familiar) well-being measure:

$$WB^1(l_i, R_i, S_i) = y_i.$$

- “Resource fetishism” (Sen, 1985).
- We need a multidimensional measure

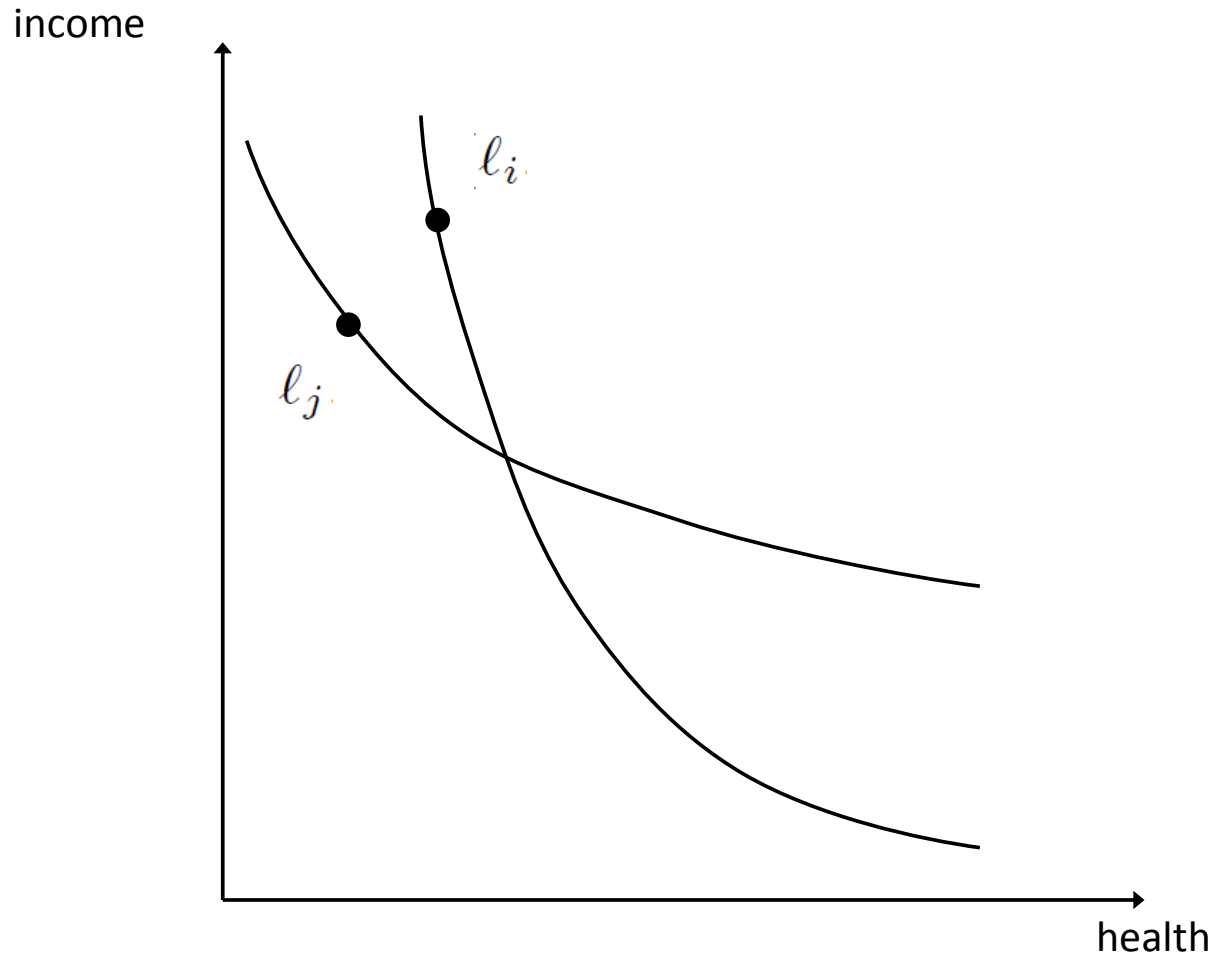
Principles for a well-being measure

Dominance Principle: If $l_i \gg l_j$, then $WB(l_i, R_i, S_i) > WB(l_j, R_j, S_j)$.



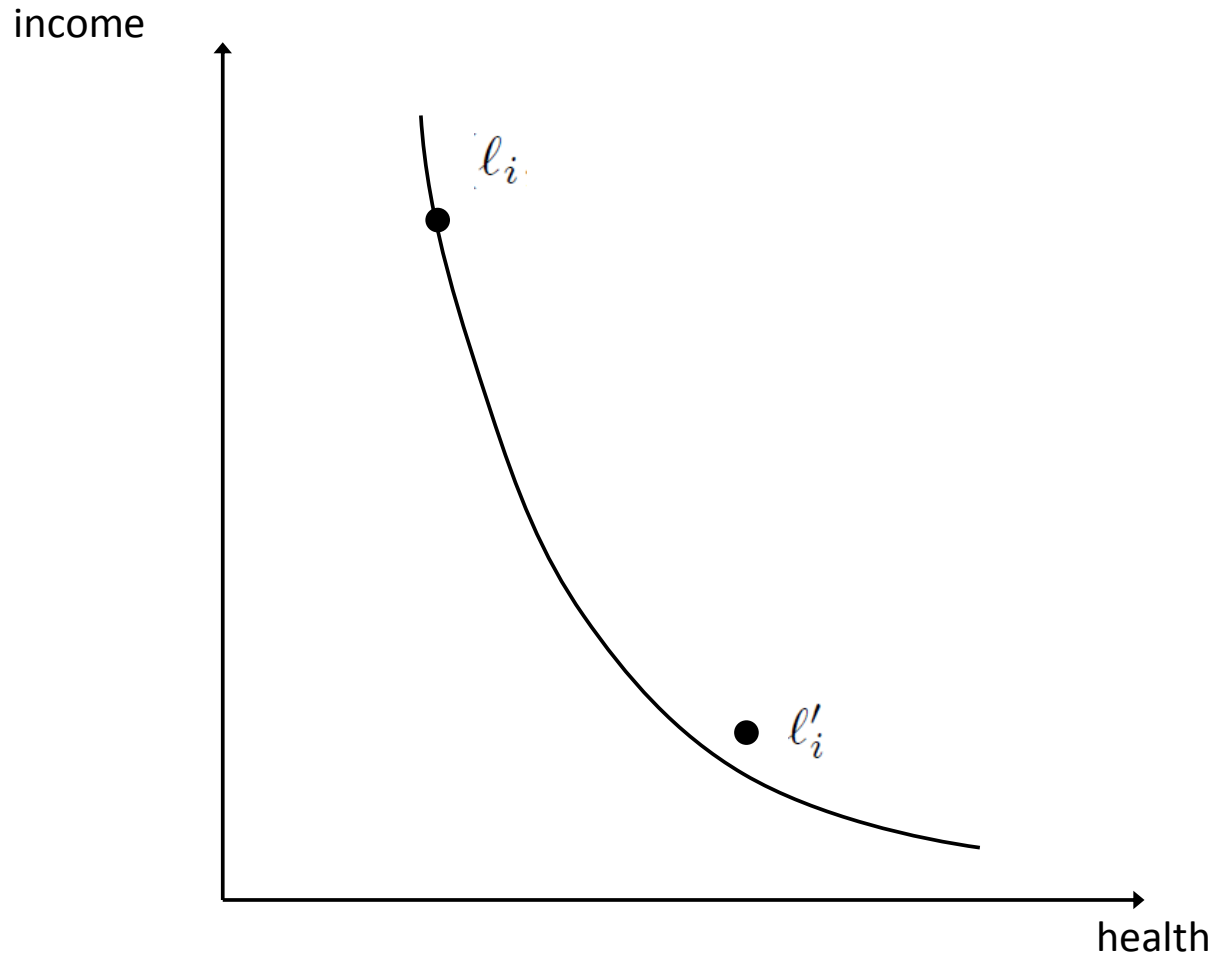
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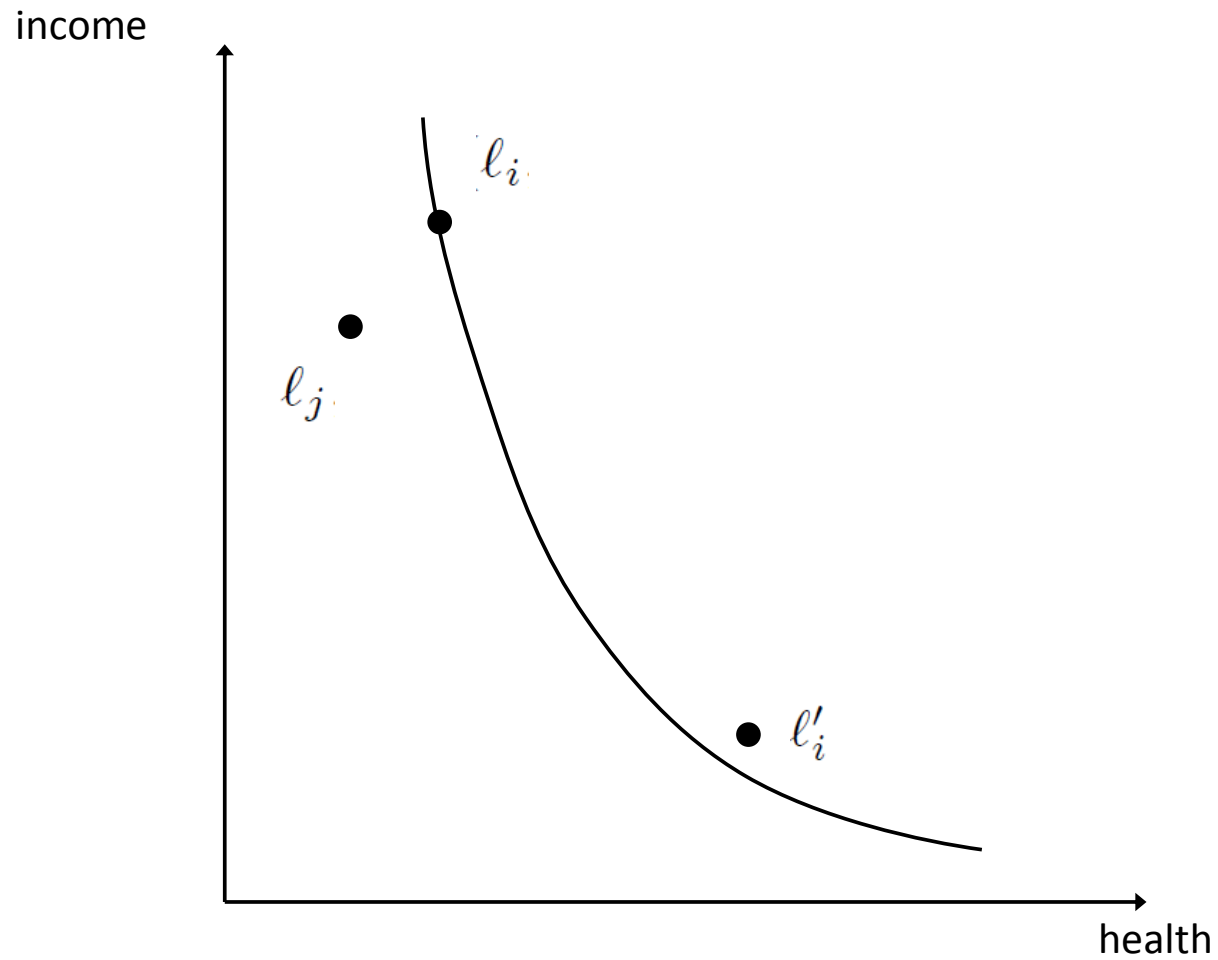


