9th Winter School on Inequality and Social Welfare Theory

Canazei January 13-16 2014

Using preference information from structural labour supply models when evaluating policies

A. Decoster

Centre for Economic Studies KU Leuven

1. Structure

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

- individual preferences: double role
  - positive (explain behaviour)
  - normative (evaluative)
- in both: preference heterogeneity

positive

Peichl, Colombino

- observed heterog.
- unobserved heterog.

in both

- preferences
- constraints (wages)

normative

Trannoy, Schokkaert

distinction between e.g. inequality following from

- difference in abilities
- difference in preferences
- difference in choices

1. Structure

- this talk: bridge, link, fertilization
- promising for two reasons:
  1. in LS, positive = structural
     - choice explained by model in terms of primitives
       - → preferences
       - → constraints

$$(c_i, l_i) = \arg\max \left[u_i(c, l) \,|\, c \leq f\left(I_i, w_i l\right) \right]$$

  2. often used for policy simulations

     => need for evaluation tools

1. Structure

- build the bridge in two directions

positive model — *normative literature*

- standard discrete choice model ← individual welfare metrics respecting preference heterogeneity

Decoster & Haan (2010, 2014)
Bargain, Decoster, Dolls, Neumann, Peichl and Siegloch (2013)

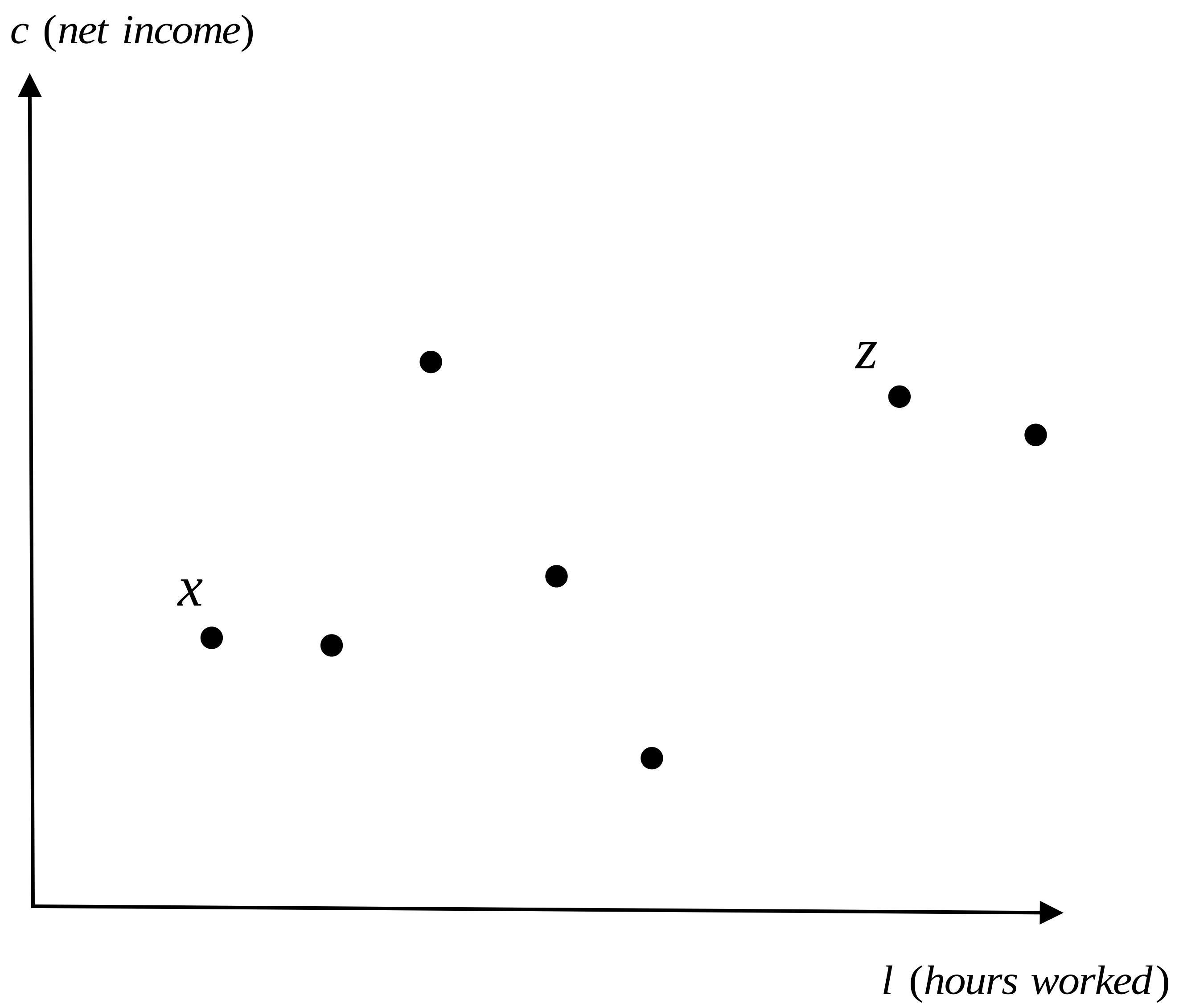
- richer structural specification (Oslo-model) →
  - get preferences "right"
  - separate preferences from demand side constraints

work in progress with Capéau & Vanleenhove

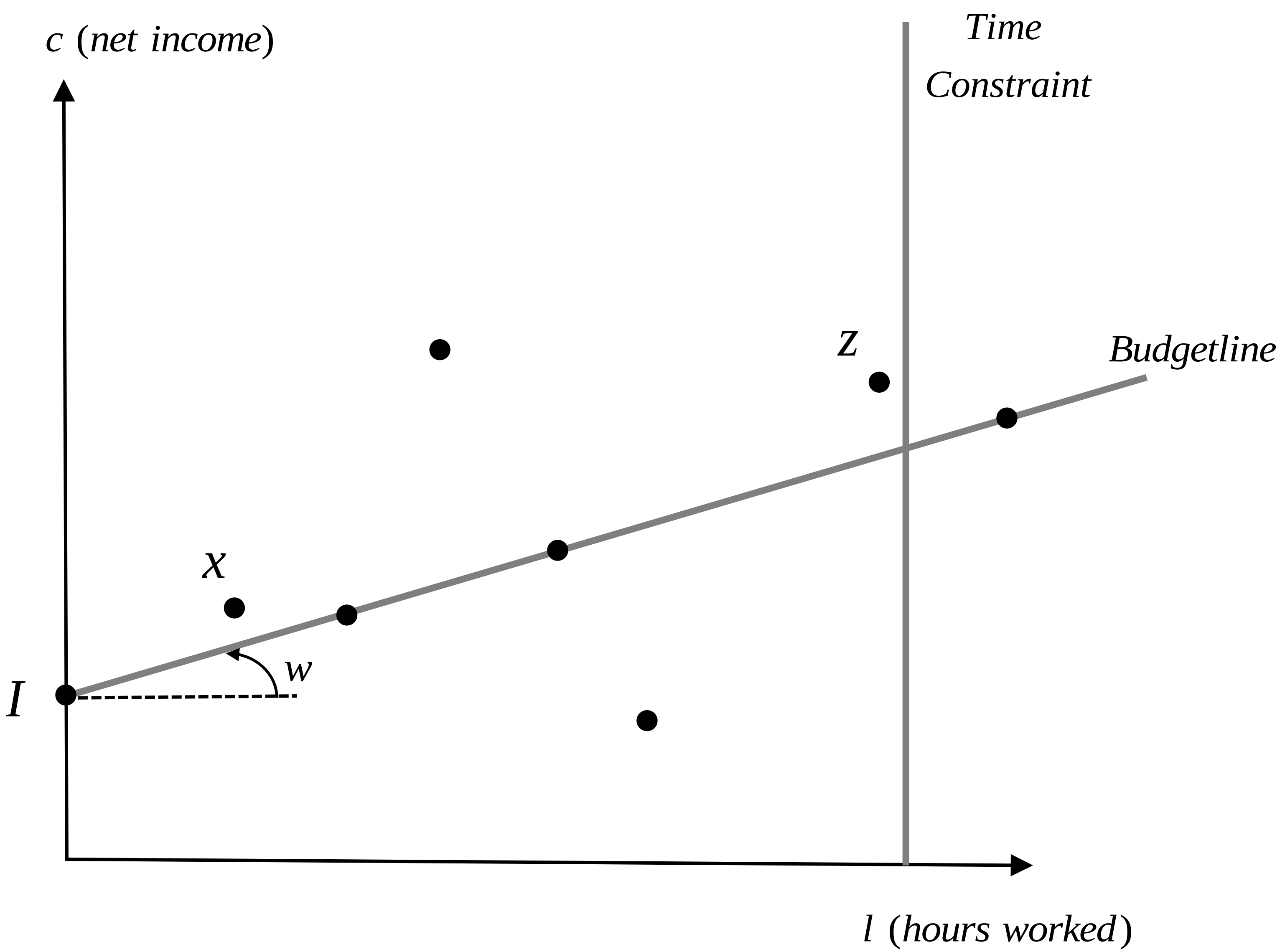
Content

1. Structure
2. individual welfare metrics
   - Fleurbaey (2006), Fleurbaey (2008)
     F. & Maniquet (2011), F. & Blanchet (2013)
   - Lecture Alain Trannoy Monday
   - Lecture Erik Schokkaert Wednesday
3. Decoster & Haan (2010)
   Bargain et al. (2013)
4. Oslo-model

