Not All Transitions are Equal

The distribution of education and the contribution of each transition to inequality of educational opportunity

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Outline

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- probabilities of passing transitions between levels of education

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- highest achieved level of education (overall IEO).

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- Mare(1981) showed that overall IEO depended on the transition probabilities, and
- that patrial IEO, as measured by odds ratios, do not.
- As a consequence the relation between partial and over IEO has largely been treated as a black box by:
  - Estimating both partial and overall IEOs and just noticing that they show different trends.
  - Showing the equation: $\sum_{k=1}^{K} \sum_{j=1}^{k} \lambda_j p_j (1 - p_j) \prod_{l \neq j}^{k} p_l$.
  - Using simulations.

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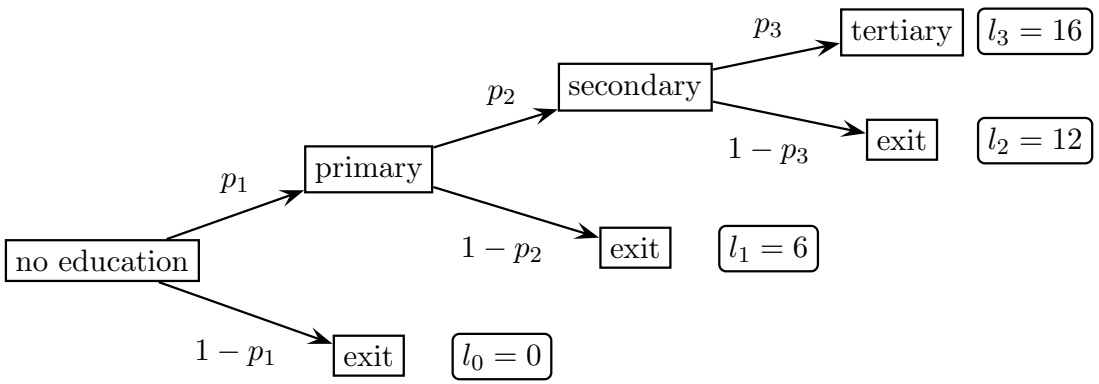
- Why bother?
  1. Differences in overall IEO are interesting in their own right.
  2. Partial IEOs (looking at the process) and overall IEO (looking at the end result) are natural complements.
  3. Differences between groups in transition probabilities are of substantive interest (e.g. educational expansion or gender IEO).

Outline

Example

Figure: Hypothetical educational system



Modeling transition probabilities and the expected level of education

$$p_{ki} = \frac{\exp(\alpha_k + \lambda_k SES_i)}{1 + \exp(\alpha_k + \lambda_k SES_i)} \quad \text{if} \quad y_{k-1\,i} = 1$$

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$$E(ed) = (1 - p_{1i})l_0 + p_{1i}(1 - p_{2i})l_1 + p_{1i}p_{2i}(1 - p_{3i})l_2 + p_{1i}p_{2i}p_{3i}l_3$$

partial and overall IEO

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$$\frac{\partial E(ed)}{\partial SES} =$$
$$\{1 \times p_{1i}(1-p_{1i}) \times [(1-p_2)l_1 + p_2(1-p_3)l_2 + p_2p_3l_3 - l_0]\}\lambda_1 +$$
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proportion at risk

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variance of the variable indicating whether one passes or not

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partial and overall IEO

expected increase in the level of education after passing

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partial and overall IEO

expected level of education for those that pass

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partial and overall IEO

minus the expected level of education for those that fail

$$\frac{\partial E(ed)}{\partial SES} =$$
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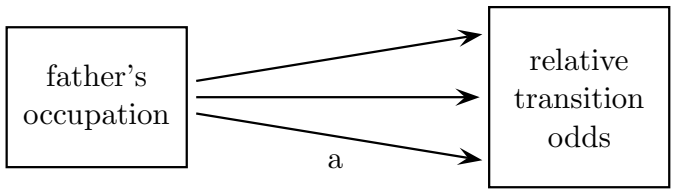
- weights = at risk $\times$ variance $\times$ gain

Differences in overall IEO between groups

Figure: Direct and indirect effect of cohort on status IEO



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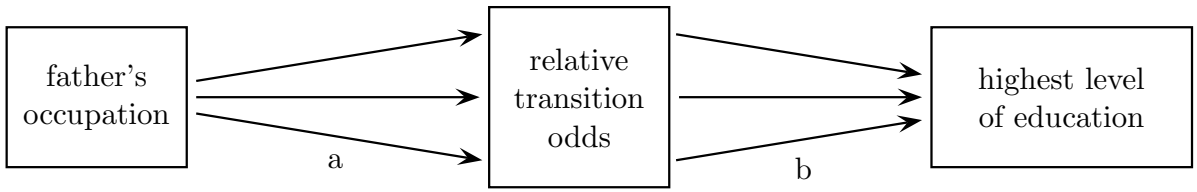