Principles for a well-being measure

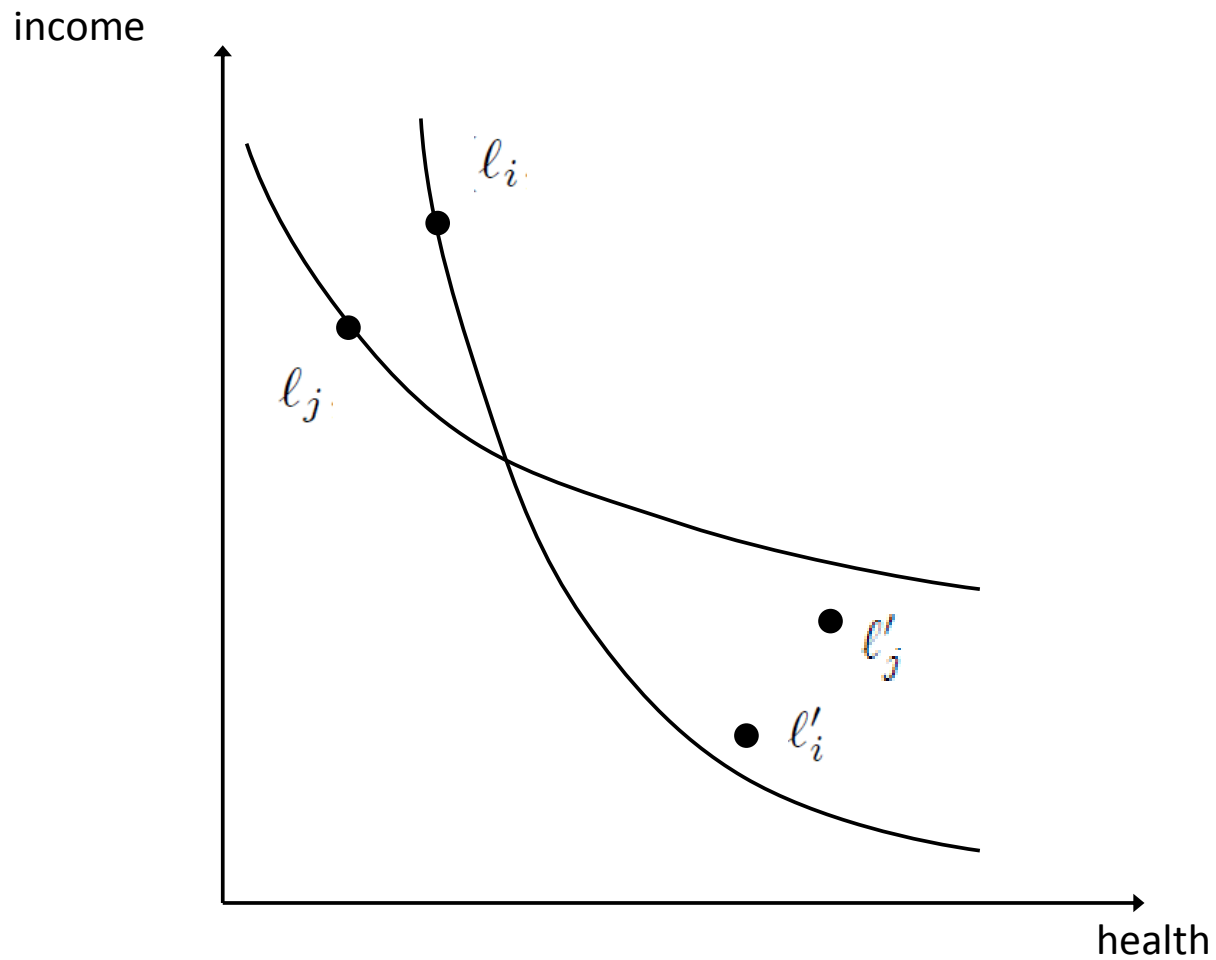
Personal Preference Principle: If $l'_i P_i l_i$, then $WB(l'_i, R_i, S_i) > WB(l_i, R_i, S_i)$.



An inconvenient result

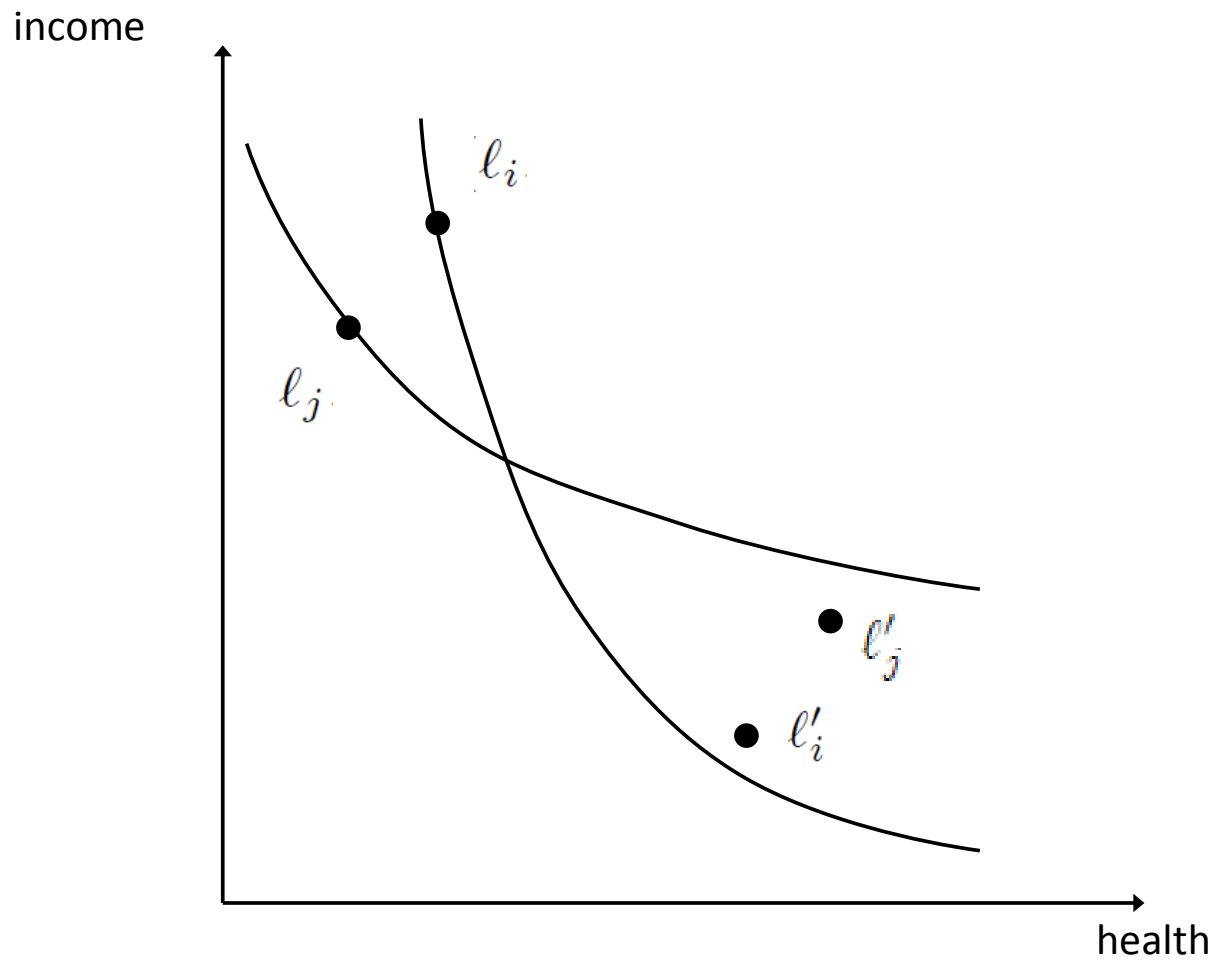


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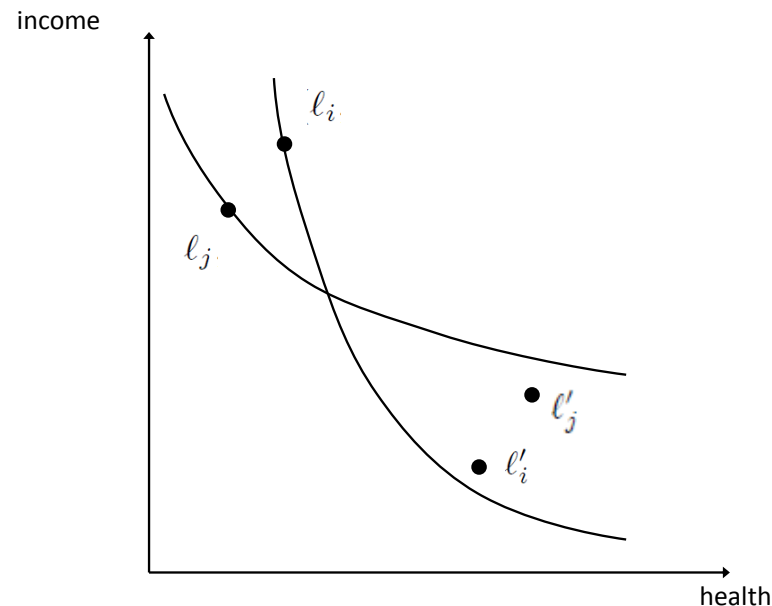
An inconvenient result

- Trouble in paradise !



An inconvenient result

- Based on this little graph we find a deep (and inconvenient) result:
- As soon as people disagree on the good life, no well-being measure satisfies both principles



Dominance Principle: If $l_i \gg l_j$, then $WB(l_i, R_i, S_i) > WB(l_j, R_j, S_j)$.

Personal Preference Principle: If $l'_i P_i l_i$, then $WB(l'_i, R_i, S_i) > WB(l_i, R_i, S_i)$.

- And we have to choose ...



The
Crossroads

Roadmap

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- Principles for a well-being measure
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Part 2. Three well-being measures

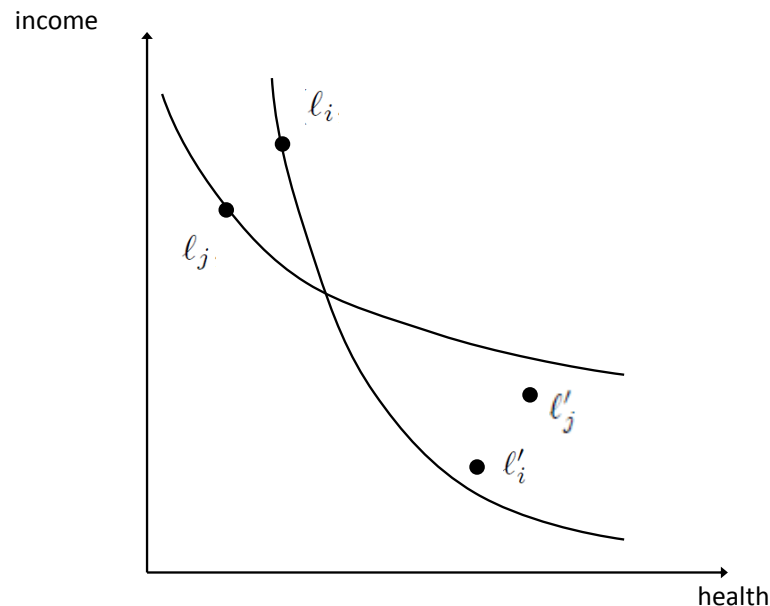
- Composite well-being index
- Life satisfaction
- Equivalent incomes