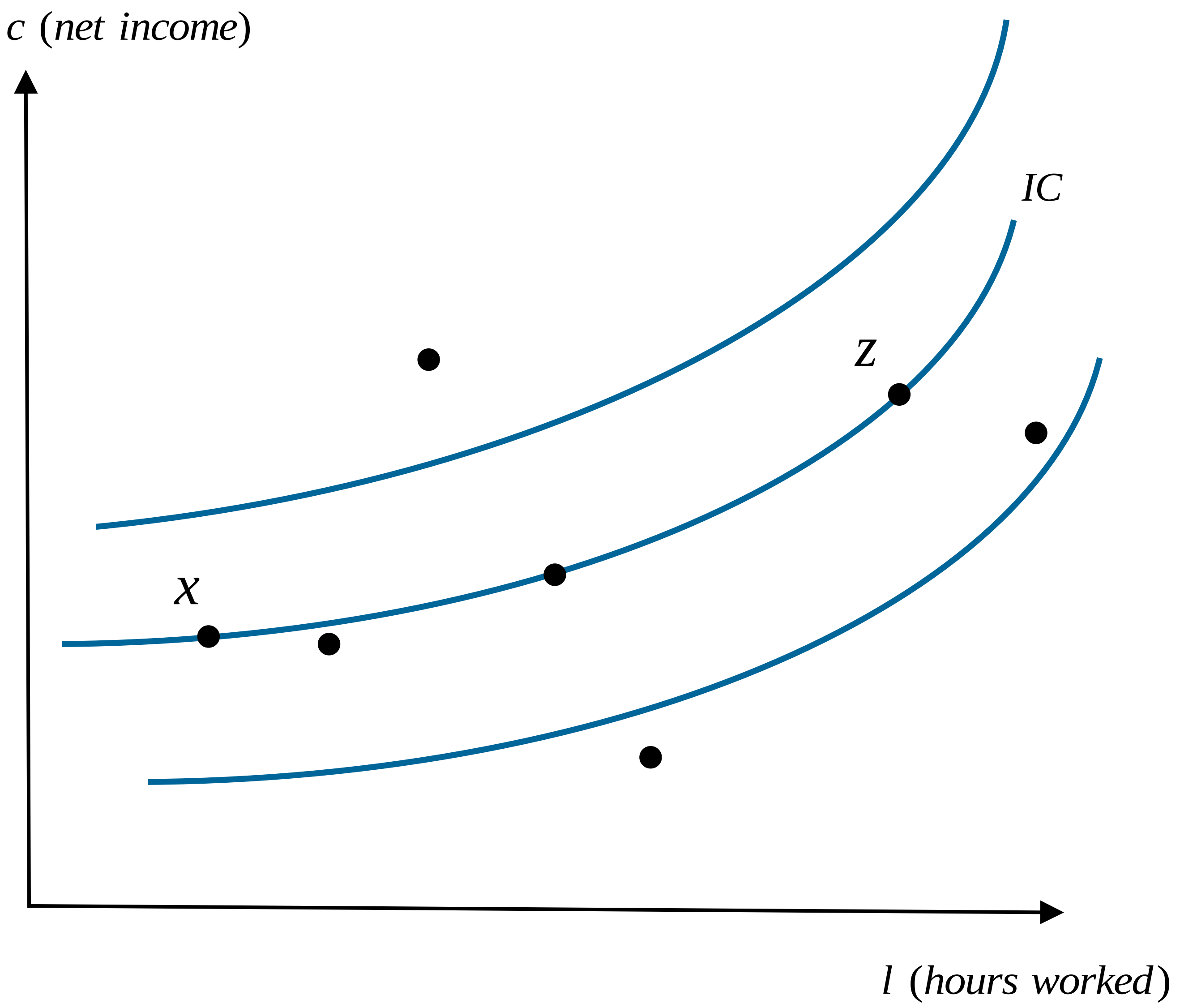
2. Positive model



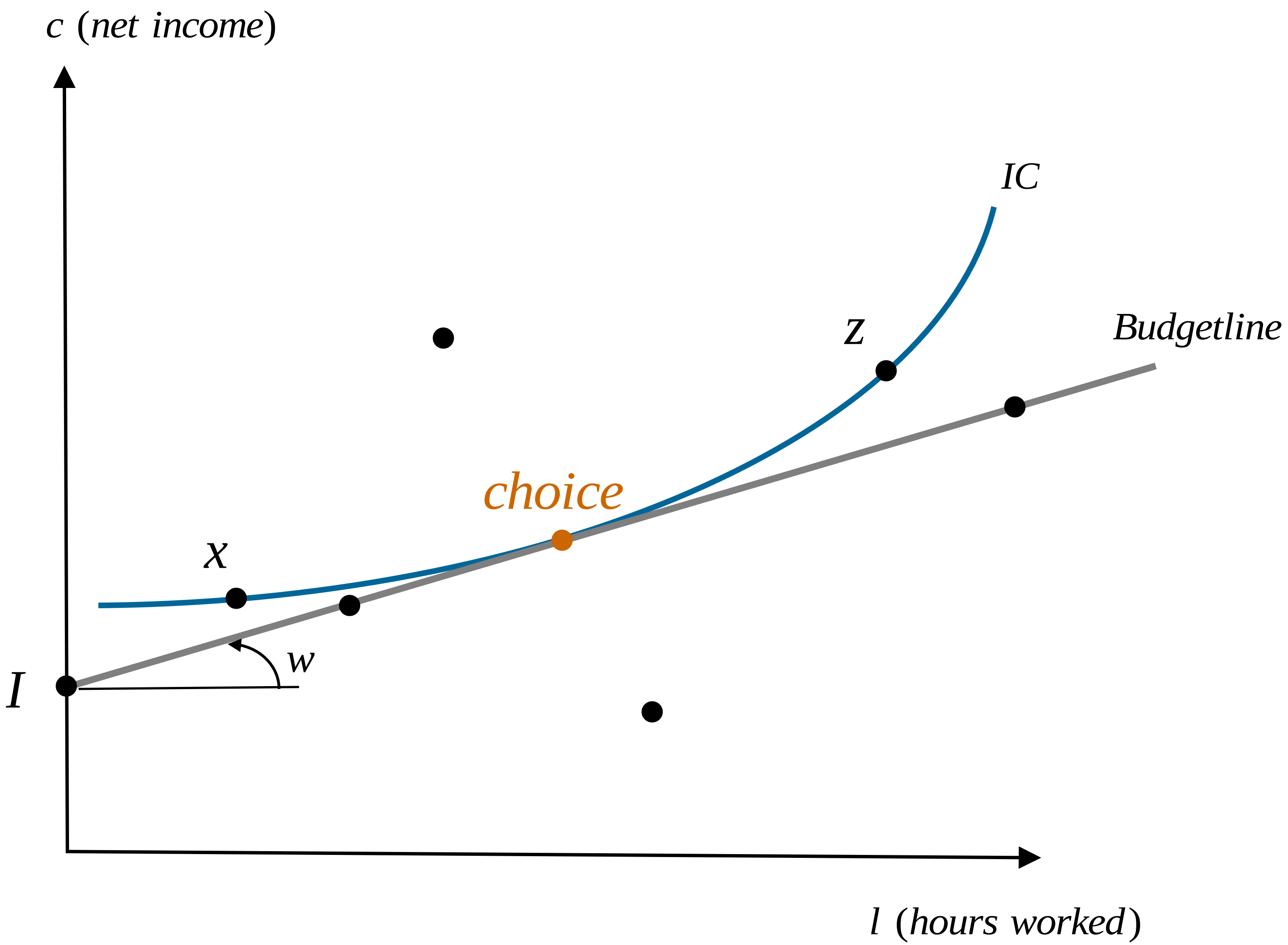
2. Positive model



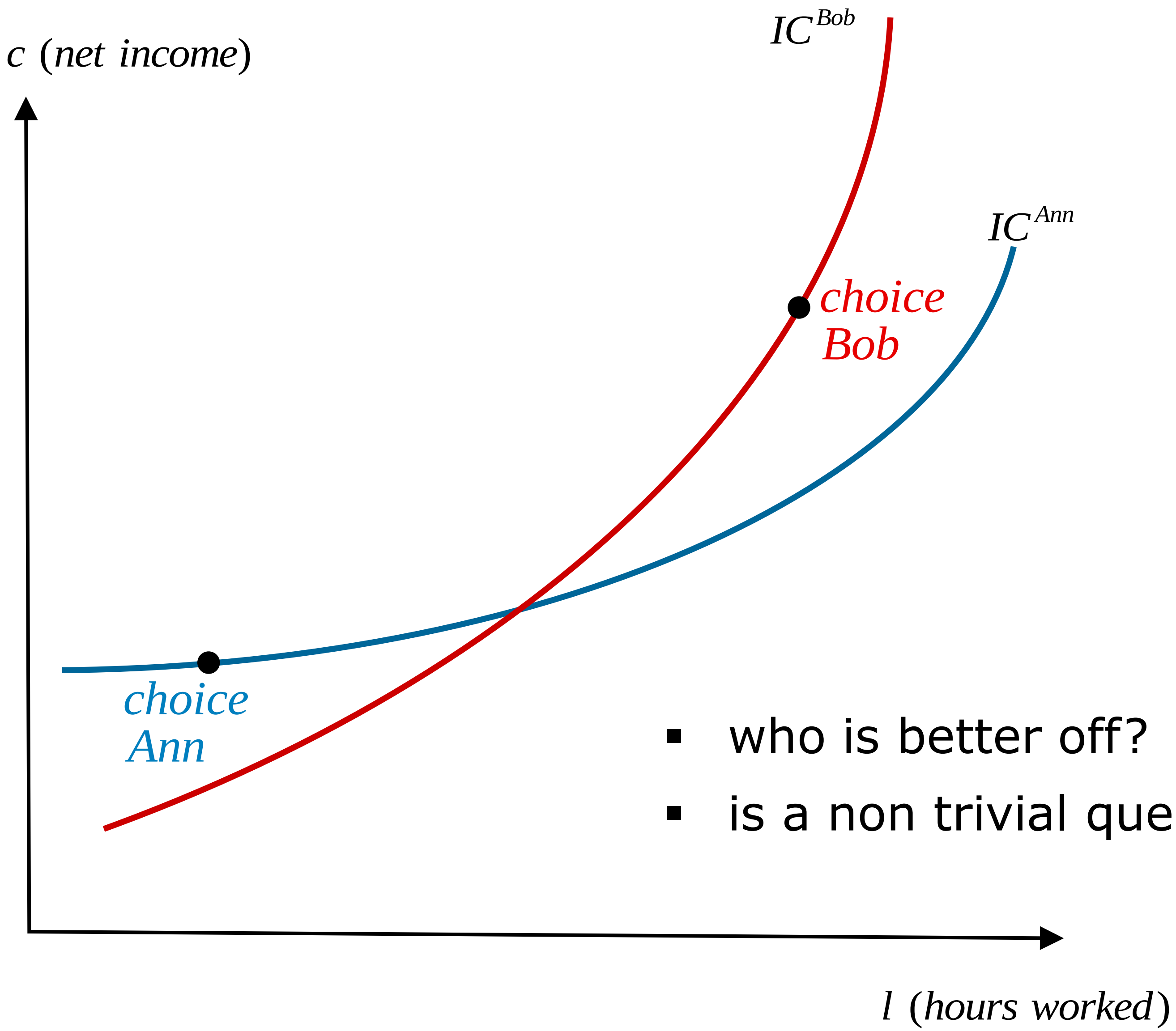
2. Positive model



2. Positive model

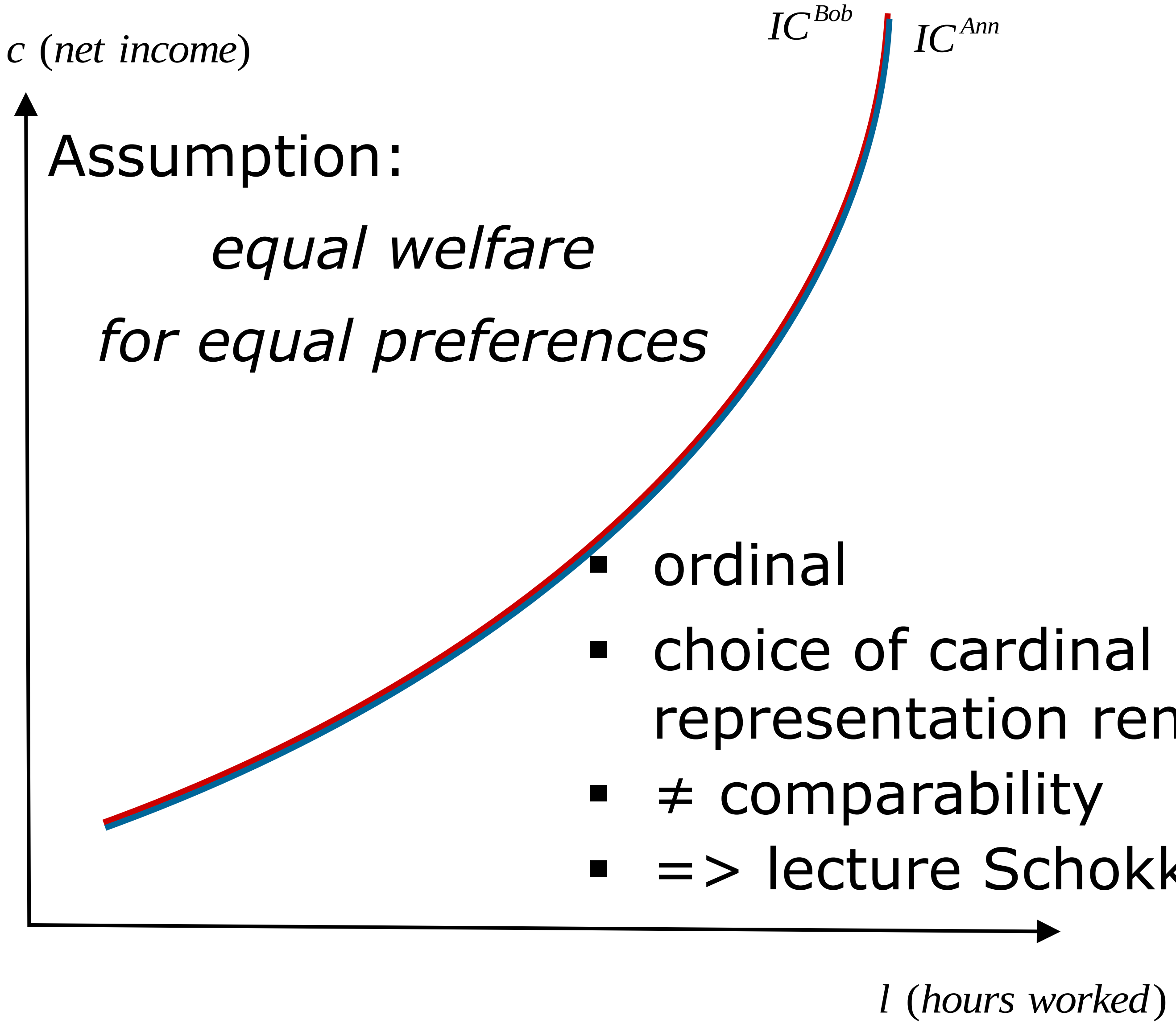


2. preference heterogeneity



- who is better off?
- is a non trivial question

2. individual welfare comparison



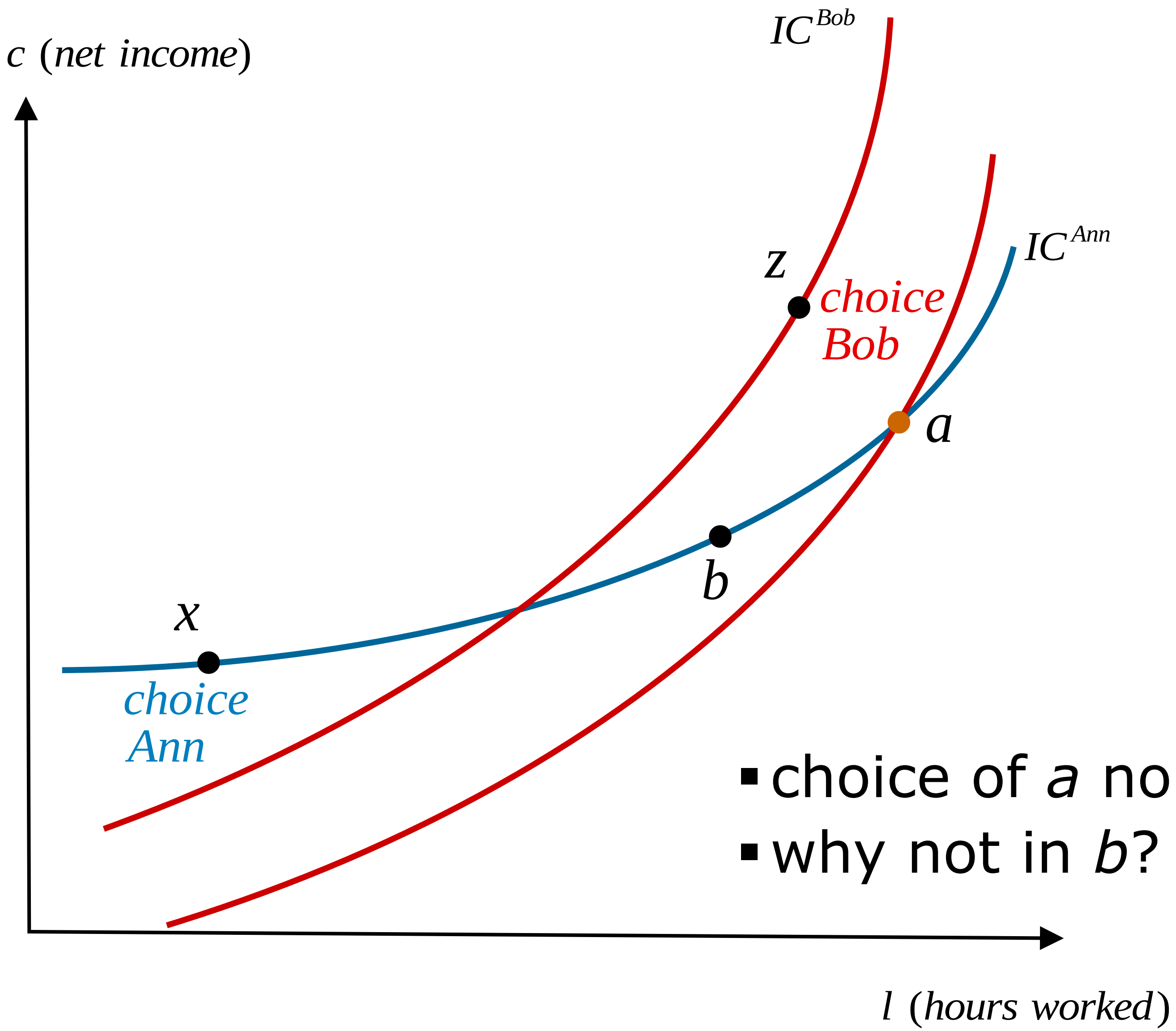
Assumption:

equal welfare

for equal preferences

- ordinal
- choice of cardinal representation remains
- ≠ comparability
- => lecture Schokkaert

2. individual welfare comparison



- choice of *a* non trivial
- why not in *b*?