Part 3. Illustrations

- The worst off in Germany
- Beyond GDP: Social Progress in Europe

Route 1. Use a common view on the good life

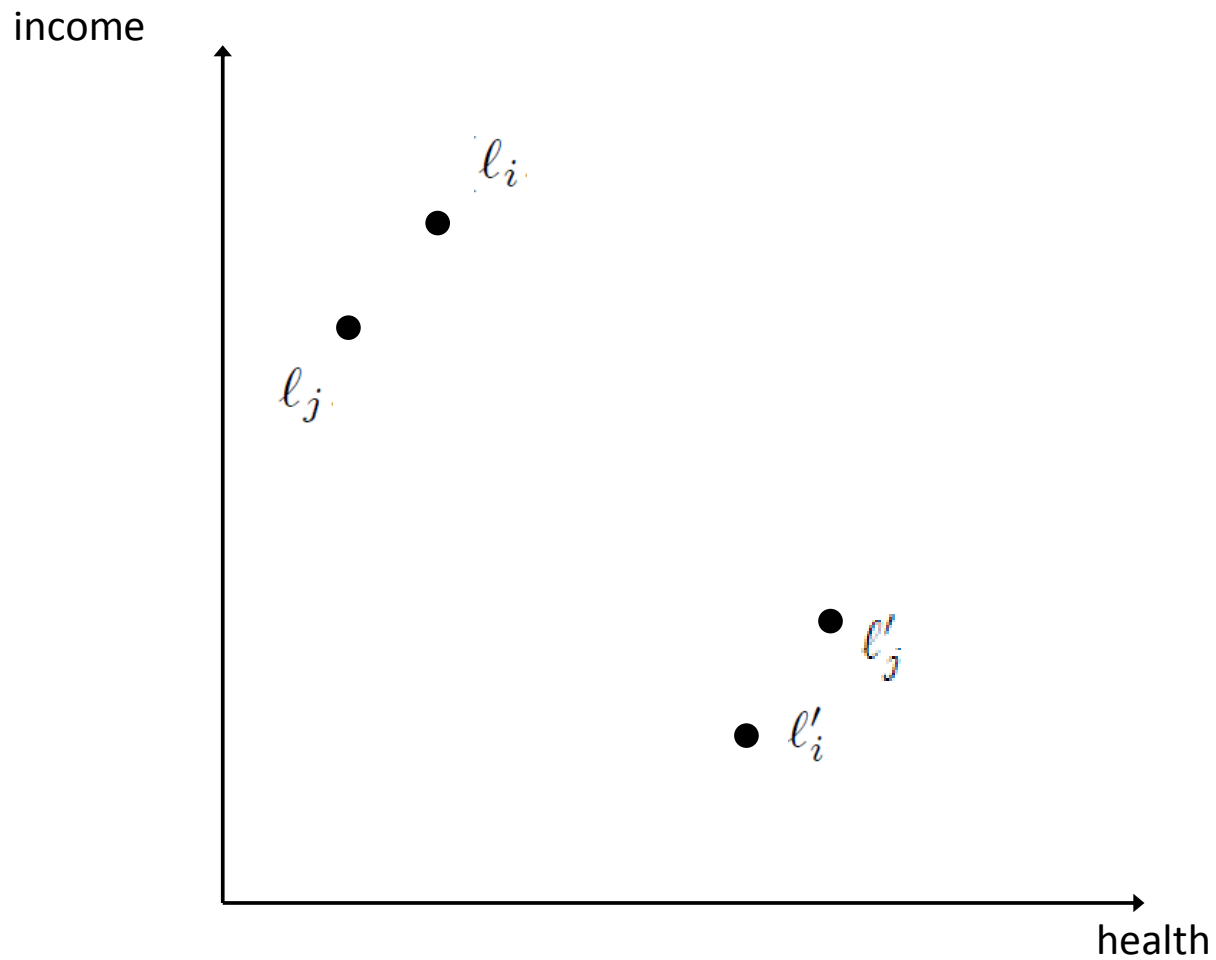
- Based on this little graph we find a deep and annoying result:
- As soon as people disagree on the good life, no well-being measure satisfies both principles



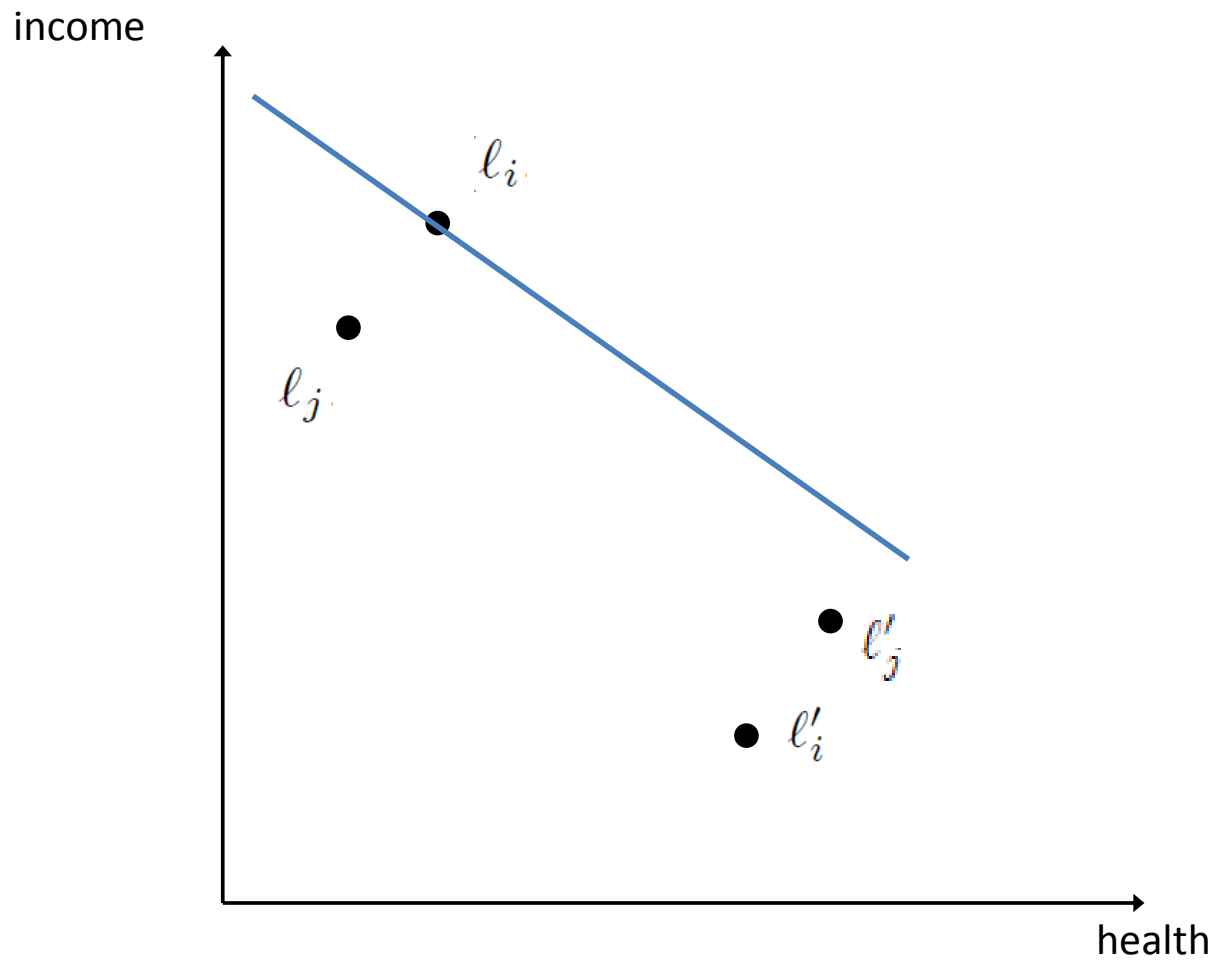
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Personal Preference Principle: If $l'_i \succ l_i$, then $WB(l'_i, R_i, S_i) > WB(l_i, R_i, S_i)$.

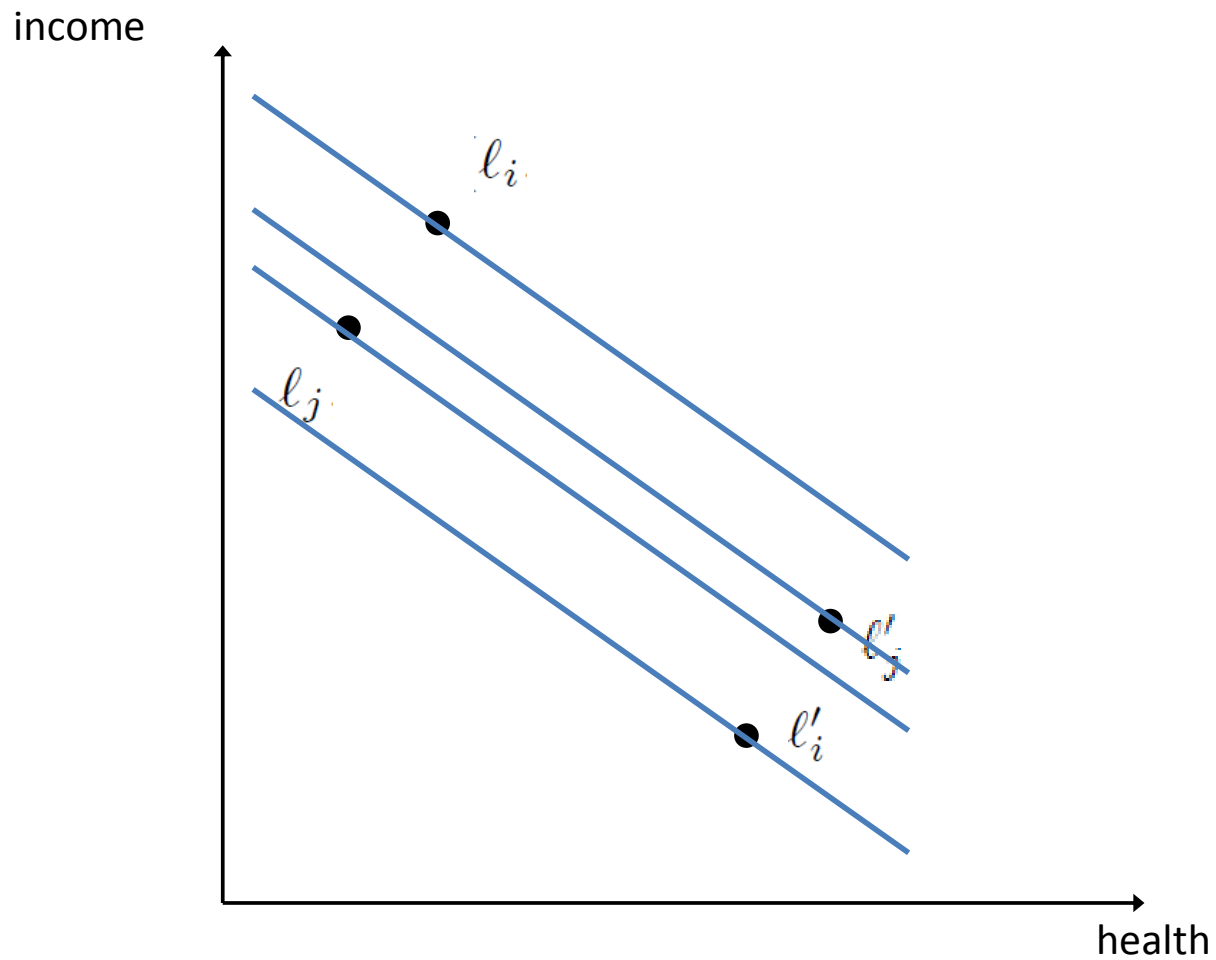
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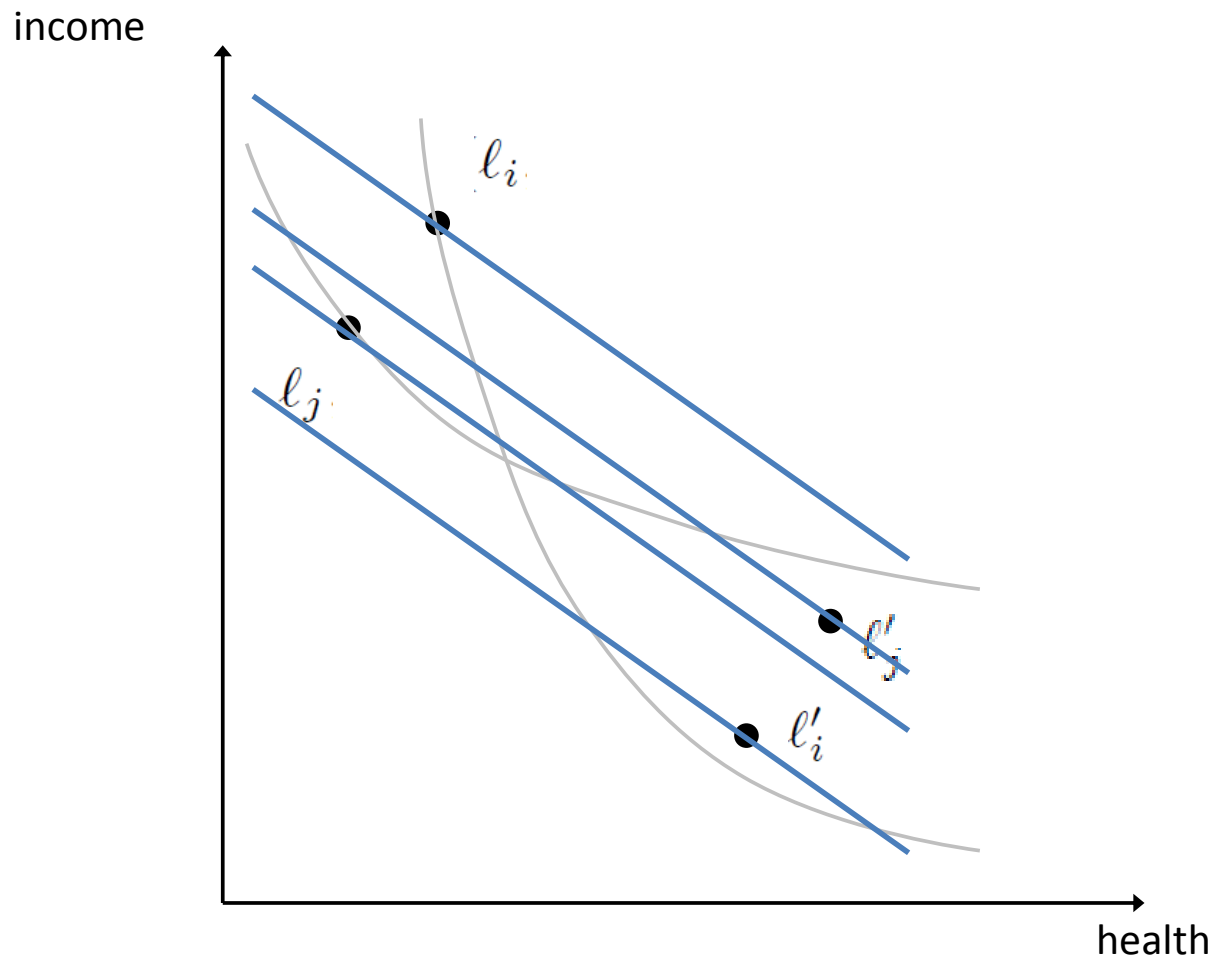
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Route 1. Use a common view on the good life