2. individual welfare comparison

- several ‘solutions’ have been used

1. discard preferences completely

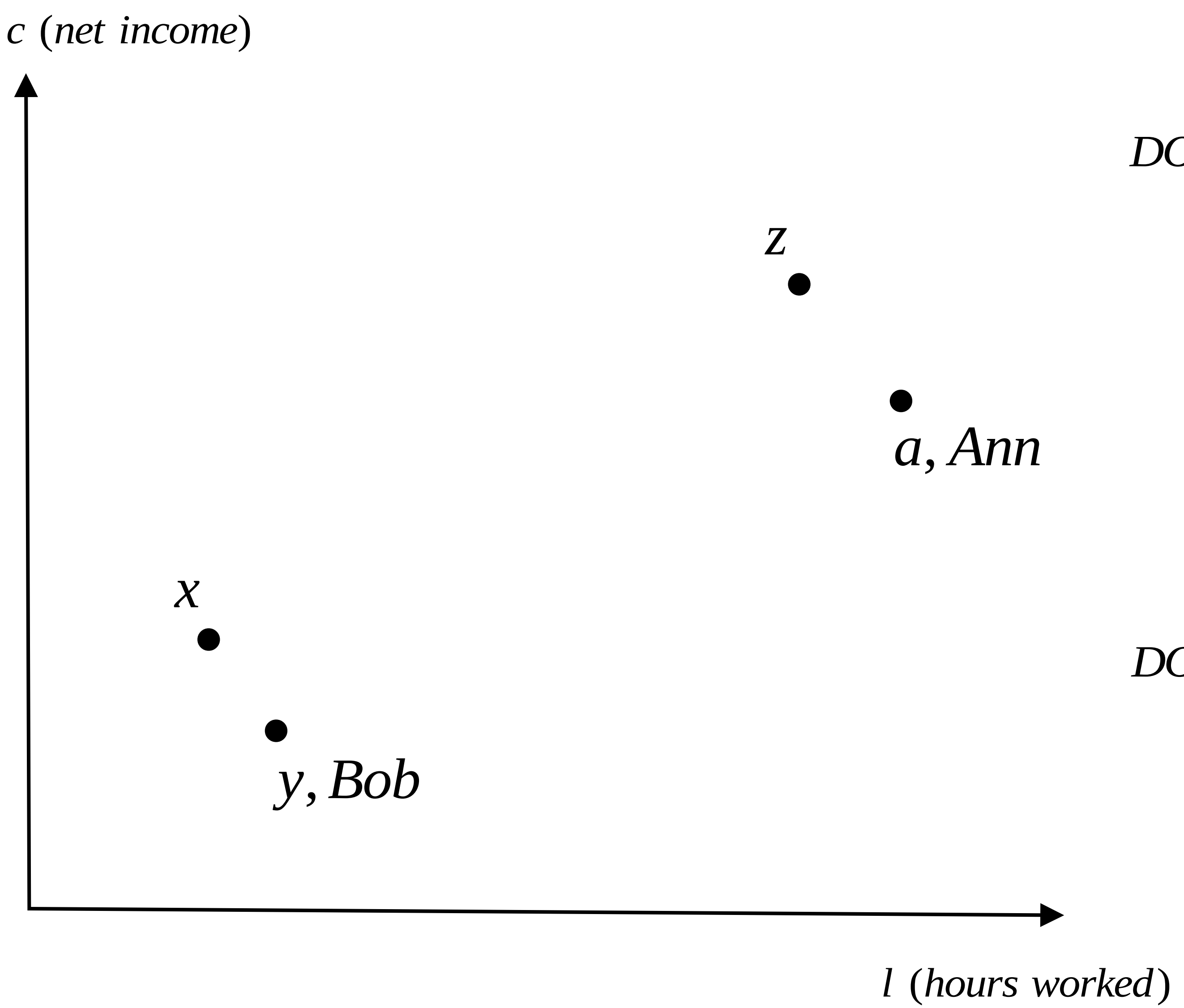
   e.g. dominance principle

2. discard preference *heterogeneity*

3. money metric utility

4. reference bundles

2. individual welfare comparison



$$DOM:(x, Ann) \succ (y, Bob)$$

$$DOM:(z, Bob) \succ (a, Ann)$$

2. individual welfare comparison

- several ‘solutions’ have been used

1. discard preferences completely

   e.g. dominance principle

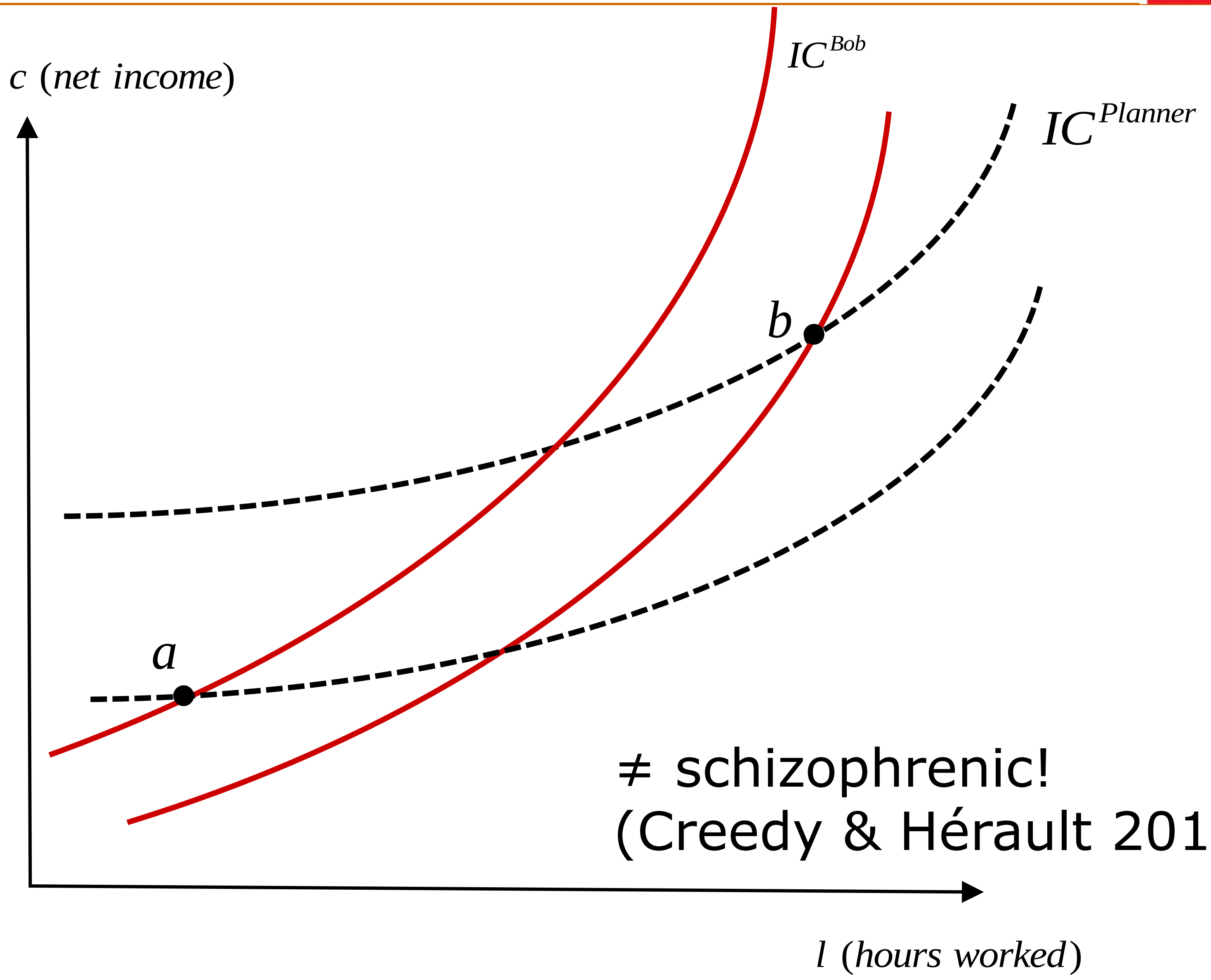
2. discard preference *heterogeneity*

   e.g. common utility function, ‘perfectionism’

3. money metric utility

4. reference bundles

2. individual welfare comparison



≠ schizophrenic!
(Creedy & Hérault 2013)

2. individual welfare comparison

- several ‘solutions’ have been used

1. discard preferences completely

   e.g. dominance principle

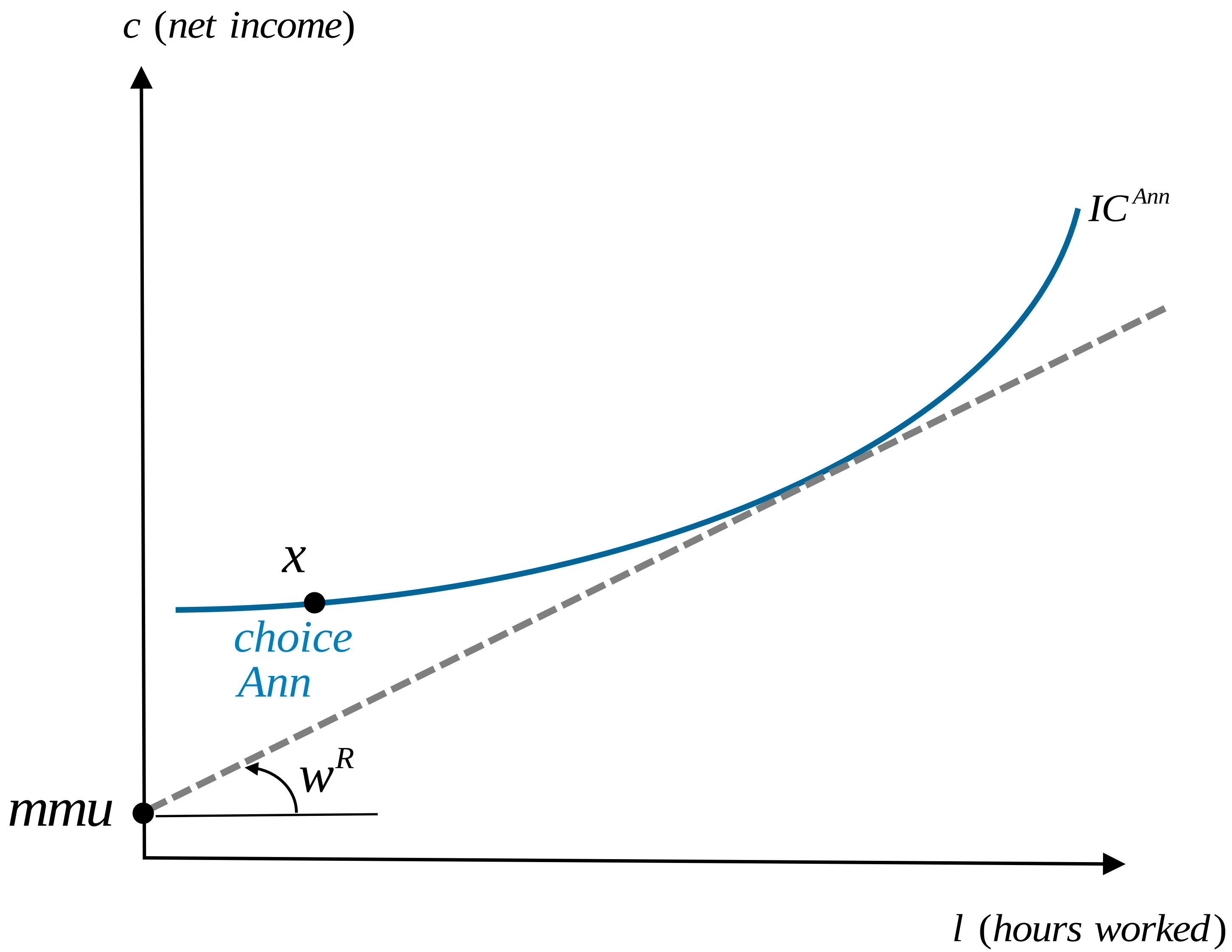
2. discard preference heterogeneity

   e.g. common utility function, ‘perfectionism’

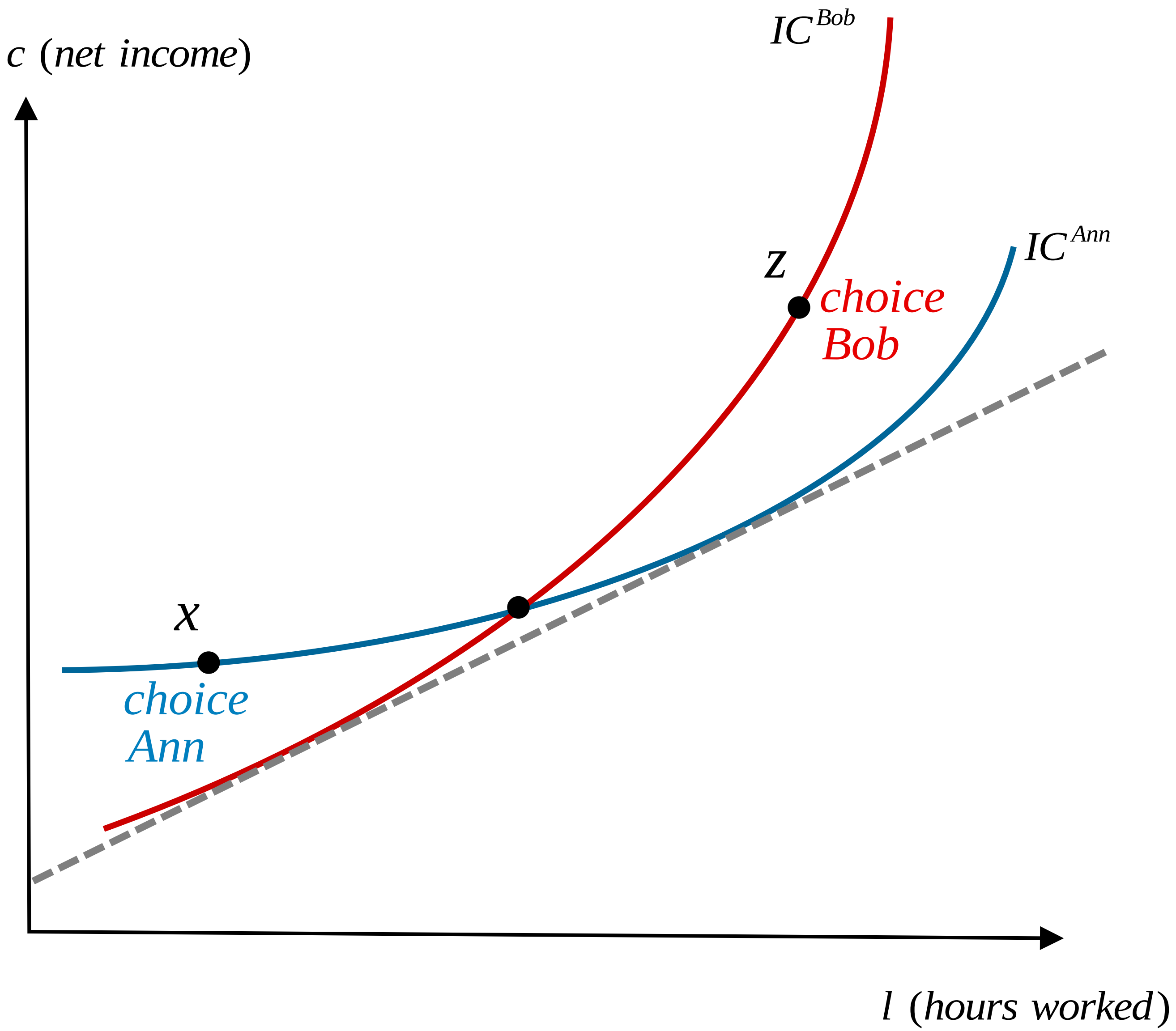
3. money metric utility (“rebirth”)