Route 1. Use a common view on the good life



Route 1. Use a common view on the good life

- A composite index of well-being

$$WB^2(\ell_i, R_i, S_i) = I(\ell_i).$$

- A popular mathematical structure

$$I(\ell_i) = \left[w^0 (f^0(y_i))^\beta + w^1 (f^1(x_i^1))^\beta + \dots + w^m (f^m(x_i^m))^\beta \right]^{1/\beta},$$

- Degree of substitutability

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- Degree of substitutability
- Transformation function
- Weighting scheme

Route 1. Use a common view on the good life

- How to set the weights?
- Three main approaches
 1. Data-driven
 - Depend only on information on outcomes
 - BUT: Hume's guillotine
 2. Normative
 - Depend only on the common opinion on the "good life"
 - BUT: the opinion of whom?
 3. Hybrid
 - Depend on both

Route 1. Use a common view on the good life

- Data: LEVO (2010) (n=1552)

	Statements on well-being
GOA	I am, given my age, satisfied with the goals I have reached
HEA	I consider myself in good health
EDU	I study (studied) or follow(ed) courses according to my wishes
LIV	My (household) income is sufficient to live well
SOC	I have a satisfying social life (friend, leisure, ...)
ENV	I live and spent my life in pleasant environments (house, work, environment)
VIS	I act according to my personal vision on life when making decisions
SIT	I am satisfied with my actual situation (work/study/retirement)
REL	I am satisfied with my relationship

Route 1. Use a common view on the good life

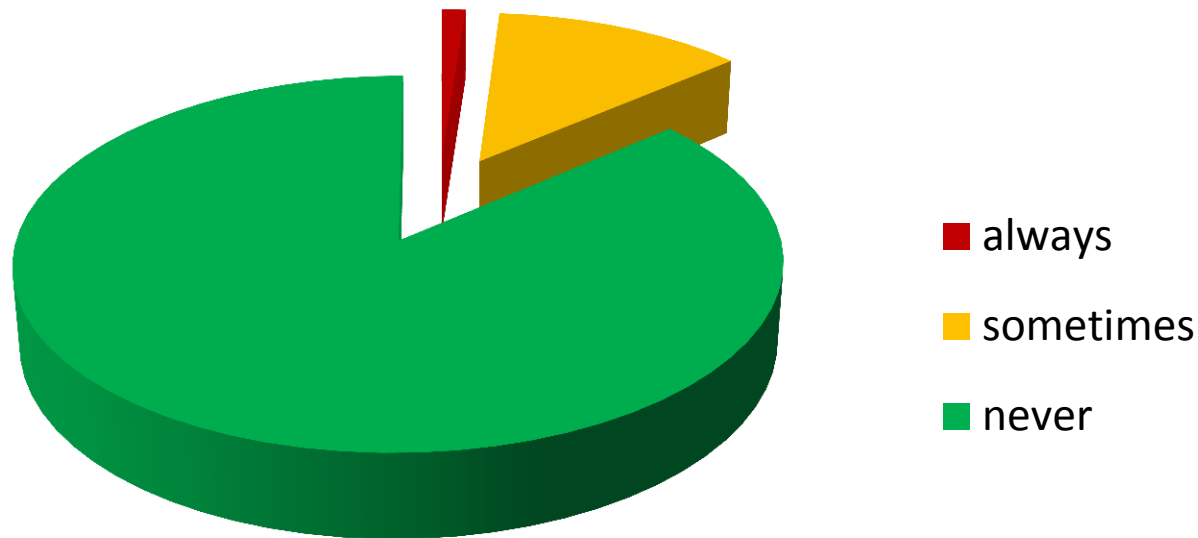
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	Data-driven			Normative		Hybrid			
	FREQ	PRINC	MOFA	EQUA	UNDP	SAT(1)	CAP(1)	SAT(2)	CAP(2)
GOA	0.1135	0.1290	0.0500	0.1111	0	0.2144	0.2030	0.2348	0.2224
HEA	0.1067	0.1078	0.0500	0.1111	0.3333	0.0713	0.1621	0	0.1307
EDU	0.1020	0.0869	0.0500	0.1111	0.3333	0	0	0	0
LIV	0.1085	0.1180	0.0500	0.1111	0.3333	0	0.1033	0	0.0899
SOC	0.1147	0.1152	0.0500	0.1111	0	0.1385	0	0.1008	0
ENV	0.1163	0.1261	0.0500	0.1111	0	0.1489	0.1243	0.1728	0.1350
VIS	0.1178	0.1148	0.0500	0.1111	0	0	0.2047	0	0.1783
WOR	0.1091	0.1266	0.0500	0.1111	0	0.2163	0.1069	0.2581	0.1405
REL	0.1114	0.0756	0.6000	0.1111	0	0.2105	0.0957	0.2335	0.1083

Route 1. Use a common view on the good life

- Example: target the multidimensional poor individuals (i.e. below 60% of median well-being)

Multidimensional poverty



- Who are the worst-off?

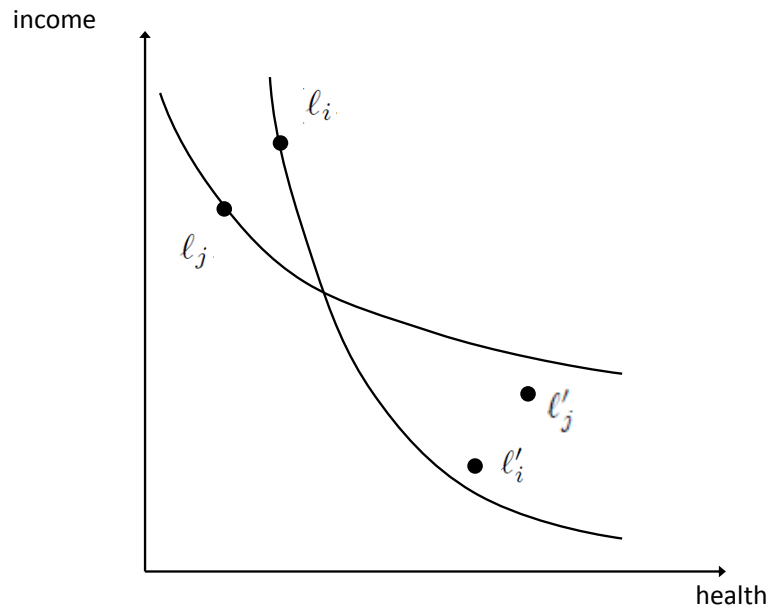
Route 1. Use a common view on the good life

“... those with a stake in the outcomes will almost certainly be in a better position to determine what weights to apply than the analyst calibrating a measure of poverty.”



Back to the cross road

- Based on this little graph we find a deep (and inconvenient) result:
- As soon as people disagree on the good life, no well-being measure satisfies both principles



~~Dominance Principle: If $l_i \gg l_j$, then $WB(l_i, R_i, S_i) > WB(l_j, R_j, S_j)$.~~

Personal Preference Principle: If $l'_i P_i l_i$, then $WB(l'_i, R_i, S_i) > WB(l_i, R_i, S_i)$.

- And take the other route

Route 2. Use life satisfaction

- Why don't we ask the individuals themselves?

$$WB^3(l_i, R_i, S_i) = S_i(l_i),$$

- Subjective Well-Being (SWB)
 - Affects (happiness)
 - Cognitive valuations (life satisfaction)

Route 2. Use life satisfaction

- Why don't we ask the individuals themselves?

$$WB^3(l_i, R_i, S_i) = S_i(l_i),$$

- Subjective Well-Being (SWB)
 - Affects (happiness)
 - Cognitive valuations (life satisfaction)
- Are the opinions of individuals (preferences) respected?

Route 2. Use life satisfaction

- Under the consistency assumption

$$S_i(l_i) \geq S_i(l'_i) \text{ if and only if } l_i R_i l'_i$$

the preferences of the concerned individuals are respected in intra-personal comparisons

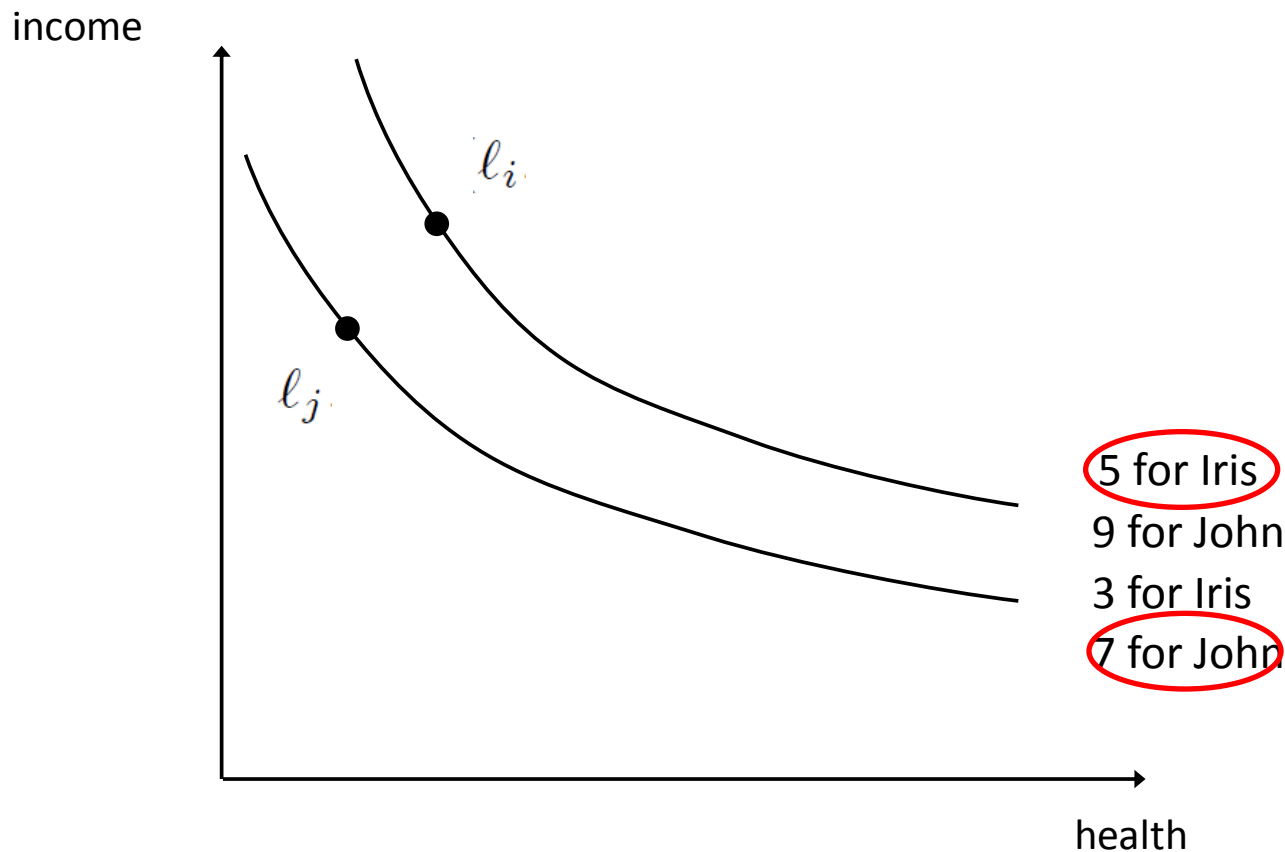
Personal Preference Principle: If $l'_i P_i l_i$, then $WB(l'_i, R_i, S_i) > WB(l_i, R_i, S_i)$.

- What about interpersonal comparisons?
- A more attractive (useful) principle:

Same Preference Principle: If $R_i = R_j = R$ and $l_i P l_j$, then $WB(l_i, R_i, S_i) > WB(l_j, R_j, S_j)$.

Route 2. Use life satisfaction

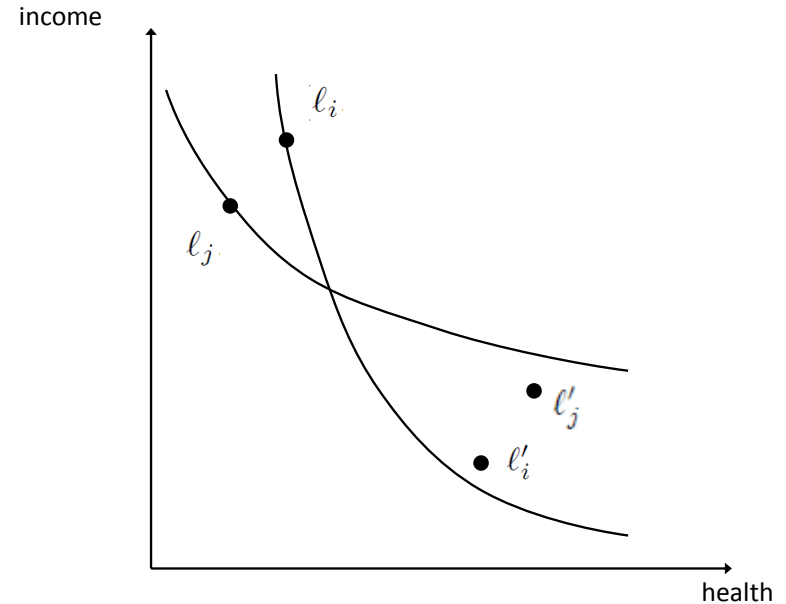
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- SWB does not fulfil the Same Preference Principle
- SWB does not fulfil the Dominance Principle

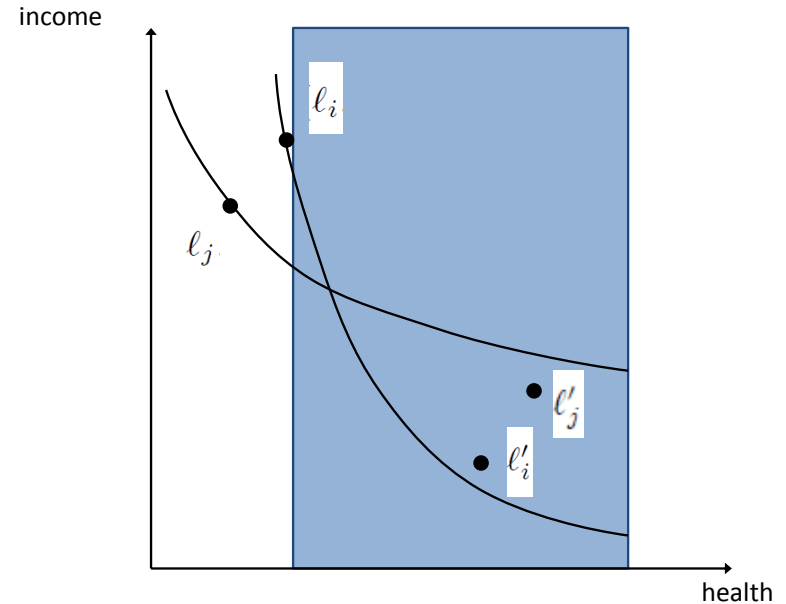
Route 3. Equivalent Incomes

- Is there a third route?
- A measure that satisfies Same Preference Principle
- Back to the trouble maker:
- Let's weaken the Dominance Principle



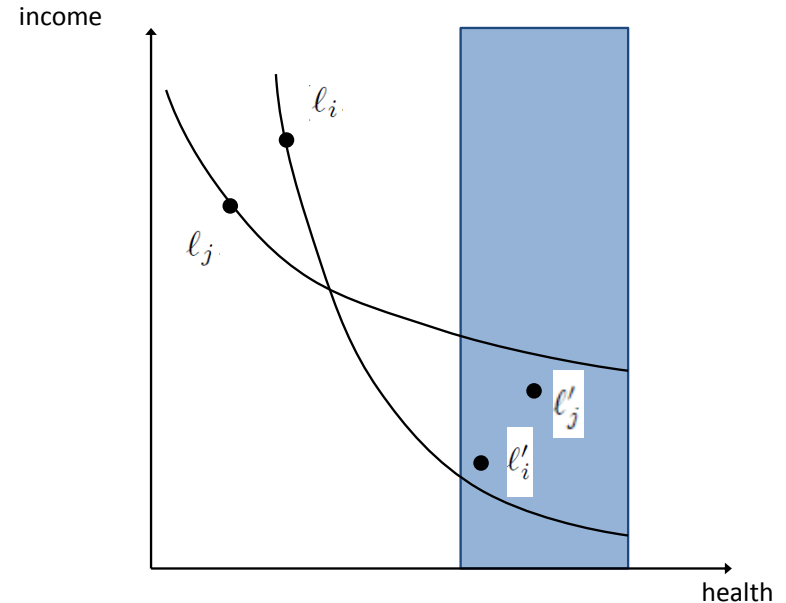
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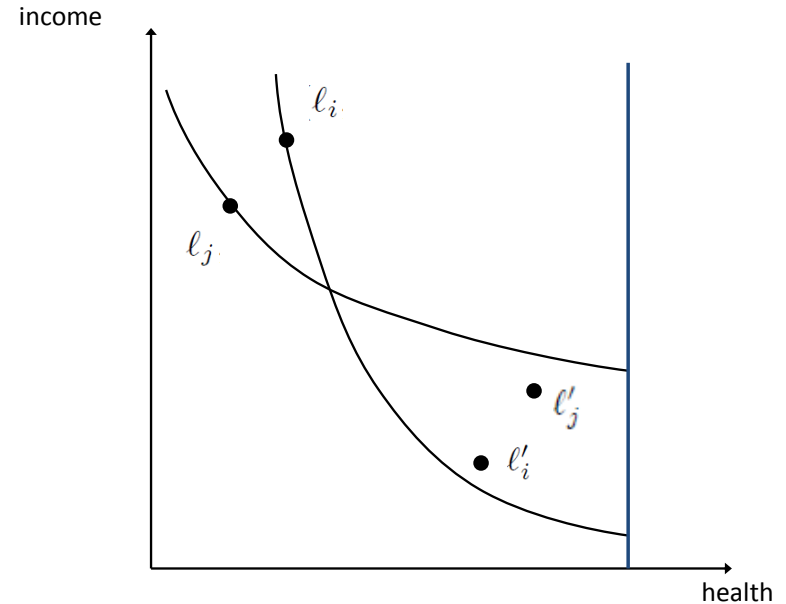
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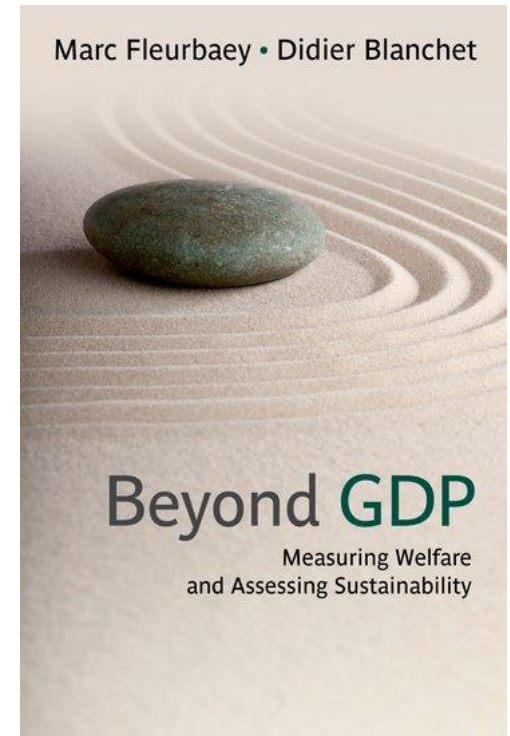
Route 3. Equivalent Incomes

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Route 3. Equivalent Incomes

- There is a measure that satisfies the Same Preference principle and such a weak dominance principle
- And that is “Equivalent Income”
- Developed in 70s by Samuelson and others
- Revitalized recently by Fleurbaey, Maniquet, Schokkaert and others