4. reference bundles

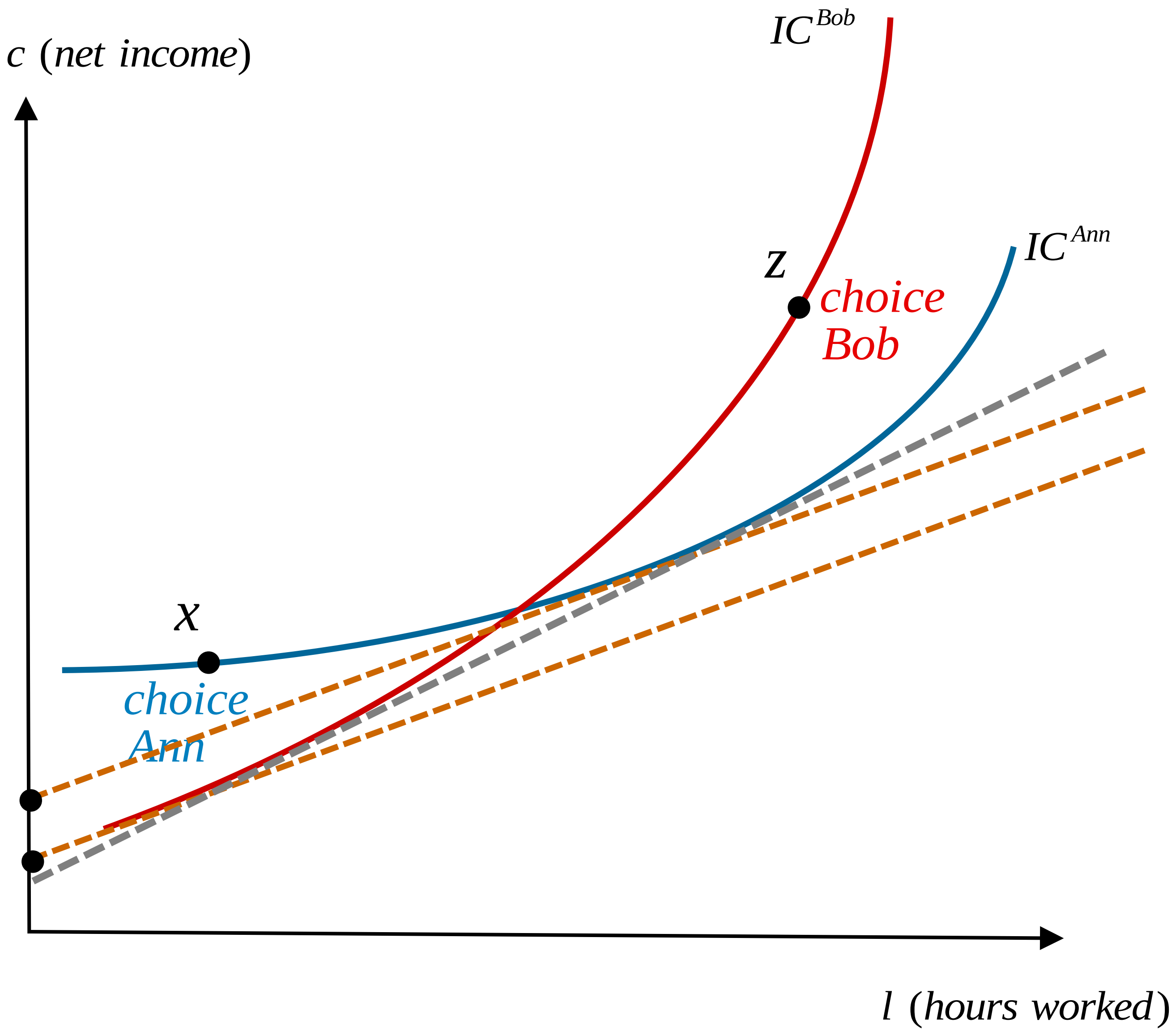
2. money metric



2. money metric

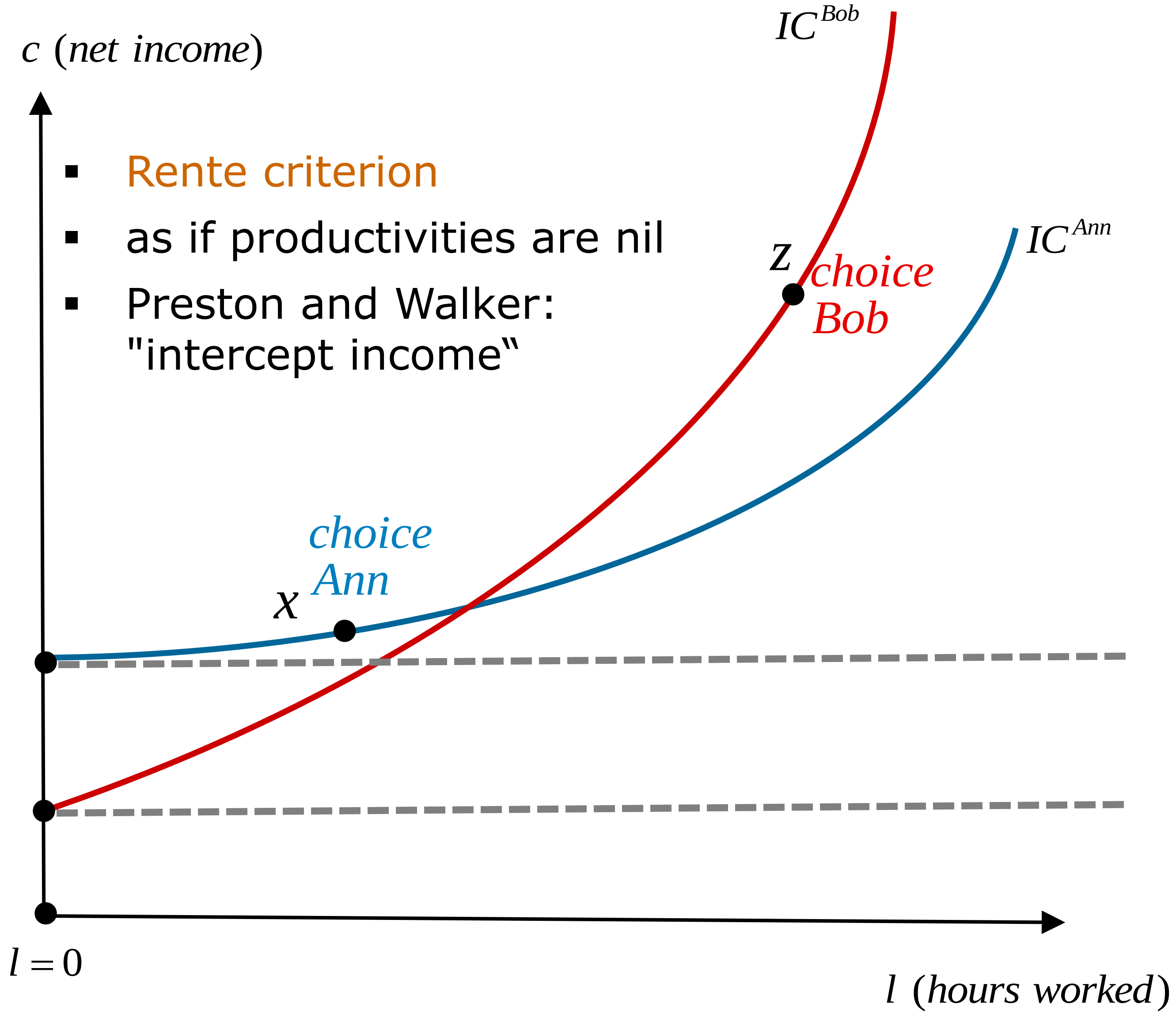


2. money metric



2. money metric

- Rente criterion
- as if productivities are nil
- Preston and Walker: "intercept income"