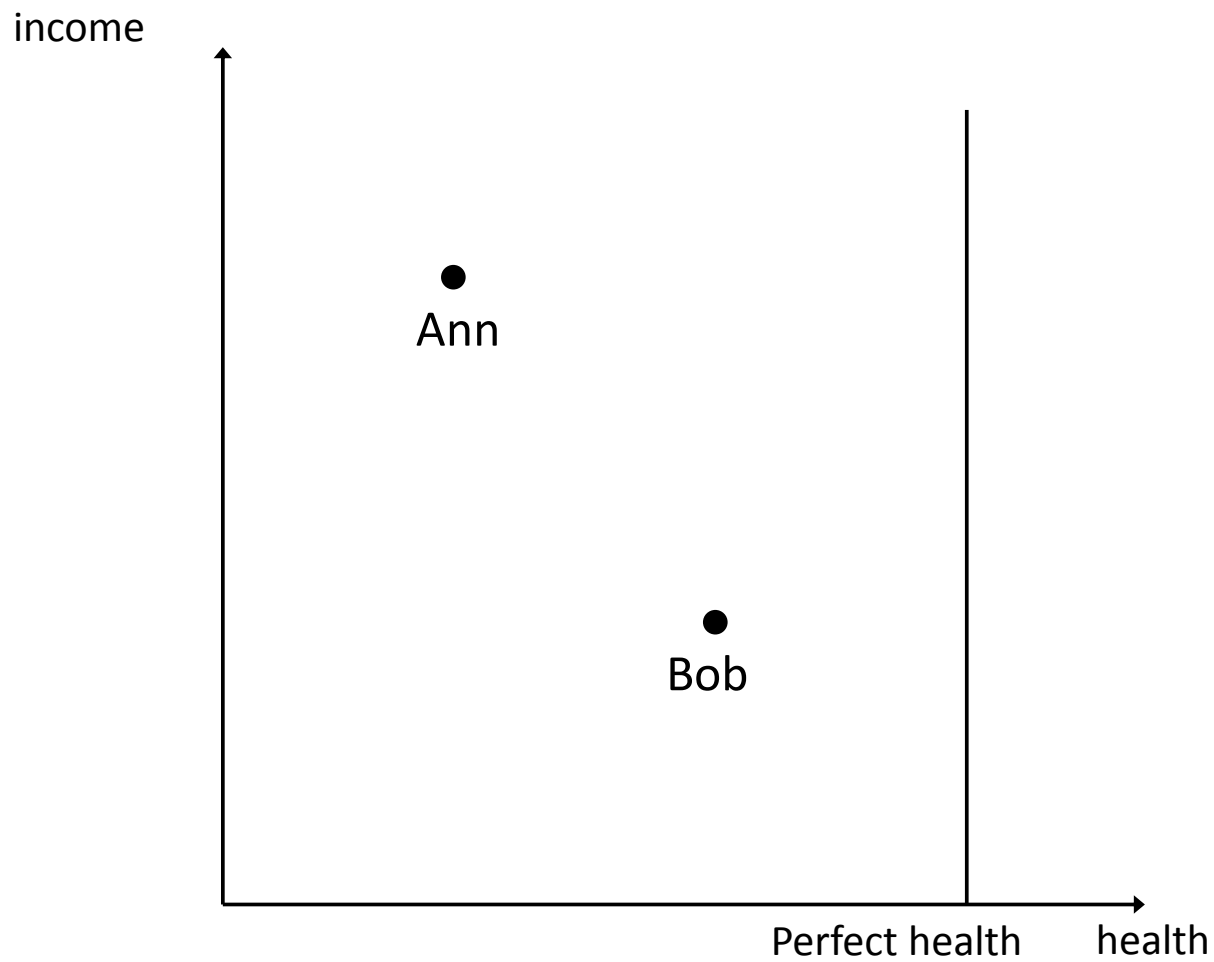


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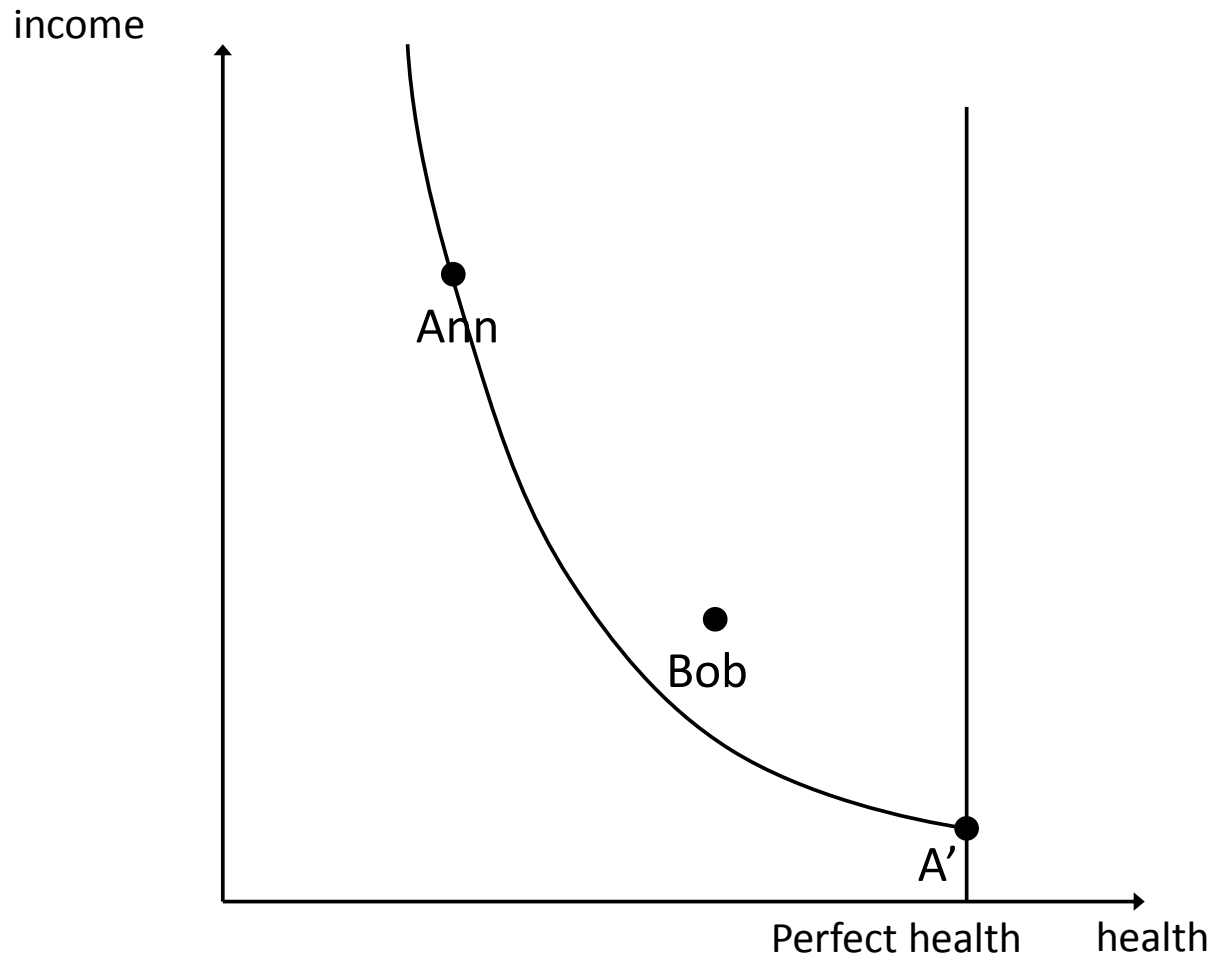
- Equivalent income =
the hypothetical income that -- if combined with a reference value on all non-income dimensions -- would place the individual in a situation that she finds equally good as her initial situation

$$WB^4(\ell_i, R_i, S_i) = y_i^* \text{ such that } (y_i, x_i) I_i (y_i^*, \tilde{x}).$$

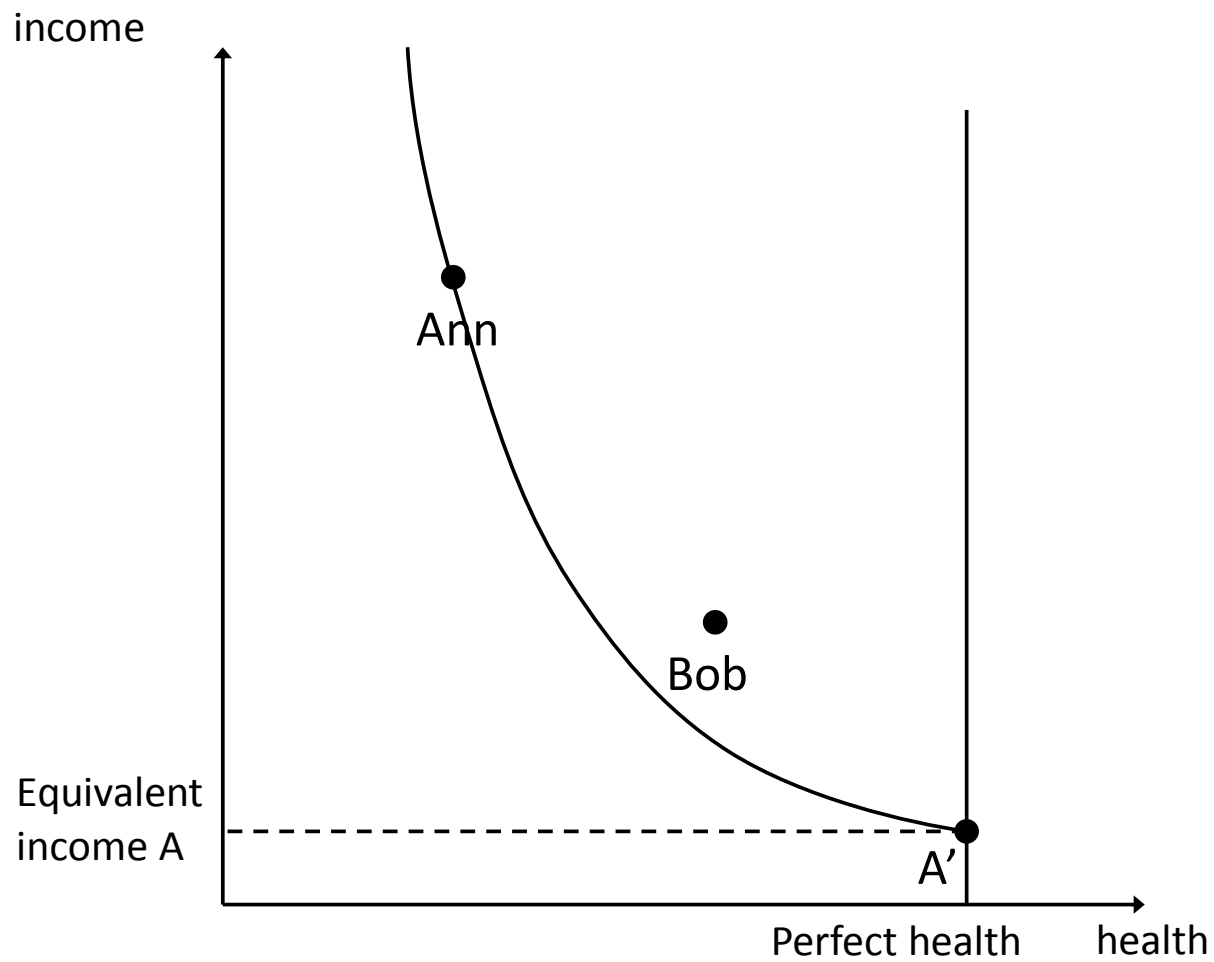
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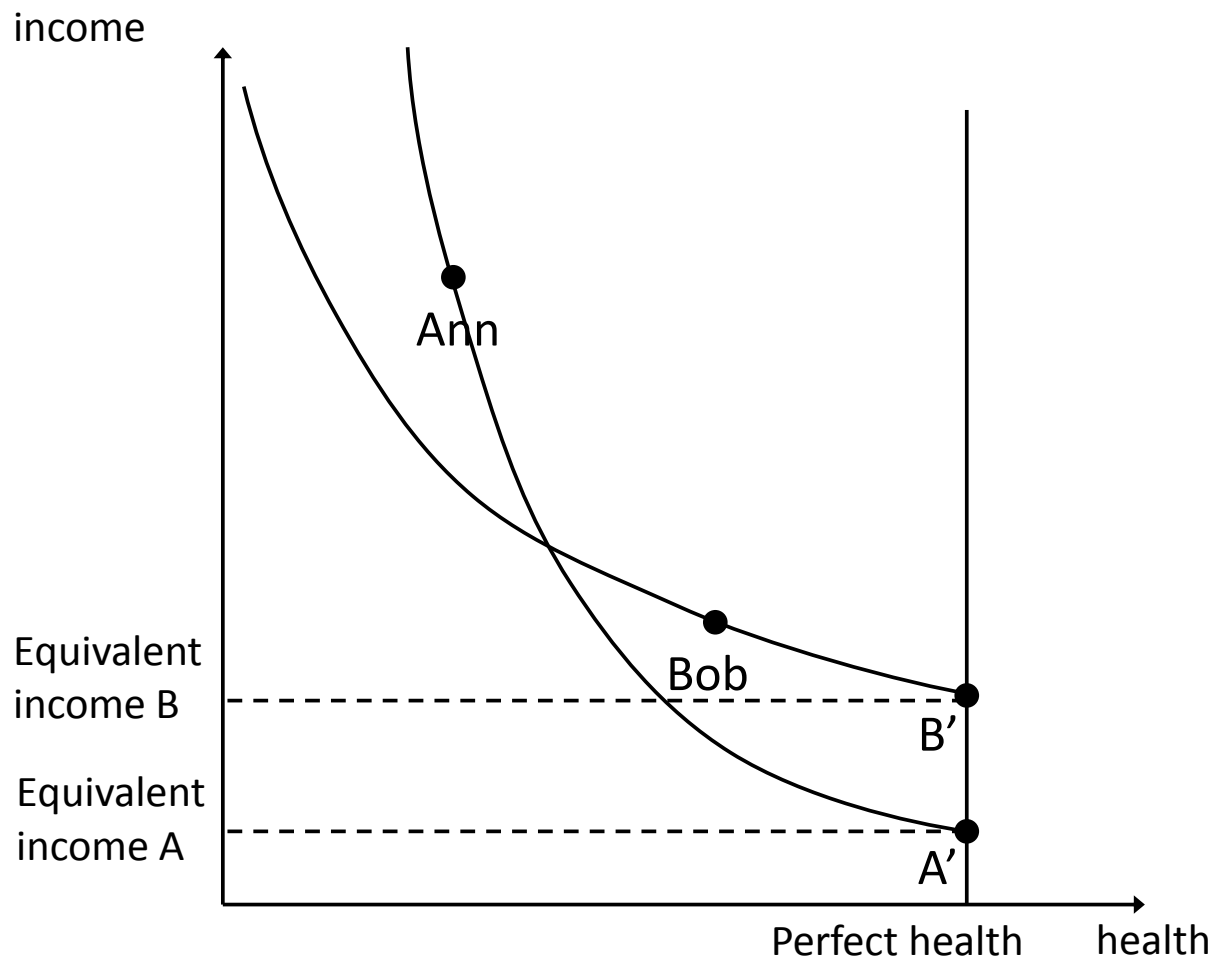
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Route 3. Equivalent Incomes