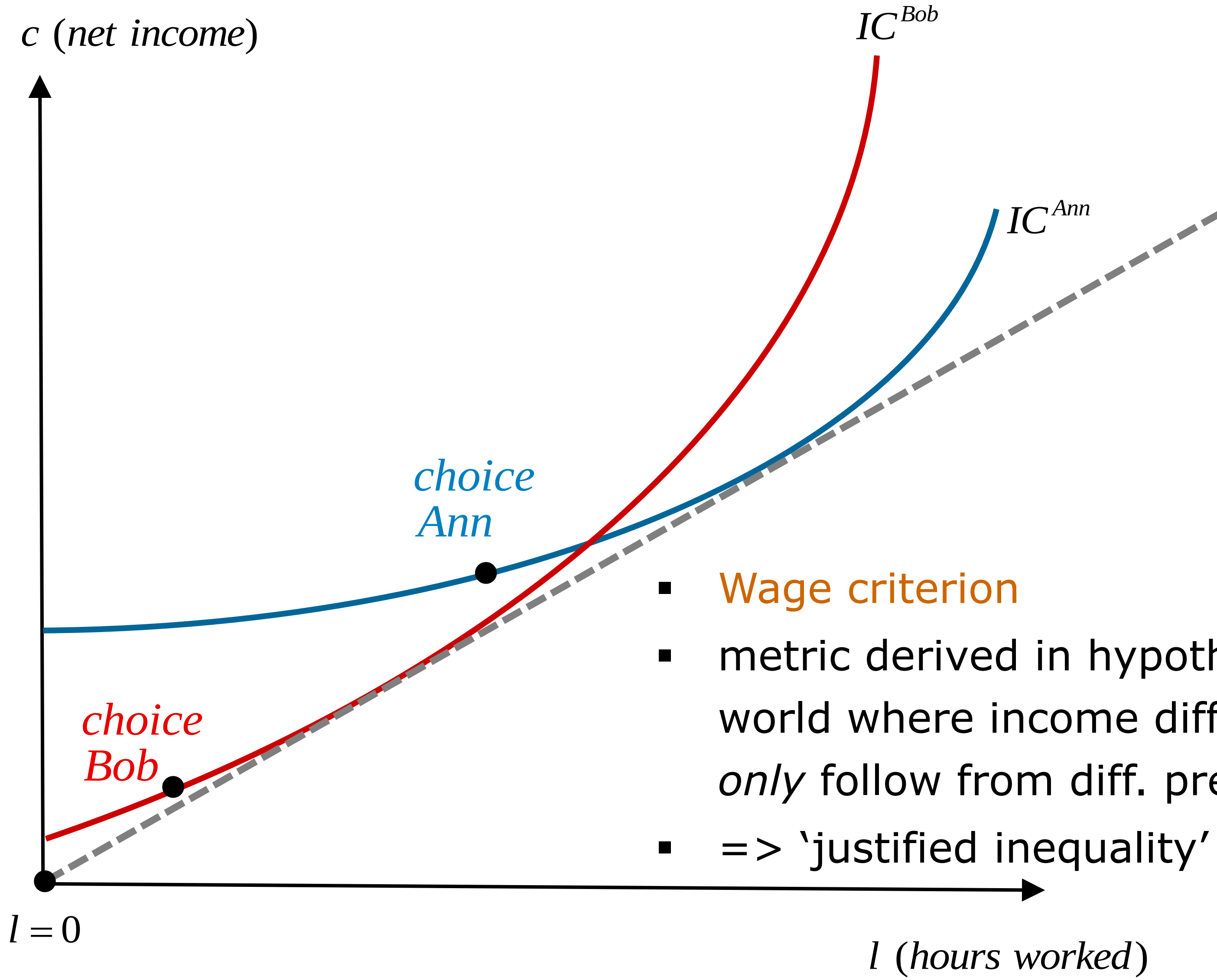


2. individual welfare comparisons

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

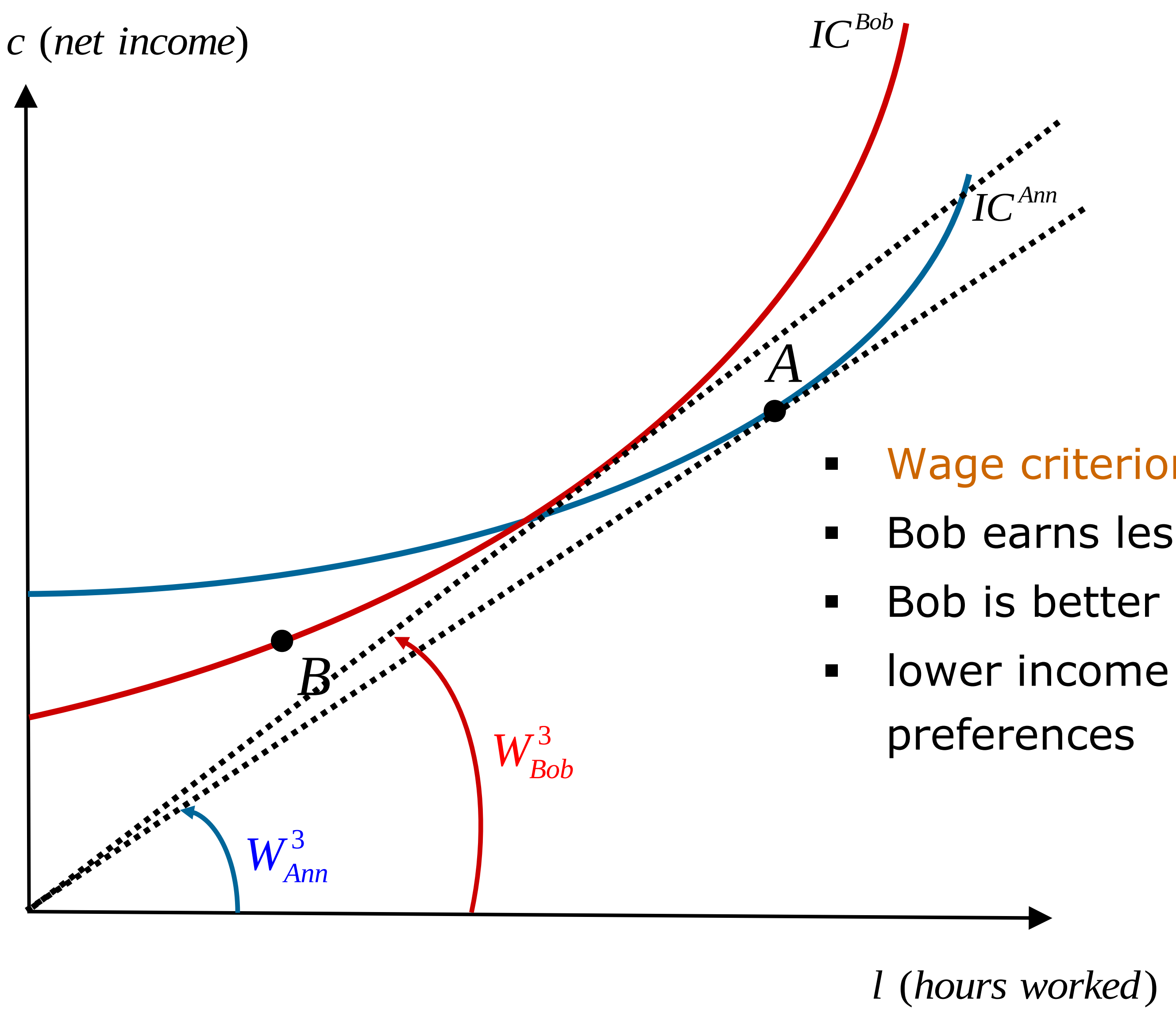
- many other possibilities:
  - wage criterion
  - reference bundles

2. individual welfare comparisons



- Wage criterion
- metric derived in hypothetical world where income differences *only* follow from diff. preferences
- => 'justified inequality'

2. individual welfare comparisons



- Wage criterion
- Bob earns less
- Bob is better off
- lower income due to preferences

2. individual welfare comparisons

- different ways to fix the comparison
- no need to impose ‘perfectionism’
- not only possible to use preference info
- also: respect preference heterogeneity
- of course:
  built on different underlying ethical priors

2. individual welfare comparisons

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

Let us now turn to the objection that the choice of reference parameters z_0 is crucial and arbitrary. For the equivalence approach more generally, what is at stake is the choice of reference sets $(B_\lambda)_{\lambda \in \mathbb{R}_+}$. The generality of the equivalence approach is helpful here because it suggests that the literature which criticizes the money-metric utility for being dependent on the reference price vector does not fully pursue the logic of its own critique. This literature accepts to take budget sets at given prices as the class of reference sets $(B_\lambda)_{\lambda \in \mathbb{R}_+}$. But this too should be questioned if one really wanted the analysis to be independent of the reference. Conversely, if one accepts to work with budget sets, why not examine if some reference prices are more plausible than others?

More directly, the answer to this objection is that if the equivalence approach depends on reference parameters, it can avoid arbitrariness if it develops an ethical theory of the choice of the reference. Some examples in the literature on fair social orderings show that rather natural axioms of fairness may force to adopt certain reference parameters. For

2. individual welfare comparisons

- different underlying ethical priors
- not always so clearly articulated (work to be done)
- our question: does it matter empirically?

Content

1. Context
2. Individual welfare metrics
3. Decoster & Haan (2010, 2011)
   Bargain et al. (2013)
4. Oslo-model
5. Conclusion

3. empirical applications

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

- preference heterogeneity inferred from 'standard' discrete choice model labour supply

$$(c_i, l_i) = \arg\max \left[u_i(c, l) \,|\, c \leq f\left(I_i, w_i l\right) \right]$$

- where preferences are structurally specified
- to check sensitivity of choice of individual welfare metric in empirical context of LS-model
- we calculated three metrics:

3. empirical applications

- We calculated

$$u_i(c_i, l_i) = u_i(W_i^1, 0)$$

$$u_i(c_i, l_i) = u_i(W_i^2 + w^R l_2, l_2)$$

$$u_i(c_i, l_i) = u_i(W_i^3 l_3, l_3)$$

$$(c_i, l_i) = \arg\max\left[u(c, l; \mathbf{z}_i)\, |c \leq f\,(I_i, w_i l)\right]$$

3. empirical applications

- two applications:
  - labour supply model German married women
  - cross country comparison for 12 countries


DISCUSSION PAPER SERIES

IZA

IZA DP No. 5301

Empirical Welfare Analysis in Random Utility Models of Labour Supply

André Decoster
Peter Haan

November 2010

3. Empirical application 1

- Germany SOEP-dataset (2005)
- limited decision females in couple (N=2076)
  - labour supply spouse is given
  - enters through non-labour income
- based on estimation of discrete choice model
  - *J=5* discrete alternatives
    (0; median of [0-15], [16-34], [35-40], >40)
  - allows non linearities & non convexities in budget set
  - deterministic part + stochastic term:

3. Empirical application 1

The state specific level of utility for household i, V_{ij}, at $j = 0, ..., J$, discrete states is defined as:

$$V_{ij} = u(c_{ij}, (1 - l_{ij}); \mathbf{z}_i) + \epsilon_{ij}.$$

with a Box-Cox functional form for deterministic part (cfr. Aaberge et al. (2004):

$$u(c_{ij}, (1 - l_{ij}); \mathbf{z}_i) = \beta_c \frac{c_{ij}^{\alpha_c} - 1}{\alpha_c} + \beta_l(\mathbf{z}_i) \frac{(1 - l_{ij})^{\alpha_l} - 1}{\alpha_l}$$

where β_c, β_l, α_c and α_l are the parameters to be estimated.

We introduce observed heterogeneity by taste-shifters for female's preferences for leisure:

$$\beta_l = \beta_{l0} + \boldsymbol{\beta}_{l1}^{'} \mathbf{z}_i$$

where $\mathbf{z}_i$ includes:

age of both spouses

formal education (three levels)

the number and age of children

regional information (East/West)

3. Empirical application 1

Table 2: Estimated parameters of Box-Cox utility function

	Coefficient	Standard Error
Preferences for Consumption		
α_c	0.20	0.14
β_c	3.47	0.59
Preferences for Leisure		
α_l	-1.82	0.33
β_{l0}	0.64	0.27
β_{l1} :		
Age of wife	1.79	0.95
Age of husband	-1.02	0.86
Child younger 3	1.75	0.41
Child between 4 and 6	0.95	0.23
East Germany	-0.64	0.15
Low Education	0.40	0.15
Medium Education	0.28	0.10

3. Empirical application 1

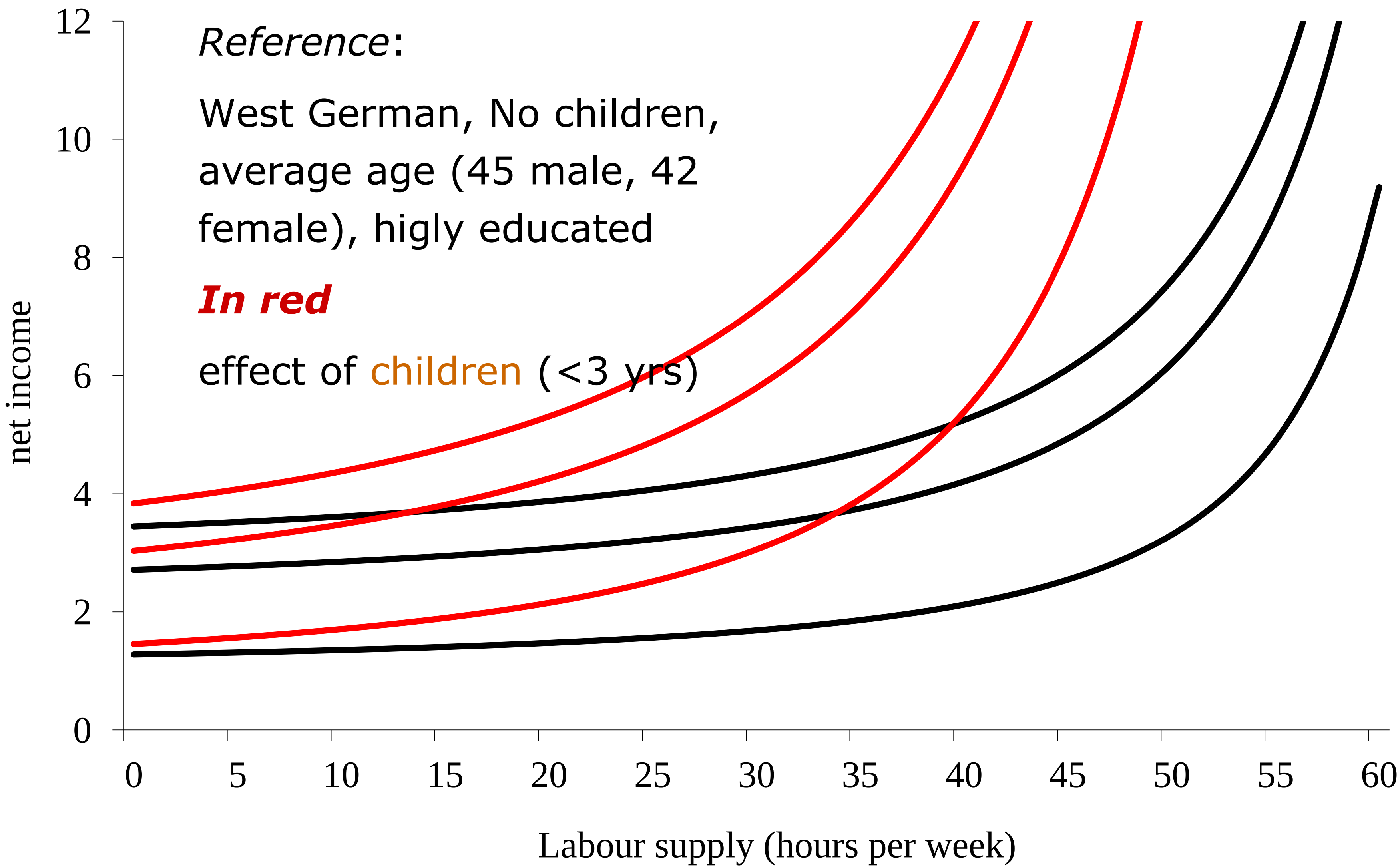
KU LEUVEN
CENTER FOR ECONOMIC STUDIES

Reference:

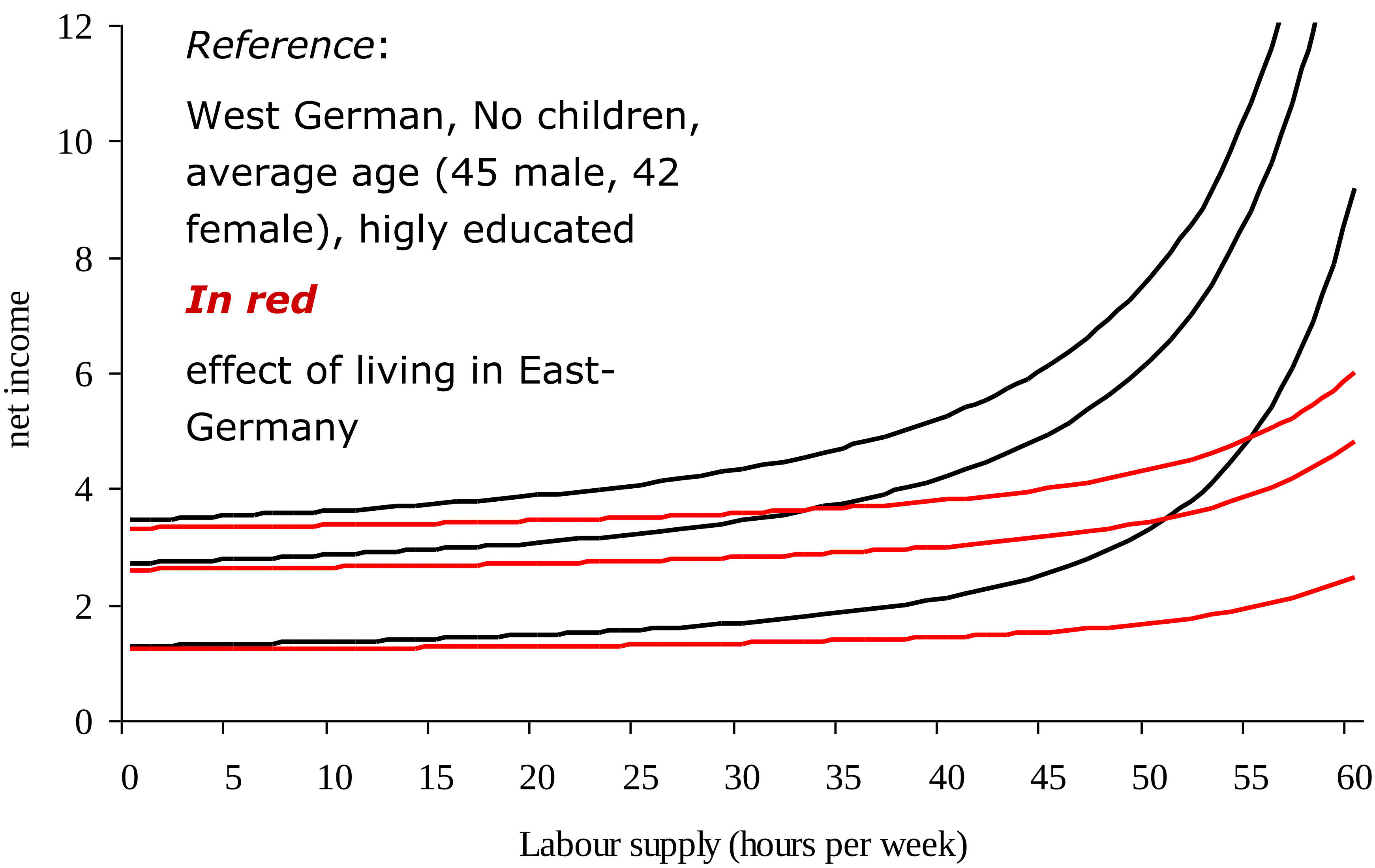
West German, No children, average age (45 male, 42 female), higly educated

In red

effect of children (<3 yrs)

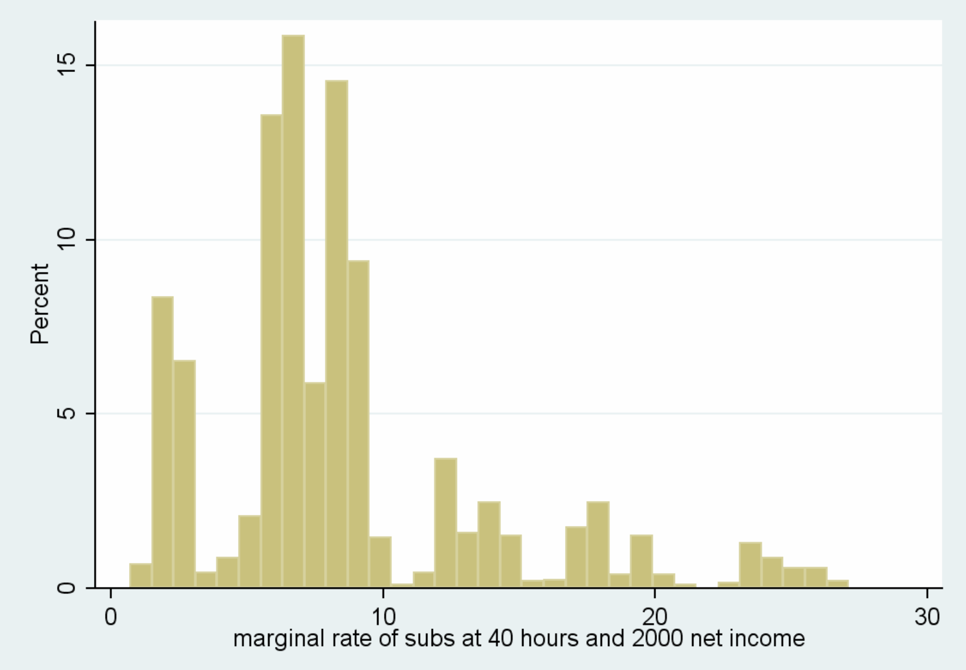


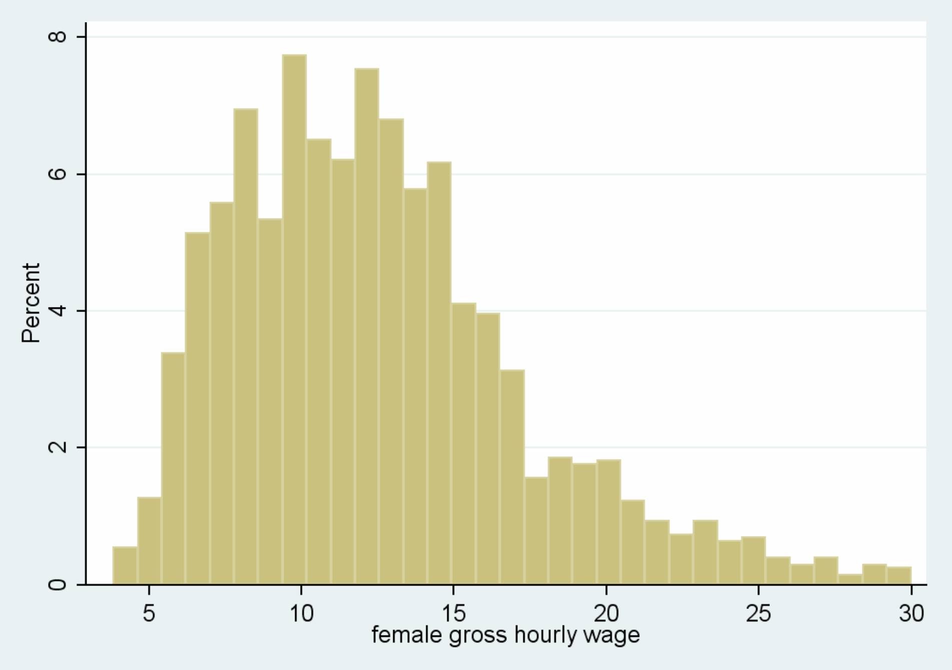
3. Empirical application 1



3. Empirical application 1: variation in the MRS

stats	gross wage	MRS
mean	12.9	8.5
min	3.8	0.7
max	91.8	27.1
sd	5.9	5.1
p10	7.0	2.4
p25	9.0	6.0
p50	11.9	7.4
p75	15.1	9.1
p90	19.7	16.9





3. Empirical application 1

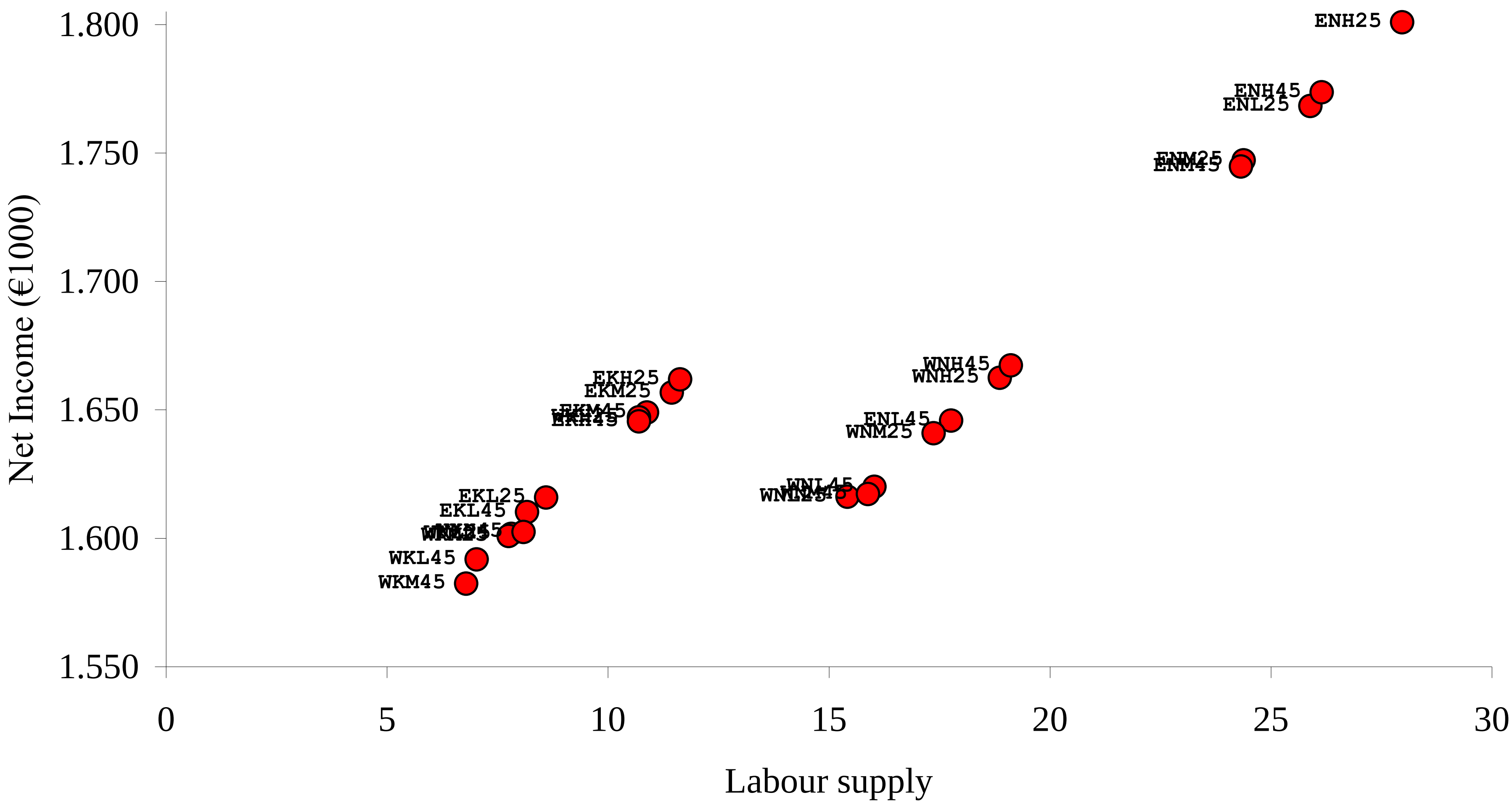
- Who is worst-off? => calculate welfare metric
- 100 draws from distribution error-term
- net income, leisure: expected values
- welfare metric: also expected value
- sensitivity of welfare ordering for
  - stylized households
  - for actual distribution

3. Empirical application 1

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

- Who is worst-off ?
- 24 stylized households:
  - female wage €10
  - husband is working full time
  - preference characteristics in label e.g. W-K-M-45
    - **W**est/**E**ast
    - **K**ids/**N**o Kids (children less than 3 years old)
    - **L**ow, **M**edium, **H**igh education
    - Age of female in years (and husband same age)
  - simulate labour supply and net income:

3. Empirical application 1



3. Empirical application 1

net income	W1	W2 €7	W2 €12	W2 €20	W3
WKM45	WKL25	WNL25	ENH25	ENH45	ENH45
WKL45	WKL45	EKL25	ENM25	ENL45	WNH25
WKM25	EKL45	WKL25	WNL25	ENM45	ENH25
WKL25	EKL25	WKM25	WNM25	ENH25	ENM25
WKH45	WKH45	EKL45	WNM45	WNH25	WNH45
EKL45	WKM25	WNL45	WNH45	WNL45	WNM25
EKL25	**WKM45**	EKM45	ENM45	WNH45	ENL25
WNL25	EKH25	WNM45	WNL45	ENL25	ENL45
WNM45	EKM25	WKL45	EKH25	WNL25	EKH45
WNL45	WNL25	EKM25	EKL25	WNM25	WNL25
WNM25	EKM45	WKH45	EKM25	WKL25	ENM45
EKH45	WNL45	WKH25	ENH45	ENM25	WNM45
ENL45	WNM25	WNM25	ENL25	WNM45	EKM25
WKH25	WKH25	ENH45	EKM45	WKM25	WNL45
EKM45	WNM45	**WKM45**	EKH45	EKH25	EKM45
EKM25	EKH45	EKH25	EKL45	WKL45	EKL25
EKH25	WNH45	ENM45	WKM25	**WKM45**	EKL45
WNH25	ENM45	EKH45	WKL25	WKH25	WKH25
WNH45	ENL45	WNH45	WKL45	WKH45	WKH45
ENM45	ENL25	ENL45	WKH45	EKL25	WKM25
ENM25	WNH25	ENM25	WKH25	EKL45	WKL25
ENL25	ENH45	ENH25	ENL45	EKM25	**WKM45**
ENH45	ENM25	WNH25	**WKM45**	EKM45	EKH25
ENH25	ENH25	ENL25	WNH25	EKH45	WKL45

3. Empirical application 1

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

net income	W1	W2 €7	W2 €12	W2 €20	W3
WKM45	WKL25	WNL25	ENH25	**ENH45**	**ENH45**
WKL45	WKL45	EKL25	ENM25	ENL45	WNH25
WKM25	EKL45	WKL25	WNL25	ENM45	ENH25
WKL25	EKL25	WKM25	WNM25	ENH25	ENM25
WKH45	WKH45	EKL45	WNM45	WNH25	WNH45
EKL45	WKM25	WNL45	WNH45	WNL45	WNM25
EKL25	**WKM45**	EKM45	ENM45	WNH45	ENL25
WNL25	EKH25	WNM45	WNL45	ENL25	ENL45
WNM45	EKM25	WKL45	EKH25	WNL25	EKH45
WNL45	WNL25	EKM25	EKL25	WNM25	WNL25
WNM25	EKM45	WKH45	EKM25	WKL25	ENM45
EKH45	WNL45	WKH25	**ENH45**	ENM25	WNM45
ENL45	WNM25	WNM25	ENL25	WNM45	EKM25
WKH25	WKH25	**ENH45**	EKM45	WKM25	WNL45
EKM45	WNM45	**WKM45**	EKH45	EKH25	EKM45
EKM25	EKH45	EKH25	EKL45	WKL45	EKL25
EKH25	WNH45	ENM45	WKM25	**WKM45**	EKL45
WNH25	ENM45	EKH45	WKL25	WKH25	WKH25
WNH45	ENL45	WNH45	WKL45	WKH45	WKH45
ENM45	ENL25	ENL45	WKH45	EKL25	WKM25
ENM25	WNH25	ENM25	WKH25	EKL45	WKL25
ENL25	**ENH45**	ENH25	ENL45	EKM25	**WKM45**
ENH45	ENM25	WNH25	**WKM45**	EKM45	EKH25
ENH25	ENH25	ENL25	WNH25	EKH45	WKL45