- Equivalent incomes

$$WB^4(\ell_i, R_i, S_i) = y_i^* \text{ such that } (y_i, x_i) I_i (y_i^*, \tilde{x}).$$

- Additional information is necessary on:
 - The reference values: an ethical question, hence room for debate.
 - The preferences of the individuals (see next part).

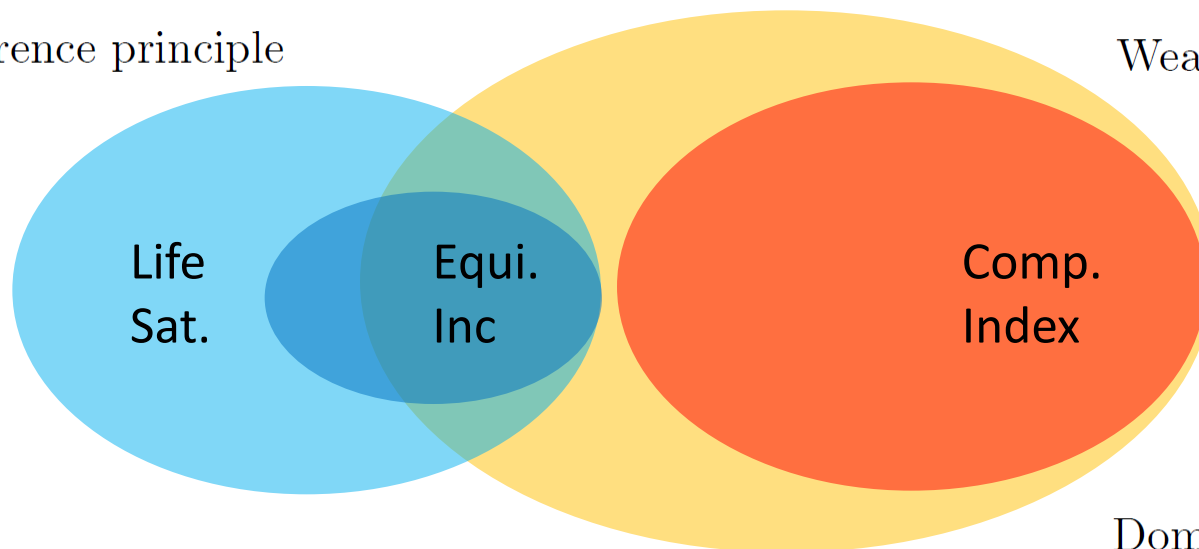
Three well-being measures

- In sum ...

	Objective composite index	Subjective life satisfaction	Equivalent income
Personal preference principle	No	Yes	Yes
Same preference principle	No	No	Yes
Weak dominance	Yes	No	Yes
Dominance	Yes	No	No

Personal preference principle

Weak dominance



Same preference principle

Dominance

Outline

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Part 3. Estimating trade-offs between dimensions

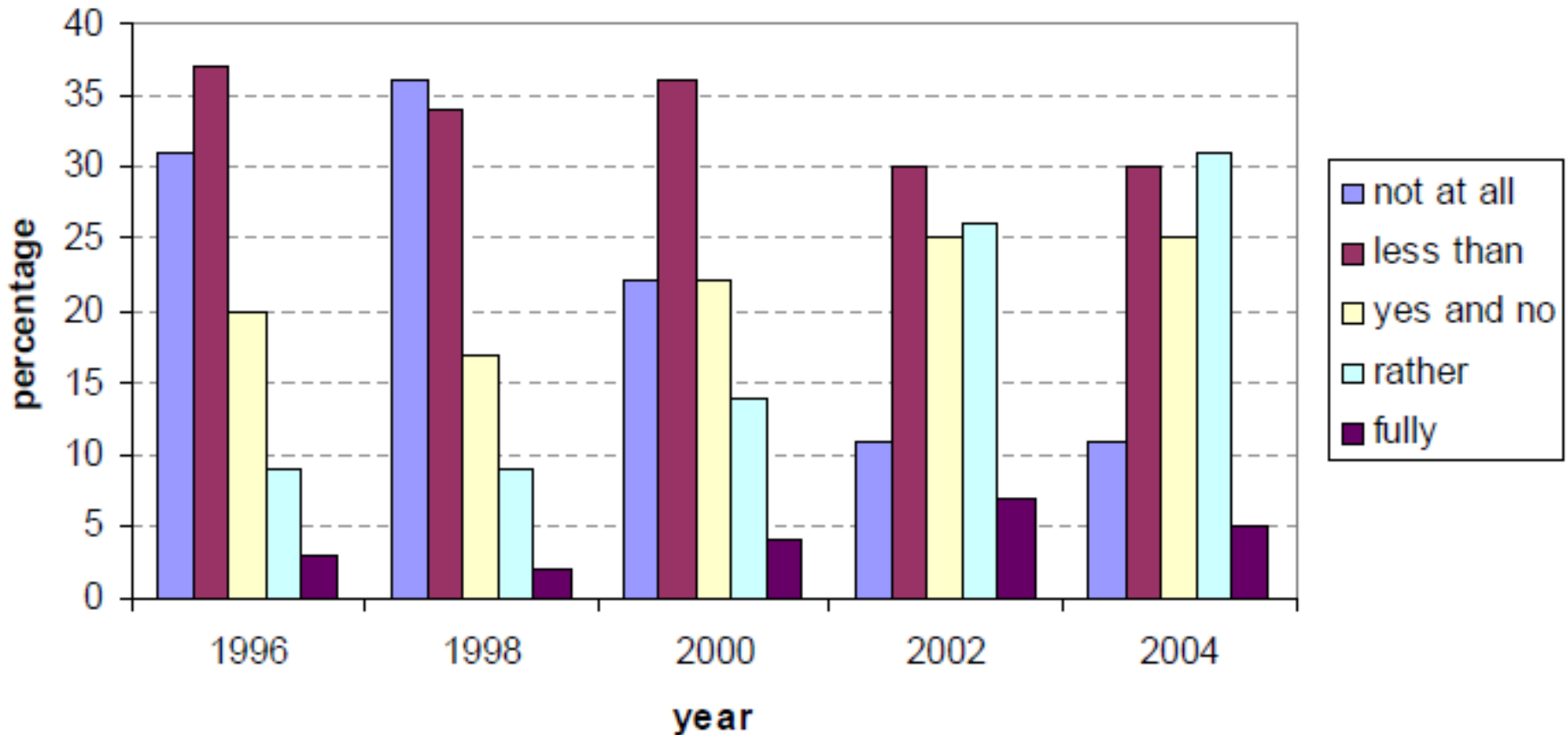
- Life satisfaction approach
- Discrete choice approach

Estimating trade-offs between dimensions

- Problem: we don't observe preferences in real world data
- Three approaches:
 - **Stated preference**: ask people
(in health economics: Fleurbaey and Schokkaert, 2013)
 - **Revealed preference**: infer from behavior
(in labor supply applications: Decoster and Haan, 2014; Bargain et al. 2013)
 - Use **Happiness surveys**: estimate from evaluations
(in functioning-framework: Clark and Oswald 2002; Decancq, Fleurbaey and Schokkaert, frthc)

Life satisfaction approach

- Example with RLMS-HSE data (from Decancq et al.)
- Life satisfaction in Russia



Life satisfaction approach

- Starting point: estimate a “standard” life satisfaction regression

$$S_{it} = \alpha_i + \mu_t + \gamma_1' l_{it} + \gamma_2' Z_{it} + d_{it},$$

- Sophistications
 - Heterogeneity in coefficients
 - Decreasing marginal returns in income

$$S_{it} = \alpha_i + \mu_t + (\beta + \Gamma Z_{it}) \ln(y_{it}) + (\vartheta + \Lambda Z_{it})' q_{it} + \delta' Z_{it} + d_{it},$$

- Equivalent income

$$y_{it}^* = y_{it} \exp \left[\left(\frac{\vartheta + \Lambda Z_{it}}{\beta + \Gamma Z_{it}} \right)' (q_{it} - q_i^*) \right]$$

Table 7: Satisfaction estimation

Life satisfaction

	coefficients	standard errors
log expenditures (per cons. unit)	0.314***	(0.0264)
self-assessed health	0.432***	(0.0423)
housing (in 100.000 rubles)	0.284***	(0.0825)
unemployed	0.161	(0.135)
wage arrears	-0.0872	(0.0680)
high status	0.325***	(0.0970)
middle status	0.259***	(0.0461)
higher educ.	0.236	(0.153)
married	0.0907	(0.102)
as married	-0.0197	(0.103)
divorced	-0.292**	(0.110)
widowed	-0.489***	(0.121)
ref. group unemployment	-1.087**	(0.333)
ref. group expenditures	-0.176**	(0.0613)
age squared/100	0.0809***	(0.0171)
1996	-0.189***	(0.0525)
1998	-0.408***	(0.0752)
2000	-0.0809	(0.0962)
2001	0.158	(0.109)
2002	0.616***	(0.124)
2003	0.353*	(0.139)
young X health	-0.0960*	(0.0445)
young X expend.	0.0316+	(0.0188)
male X health	-0.120*	(0.0465)
male X unemployed	-0.347***	(0.101)
rural X health	-0.109*	(0.0542)
rural X house	0.217*	(0.107)
minority X health	0.118+	(0.0667)
minority X expend.	-0.253***	(0.0616)
high educ. X house	-0.193*	(0.0813)
high educ. X unemployed	-0.468***	(0.133)
high educ. X arrear	-0.150*	(0.0756)
<i>N</i>	40120	
pseudo R^2	0.082	