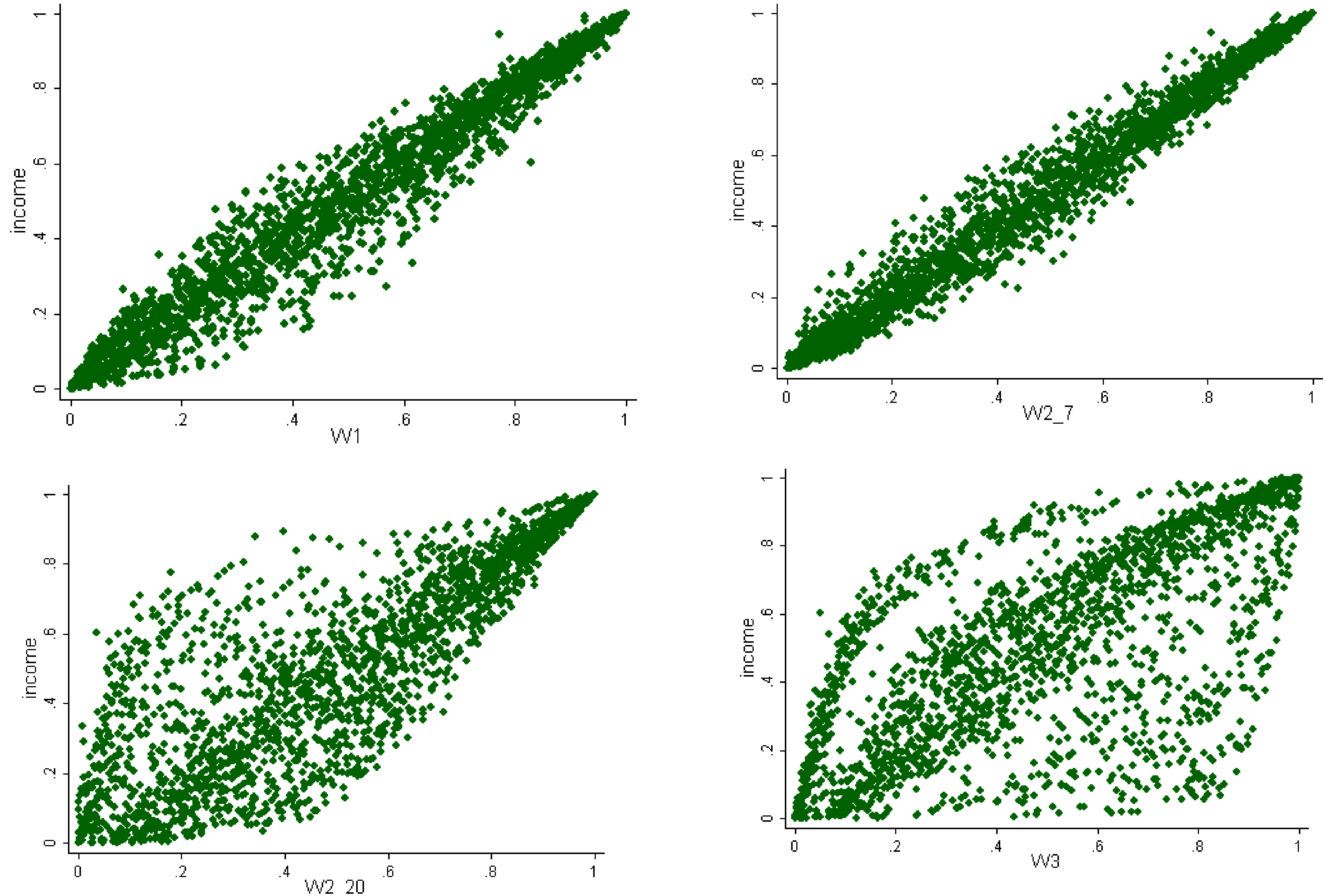
3. Empirical application 1

- Who is worst-off ?
- Now we combine with variation of actual gross wages and non labour incomes in the dataset

3. Empirical application 1

Quintiles	Income	Rente Criterion	Reference wage 7	Reference wage 12	Reference wage 20	Wage Criterion
			Share of households in East Germany			
1	0.31	0.22	0.33	0.47	0.61	0.62
2	0.21	0.18	0.20	0.17	0.16	0.18
3	0.17	0.20	0.17	0.15	0.07	0.14
4	0.17	0.24	0.15	0.12	0.10	0.05
5	0.17	0.19	0.16	0.11	0.08	0.04
			Share of households with low education			
1	0.23	0.24	0.21	0.17	0.11	0.09
2	0.14	0.14	0.14	0.18	0.20	0.14
3	0.12	0.09	0.12	0.11	0.13	0.19
4	0.05	0.05	0.05	0.07	0.07	0.08
5	0.03	0.02	0.03	0.03	0.03	0.06
			Share of household with children younger 3			
1	0.22	0.29	0.23	0.12	0.03	0.00
2	0.16	0.12	0.15	0.17	0.11	0.02
3	0.07	0.08	0.09	0.12	0.19	0.04
4	0.09	0.06	0.07	0.10	0.15	0.18
5	0.05	0.03	0.03	0.06	0.10	0.33

3. Empirical application 1



3. Empirical application 2

- two applications:
  - labour supply model German married women
  - cross country comparison for 12 countries

Soc Choice Welf (2013) 41:789–817
DOI 10.1007/s00355-012-0707-x

ORIGINAL PAPER

Welfare, labor supply and heterogeneous preferences: evidence for Europe and the US

**Olivier Bargain · André Decoster ·
Mathias Dolls · Dirk Neumann ·
Andreas Peichl · Sebastian Siegloch**

Content

4. Oslo-model

- build the bridge in two directions

positive model — *normative literature*

- standard discrete choice model ← • individual welfare metrics respecting preference heterogeneity

- richer structural specification (Oslo-model) → • get preferences "right"
  • separate preferences from demand side constraints

work in progress with Capéau & Vanleenhove

4. Oslo-model

- disentanglement increasingly important in normative literature
  - see lectures Trannoy/Schokkaert
  - “responsible” for preferences
  - “not responsible” for circumstances
  - justified, unjustified inequalities

4. Oslo-model

- example 1: regional CGE-model Belgium
- region-specific calibration:

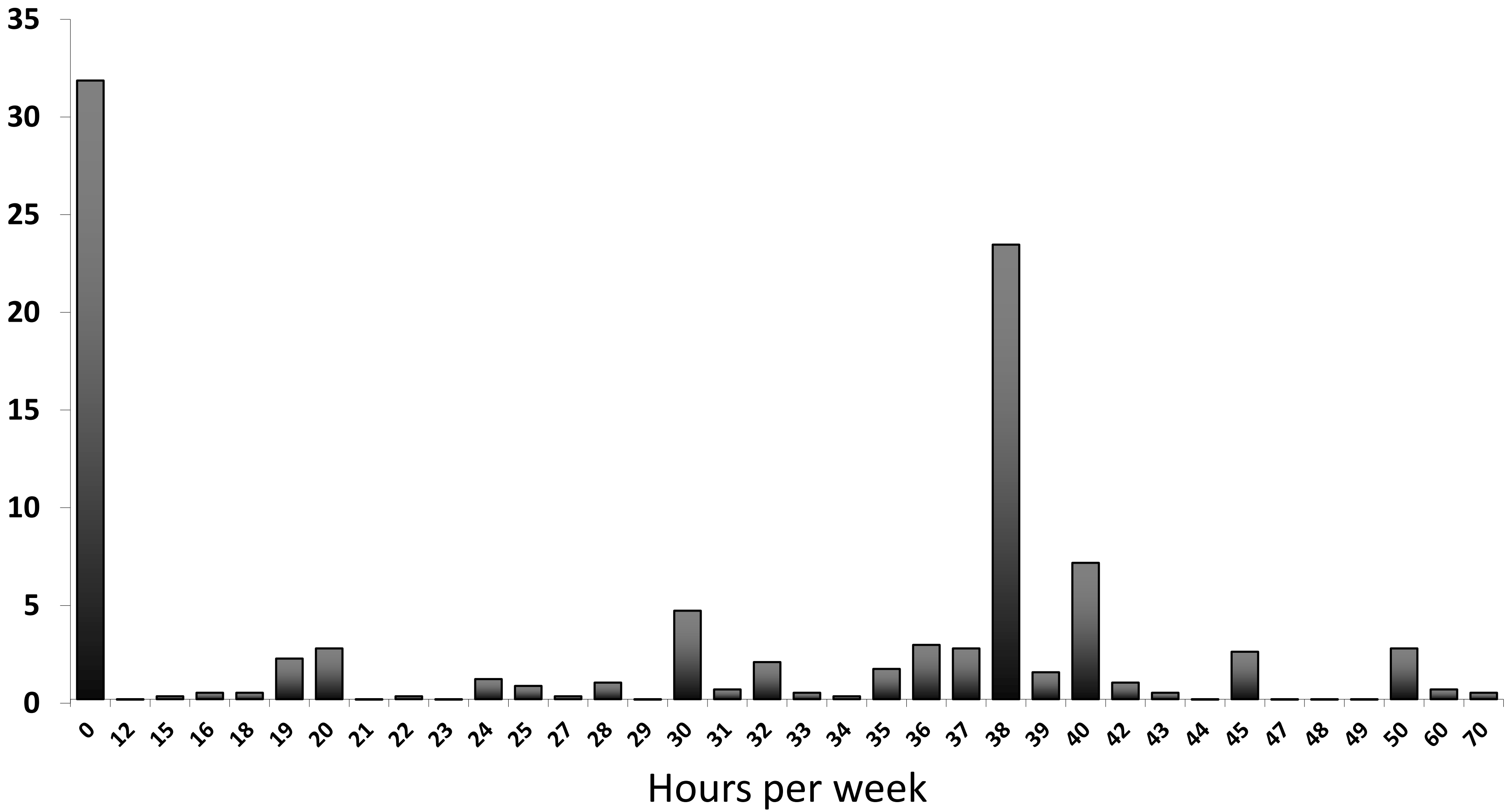
$$U(C,L) = \beta_C \ln(C - \gamma_C) + \beta_L \ln(L - \gamma_L)$$

	β_C	β_L
Brussels	0.737	0.263
Flanders	0.774	0.226
Wallonia	0.808	0.192

Table 4.2: Calibrated preference parameters

4. Oslo-model

- example 2: choice of hours (single females)



4. Oslo-model

- do we really believe this is driven by (only) “preferences”?
- answer from “the Oslo-model”:
  - heterogeneity in preferences
  - ànd much more heterogeneity in choice sets
- richer model (structure)
  - not because of better fit (=> dummies)
  - but structural interpretation allows additional simulations (besides only tax changes)

4. Oslo-model

- Dagsvik (1994)
- Aaberge, Dagsvik and Strøm (1995)
- Aaberge, Colombino and Strøm (1999)
- Dagsvik and Strøm (2006)
- Aaberge, Colombino & Wennemo (2009)
- Aaberge and Colombino (2013)

4. Oslo-model

standard model

- choice of discrete h
- h: uniform distr.
- gross wage given

Oslo model

- choice of j: (h,w,k)
- h: non uniform
- gross wage distrib.

4. Oslo-model

- difference: in choice set
- From Aaberge et al. (2000):

Tilburg   Oslo

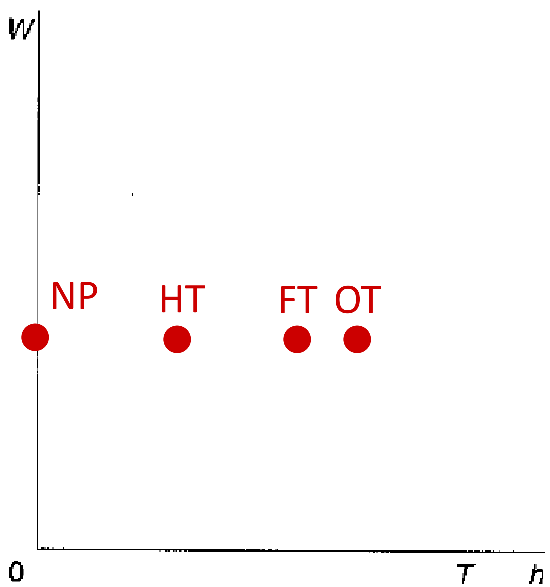


Figure 13.1 The opportunity set in the traditional approach

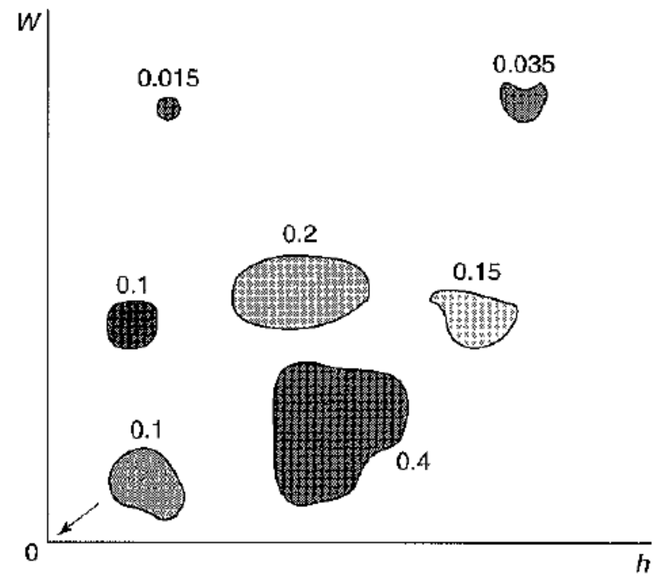


Figure 13.2 The opportunity set in our model approach (the numbers represent hypothetical densities or relative frequencies of alternatives in the corresponding 'spot')

4. Oslo-model

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

standard model	Oslo model
• choice of discrete h	• choice of j: (h,w,k)
• h: uniform distr.	• h: non uniform
• gross wage given	• gross wage distrib.
• tax-benefit system	• tax-benefit system
• functional form U(.)	• functional form U(.)
• assumptions about stochastic part	• assumptions about stochastic part
• => prob (h)	• => prob (h,w)

4. Oslo-model

- probability:

$$\varphi(h) = \Pr\left[U\left(f(wh,I),h\right) = \max_{y\in B} U\left(f(wy,I),y\right)\right]$$
$$= \frac{\exp\left[v\left(w,h\right)\right]}{\int\limits_{y\in B} \exp\left[v\left(w,y\right)\right]dy},$$

- standard multinomial logit-model (relative attractiveness of the choice)
- Oslo

$$\varphi(w,h) = \Pr\left[U\left(f(wh,I),h\right) = \max_{(x,y)\in B} U\left(f(xy,I),y\right)\right]$$
$$= \frac{\exp\left[v\left(w,h\right)\right] p(w,h)}{\int\limits_{(x,y)\in B} \exp\left[v\left(x,y\right)\right] p(x,y)\, dx\cdot dy},$$

- weighted by measure of 'availability'

4. Oslo-model

- Structural => empirical specifications
  - preferences
  - opportunities (job availability)

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

- preferences: Box-Cox

The functional form of the deterministic part of utility is the following for singles, where $C = f(wh, I)$ stands for monthly household disposable income and $L = 1 - (h/168)$ for leisure time of either the single male or the single female:

$$v(C, L) = \beta_c \left(\frac{C^{\alpha_c} - 1}{\alpha_c} \right) + \beta_L \left(\frac{L^{\alpha_L} - 1}{\alpha_L} \right), \qquad (26)$$

with observed heterogeneity in preferences modelled by means of covariates which influence the leisure coefficient β_L linearly:

$$\beta_L = \beta_{L0} + \sum_k \beta_{Lk} z_k, \qquad (27)$$

and the k-vector of covariates $\mathbf{z}$ containing the following variables:

4. Oslo-model

- preferences couples

$$v(C, L_m, L_f) = \beta_c \left(\frac{C^{\alpha_c} - 1}{\alpha_c} \right) + \beta_{Lf} \left(\frac{L^{\alpha_{Lf}} - 1}{\alpha_{Lf}} \right) + \beta_{Lm} \left(\frac{L^{\alpha_{Lm}} - 1}{\alpha_{Lm}} \right)$$
$$+ \beta_{Lfm} \left(\frac{L^{\alpha_{Lm}} - 1}{\alpha_{Lm}} \right) \left(\frac{L^{\alpha_{Lm}} - 1}{\alpha_{Lm}} \right)$$

- unitary model

4. Oslo-model

- job availability

$$\varphi(w,h) = \frac{\exp[v(w,h)] \cdot p(w,h)}{\int_{(x,y)\in B} \exp[v(x,y)] \cdot p(x,y) \cdot dx \cdot dy}$$

- market versus non-market

$$p(w,h) = \begin{cases} p_1 \cdot g(w,h) & \text{if } h,w > 0 \\ p_0 & \text{if } h,w = 0 \end{cases}$$

$$q_0 = \frac{p_1}{p_0}$$

4. Oslo-model

- job availability
  - market versus non-market

$$\log q_0 = \theta_0 + \theta_1 Edu_{low} + \theta_2 Edu_{high} + \theta_3 Wal + \theta_4 Bxl$$

  - market subset

$$g(w,h) = g_1(w) \cdot g_2(h) \quad , \tag{10}$$

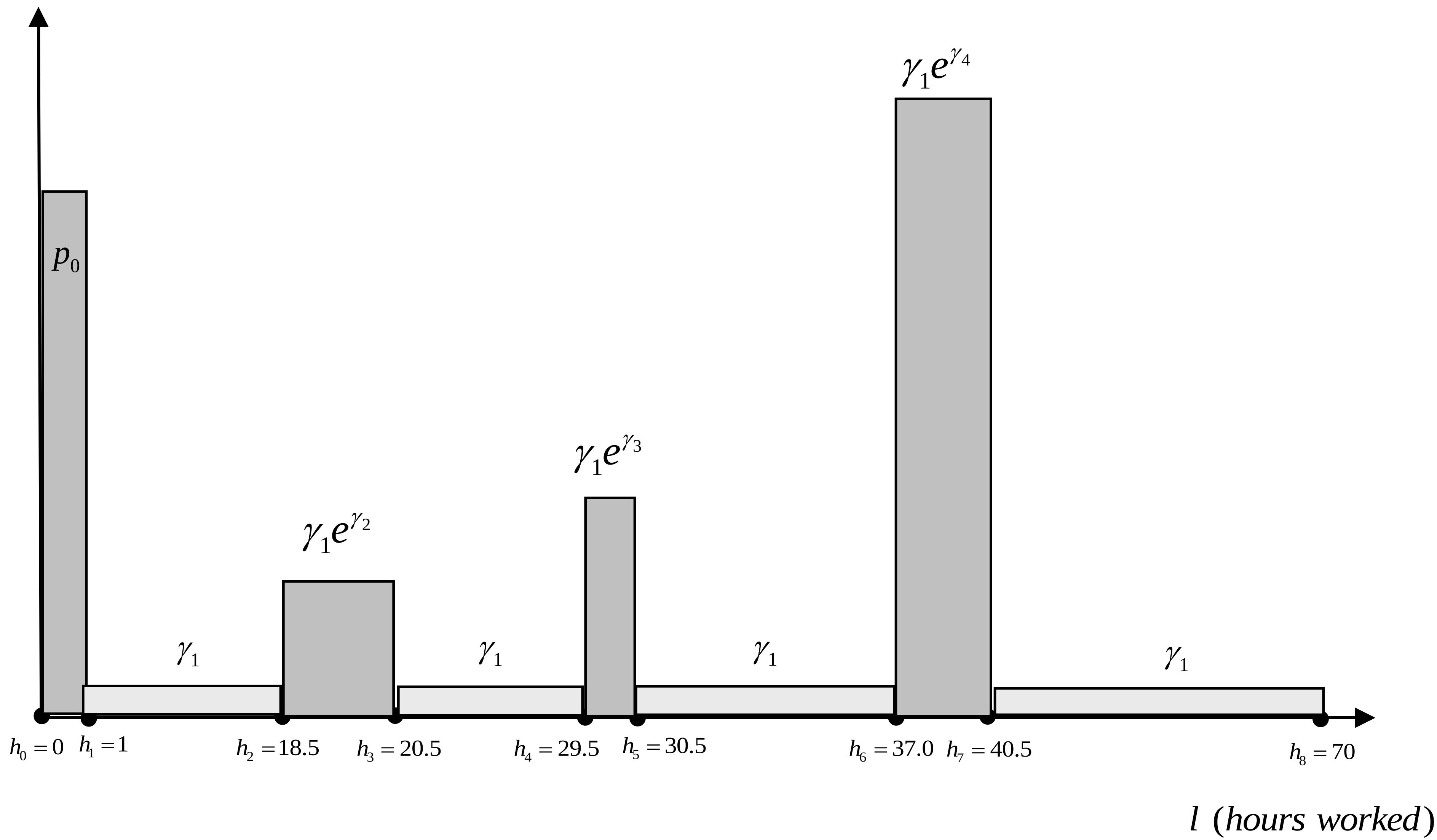
in which $g_1(w)$ and $g_2(h)$ are respectively the densities of wages and offered hours for market opportunities $(w, h > 0)$.

4. Oslo-model

- job availability
  - market subset
    - wages: lognormal (covariates: age, education)
    - hours:

$$g_2(h) = \begin{cases} \gamma_1 & h \in [01.0, 18.5[\\ \gamma_1 \exp \gamma_2 & h \in [18.5, 20.5[\\ \gamma_1 & h \in [20.5, 29.5[\\ \gamma_1 \exp \gamma_3 & h \in [29.5, 30.5[\\ \gamma_1 & h \in [30.5, 37.0[\\ \gamma_1 \exp \gamma_4 & h \in [37.0, 40.5[\\ \gamma_1 & h \in [40.5, 70.0[\end{cases}$$

4. Oslo-model



p_0
γ_1
$\gamma_1 e^{\gamma_2}$
γ_1
$\gamma_1 e^{\gamma_3}$
γ_1
$\gamma_1 e^{\gamma_4}$
γ_1
$h_0 = 0$
$h_1 = 1$
$h_2 = 18.5$
$h_3 = 20.5$
$h_4 = 29.5$
$h_5 = 30.5$
$h_6 = 37.0$
$h_7 = 40.5$
$h_8 = 70$
l (hours worked)

4. Oslo-model

- what is identified?
- hinges on the separability of g(h,w)
- non parametrically identified:
  - $v(C,h).g_2(h)$
  - q_0
  - $g_1(w)$

4. Oslo-model

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

- ML-estimation
  - 200 draws to approximate Choice Set
- on EU-SILC 2007
  - 571 single females
  - 449 single males
  - 1457 couples
- tax benefit simulator of EUROMOD

4. Oslo-model: baseline

- coefficients for utility function
- coefficients for opportunities
  - market versus non market (q_0)
  - hours (peaks): $g_2(h)$
  - wage distribution: $g_1(w)$
- elasticities
- fit of
  - hours choice and participation rates
  - income distribution

4. Oslo-model: baseline

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

Table 10: Labor supply elasticities: couples

	Unconditional elast	**Conditional elast**	**Participation elast**
	Female in couple		
Quartile 1	0.81	0.09	0.62
Quartile 2	0.49	0.04	0.40
Quartile 3	0.45	0.05	0.34
Quartile 4	0.34	0.10	0.17
Total	0.50	0.07	0.36
	Male in couple		
Quartile 1	0.42	0.14	0.22
Quartile 2	0.36	0.14	0.18
Quartile 3	0.30	0.13	0.14
Quartile 4	0.29	0.14	0.13
Total	0.33	0.14	.16

Source: Own Calculations, EU-SILC (2007)

4. Oslo-model: baseline

- preferences: by means of MRS
- based on v(C,h)
  - random term: part of preferences, neglected
- compared with a “Tilburg”-model
  - Choice set:
    - only own, observed wage
    - uniform hours distribution
  - remove the opportunity differentiation
  - “peaks” kept in

4. Oslo-model: baseline

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

Table 18: Marginal rate of substitution for single females (€ per hour)

	Oslo-model	**Tilburg model**
Total population	10.25	
# children 0-3: 0	10.18	
# children 0-3: 1	11.25	
# children 0-3: 2	14.02	
Age: 25-35	8.97	
Age: 35-50	9.55	
Age: 50+	13.07	

MRS are calculated in a fixed bundle $C = 2000$, $h = 38$

4. Oslo-model: baseline

Table 18: Marginal rate of substitution for single females (€ per hour)

	Oslo-model	**Tilburg model**
Total population	10.25	8.09
# children 0-3: 0	10.18	8.04
# children 0-3: 1	11.25	8.76
# children 0-3: 2	14.02	10.61
Age: 25-35	8.97	7.29
Age: 35-50	9.55	7.68
Age: 50+	13.07	9.81

MRS are calculated in a fixed bundle $C = 2000$, $h = 38$

4. Oslo-model: baseline

Table 6: Opportunity estimation

	Coeff.	t-value		Coeff.	t-value
Peak dummies: Female			***Peak dummies: Male***		
Peak dummy 1 (γ_2)	0.699**	0.114	*Peak dummy 1* (γ_2)	0.635**	0.231
Peak dummy 2 (γ_3)	1.493**	0.106	*Peak dummy 2* (γ_3)	0.843**	0.189
Peak dummy 3 (γ_4)	2.287**	0.075	*Peak dummy 3* (γ_4)	2.670**	0.059
Opportunities: Female			***Opportunities: Male***		
Constant (θ_{0f})	0.798**	0.291	*Constant* (θ_{0f})	−2.500**	0.233
Low educated	−0.366**	0.172	*Low educated*	−0.356	0.234
High educated	0.664**	0.175	*High educated*	−0.267	0.266
Wallonia	−0.416**	0.145	*Wallonia*	−0.657**	0.218
Brussels	−0.857**	0.209	*Brussels*	−1.211**	0.277

*Significant at 10% level, ** Significant at 5% level

Source: Own Calculations, EU-SILC (2007)

4. Oslo-model: baseline

- opportunities:
  - by calculating q_0
  - $g(h,w)$

4. Oslo-model: baseline

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

Table 1: Market and non-market opportunities: female

	1) Market opportunities (%)	2) Non-market opportunities (%)	Q0 (1/2)
Belgium	**73.04**	**26.96**	**3.30**
Low educated	61.98	38.02	1.72
Middle educated	70.08	29.92	2.50
High educated	81.38	18.62	4.79
Wallonia	**70.35**	**29.65**	**2.69**
Low educated	59.80	40.20	1.49
Middle educated	68.21	31.79	2.15
High educated	80.65	19.35	4.17
Brussels	**64.00**	**36.00**	**1.97**
Low educated	48.90	51.10	0.96
Middle educated	57.99	42.01	1.38
High educated	72.83	27.17	2.68
Flanders	**79.30**	**20.70**	**4.39**
Low educated	69.27	30.73	2.25
Middle educated	76.48	23.52	3.25
High educated	86.33	13.67	6.32

4. Oslo-model: Counterfactuals

- two counterfactual choices
  to be compared with the baseline
- Equal Opportunities (EO)
  - Choice set identical for all individuals
  - still gender specific:
    - male: 45 yrs old, middle educated, Flanders
    - female: 40 yrs old, middle educated, Flanders
  - Choice: on own preferences
  - random terms: identical as baseline

4. Oslo-model: Counterfactuals

- two counterfactual choices
  to be compared with the baseline
- Equal Preferences (EP)
  - Choice set from baseline
  - Choice: preferences of reference individual
    - gender specific
    - male: 45 yrs old, middle educated, Flanders
    - female: 40 yrs old, middle edcuated, Flanders
  - random terms: identical as baseline

4. Oslo-model: Counterfactuals

KU LEUVEN
CENTER FOR ECONOMIC STUDIES

Table 19: Participation rate: single female

Participation rate (%):	**Baseline**	**EO**	**EP**	**Δ EO-Base (pctp)**	**Δ EP-Base (pctp)**
Total population:	71.0	79.2	78.9	8.2	7.9
Quartile 1	50.1	71.6	58.9	21.5	8.8
Quartile 2	59.2	74.9	74.8	15.6	15.6
Quartile 3	86.1	81.7	89.7	−4.4	3.6
Quartile 4	87.1	88.3	91.1	1.3	4.1
Low educated	41.1	66.2	58.7	25.1	17.6
Middle educated	63.5	83.8	72.5	20.3	9.0
High educated	91.8	82.0	94.0	-9.8	2.2
Flanders	80.7	82.0	87.9	1.3	7.2
Wallonia	62.9	77.1	71.8	14.2	8.9
Brussels	62.3	76.0	70.1	13.7	7.8
age 25-35	76.3	85.5	77.5	9.2	1.2
age 35-50	73.7	80.4	76.8	6.7	3.1
age 50+	62.7	67.7	87.7	5.0	20.0

EO= Equal Opportunities, EP= Equal Preferences, FTE= Full Time Equivalent (=2000 hours/year)

4. Oslo-model: Counterfactuals

Table 17: Inequality

	Baseline	**EO**	**EP**
Gini:	24.01	20.65	24.42
Variance wage	24.56	19.77	25.77
Variance hours	322.73	266.92	296.58

4. Oslo-model: conclusion (1)

- Oslo-model seems to be promising structural model for empirical EO research

4. Oslo-model: conclusion (2)

- to do next
  - preliminary results driven mainly by wages
  - => investigate separate effects in differential opportunities (e.g. only the q_0)
  - re-estimate model on "rich data"
    - dig deeper in identification issues...
  - integrate random term in simulation of EP
  - use formal decomposition of labour earnings
  - calculate 'just' and 'unjust' inequalities