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Life satisfaction approach

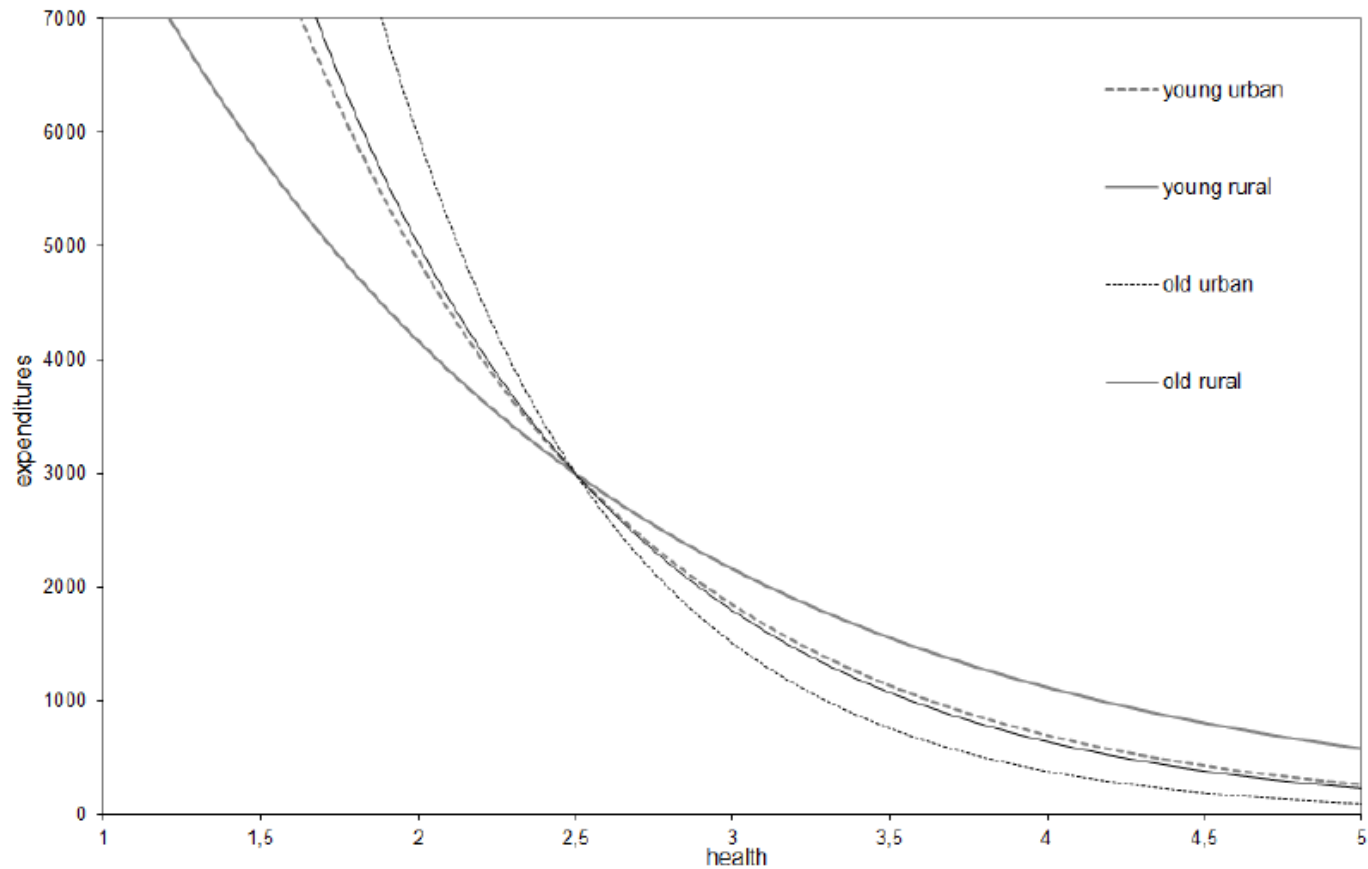


Figure 1: Indifference map in the health-expenditure space.

Life satisfaction approach

Table 5: Portrait of the deprived in different approaches in 2000.

	Set I	Set II	Set III	Set IV	Set V	Set VI	Set VII	Set VIII	Set IX	Set X	Set XI	Set XII	Obj (4 dim)	Obj (5 dim)
newcomers		59%	18%	6%	2%	3%	5%	9%	3%	3%	71%	72%		56%
income	<i>1694</i>	2730	2868	2875	2873	2919	2928	2929	3005	3092	2948	2667	2558	2983
expenditures	<i>1188</i>	3220	3245	3344	3354	3466	3480	3501	3568	3769	3046	3468	<i>2825</i>	<i>3489</i>
health	2.98	<i>2.55</i>	2.66	2.72	2.73	2.75	2.75	2.76	2.80	2.85	2.77	2.87	<i>2.46</i>	<i>3.1</i>
house	1406	1628	<i>1463</i>	1463	1464	1472	1479	1508	1512	1531	1645	1531	<i>1425</i>	<i>1493</i>
unempl.	12%	7%	8%	<i>12%</i>	12%	12%	11%	11%	11%	11%	17%	13%	<i>37%</i>	<i>34%</i>
arrear	14%	10%	11%	10%	<i>12%</i>	11%	11%	10%	10%	10%	20%	17%	6%	<i>62%</i>
high status	1%	2%	1%	1%	1%	<i>1%</i>	1%	1%	1%	2%	2%	2%	0%	3%
middle status	36%	29%	28%	27%	28%	<i>25%</i>	25%	25%	26%	28%	35%	37%	11%	46%
higher educ.	59%	57%	49%	48%	49%	50%	<i>45%</i>	46%	47%	48%	72%	66%	56%	78%
married	45%	52%	51%	50%	50%	50%	50%	<i>42%</i>	42%	43%	59%	52%	49%	62%
as married	11%	6%	6%	7%	7%	7%	6%	<i>6%</i>	6%	5%	6%	8%	8%	10%
divorced	8%	7%	6%	7%	7%	7%	6%	<i>7%</i>	7%	7%	9%	8%	8%	7%
widowed	18%	25%	25%	25%	24%	25%	26%	<i>33%</i>	32%	32%	18%	17%	21%	6%
mean unempl.	9%	9%	11%	11%	11%	11%	11%	11%	<i>12%</i>	12%	10%	10%	11%	10%
mean expend.	8153	8305	8249	8256	8257	8269	8270	8277	8282	<i>8305</i>	8277	8273	8222	8228
age in 2000	47	55	54	53	53	53	54	54	54	53	<i>49</i>	47	51	40
male	41%	28%	31%	31%	31%	32%	32%	30%	32%	32%	<i>41%</i>	42%	42%	53%
minority	12%	53%	57%	58%	58%	59%	59%	59%	60%	63%	<i>14%</i>	12%	16%	15%
rural	34%	23%	38%	39%	39%	39%	39%	37%	38%	37%	<i>30%</i>	35%	38%	40%
life satisfaction	2.03	2.19	2.21	2.22	2.22	2.22	2.22	2.24	2.24	2.27	2.15	<i>1.00</i>	1.97	2.13

Legend: The sets successively incorporate as functionalities: equivalized expenditures (Set I), self-assessed health (Set II), housing (Set III), unemployment (Set IV), wage arrears (Set V), occupational status (Set VI), education (Set VII), marital status (Set VIII), reference group unemployment (Set IX), reference group expenditures (Set X), age and personality traits (Set XI), the disturbance term (Set XII).

The composite indicators successively incorporate equivalized expenditures, self-assessed health, housing, unemployment (CI(4)) and wage arrears (CI(5)).

Life satisfaction approach

- More (detailed) examples in presentations
- Problems:
 - Endogeneity of income
 - Are variables dimensions or control variables?
 - Low R squared
 - Group preferences

Discrete choice approach

- Discrete choice experiments are used often in marketing, environmental and health economics to estimate preferences.
- Present (binary) choices to respondent and estimate their preferences
- Pre-pilot with 600 Belgian (business economics) students in fall 2014.

Discrete choice approach

EXAMPLE QUESTION

	Life A	Life B
Health (life expectancy)	70 years	90 years
Education (years of schooling)	16 years	10 years
Income per person in household (income per month)	3,500 Euro	1,500 Euro

In all other aspects the lives are the same

Which life would you prefer to live?
PLEASE SHADE ONE CIRCLE ONLY

Life A

Life B



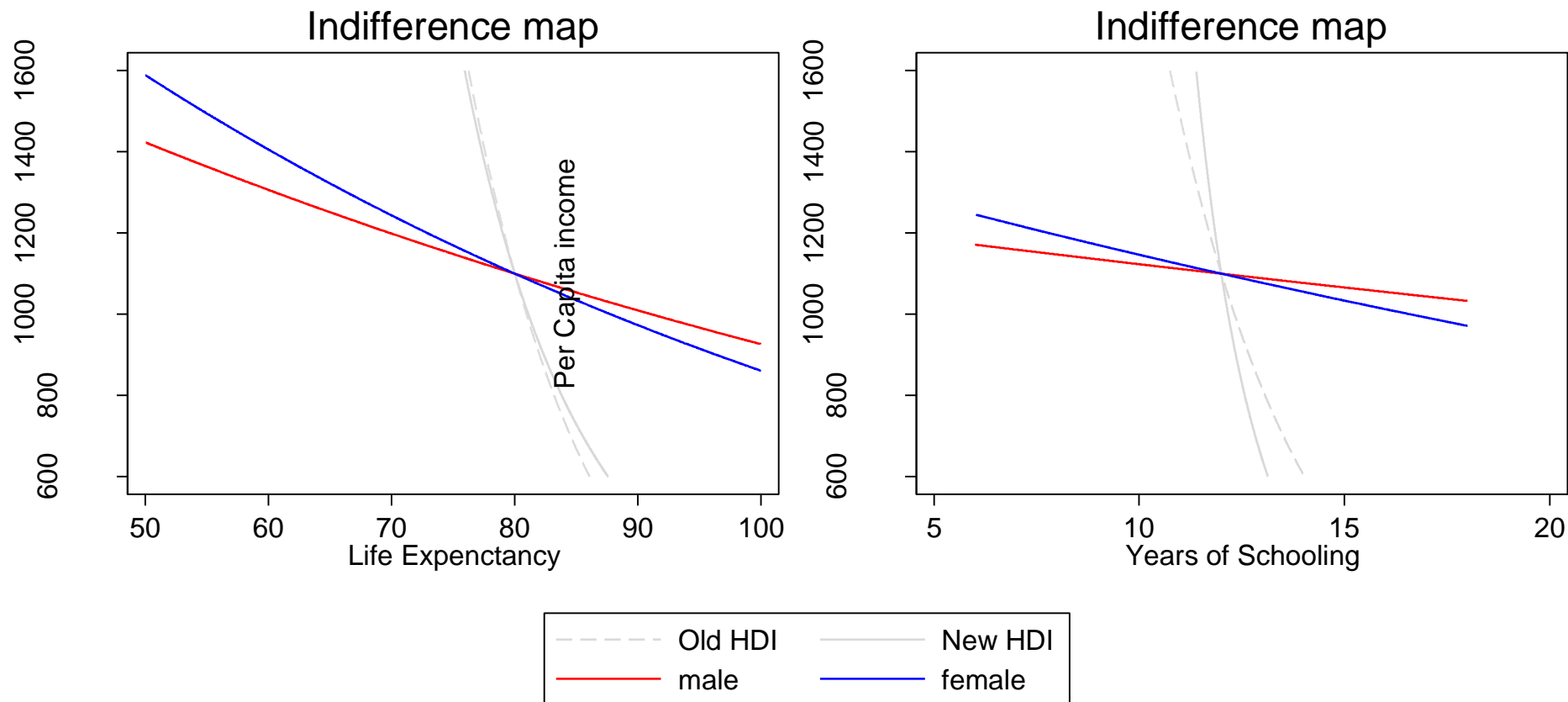
In which life would you be more satisfied?
PLEASE SHADE ONE CIRCLE ONLY

Life A

Life B

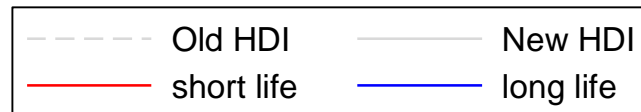


Discrete choice approach (Belgium)



Data from own survey in Antwerp in October 2014

Discrete choice approach (Belgium)



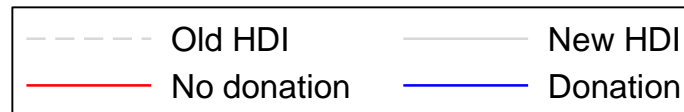
Data from own survey in Antwerp in October 2014

Discrete choice approach (Belgium)



Data from own survey in Antwerp in October 2014

Discrete choice approach (Belgium)



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Conclusion

- Can we construct an (operational) multidimensional well-being measure?

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Conclusion

- Can we construct an (operational) multidimensional well-being measure? **YES**
- Is there a single silver bullet? **NO**
- Does the choice between the measures matter empirically? **YES**

- Different measures take a different position on what are the most appealing principles. This is a value judgment.
- Let's be explicit about these value judgments, so that they are open to public scrutiny