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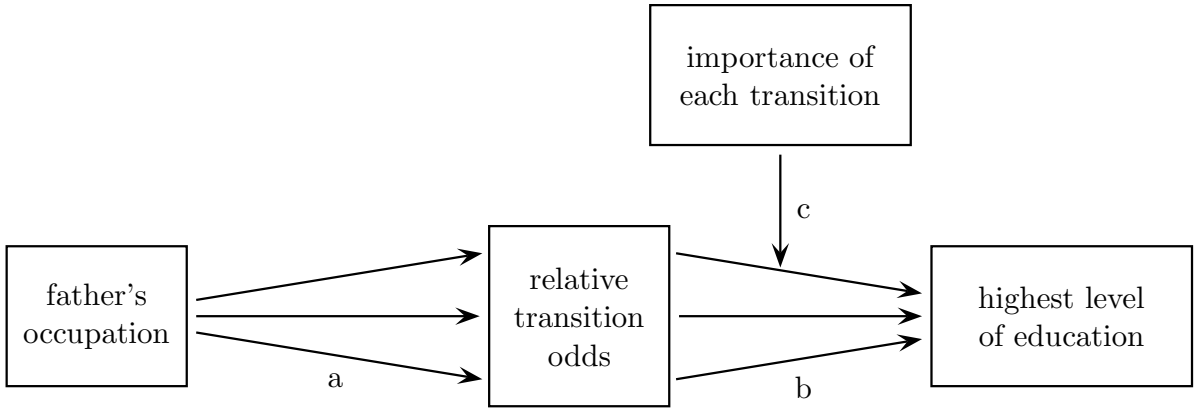

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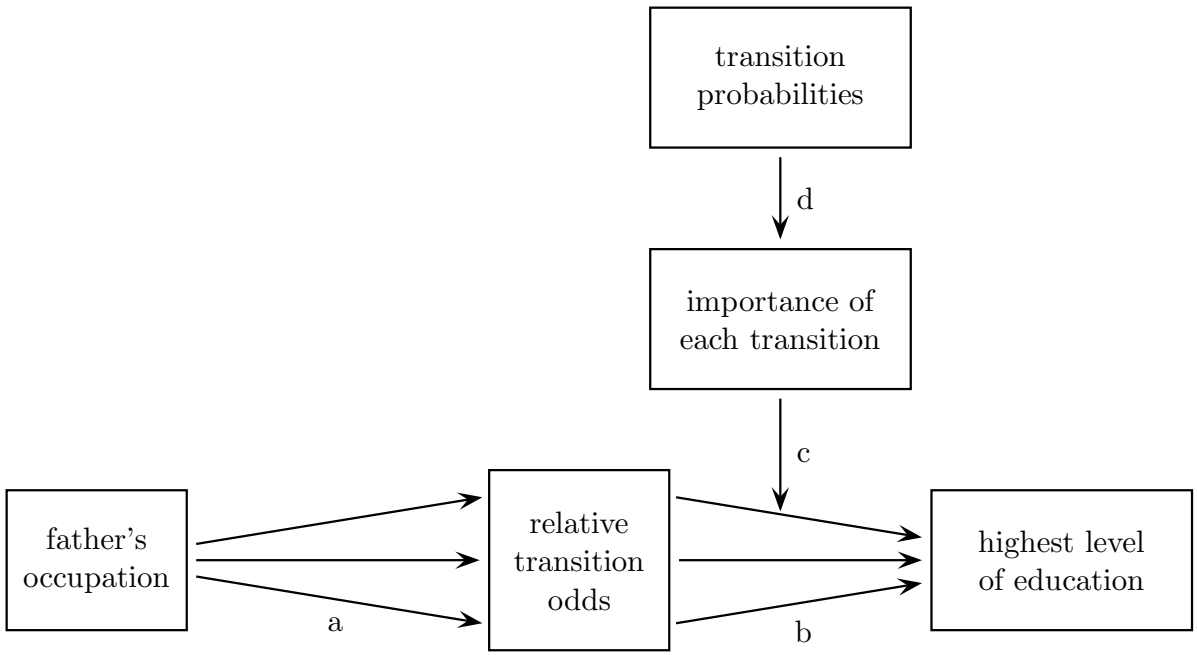

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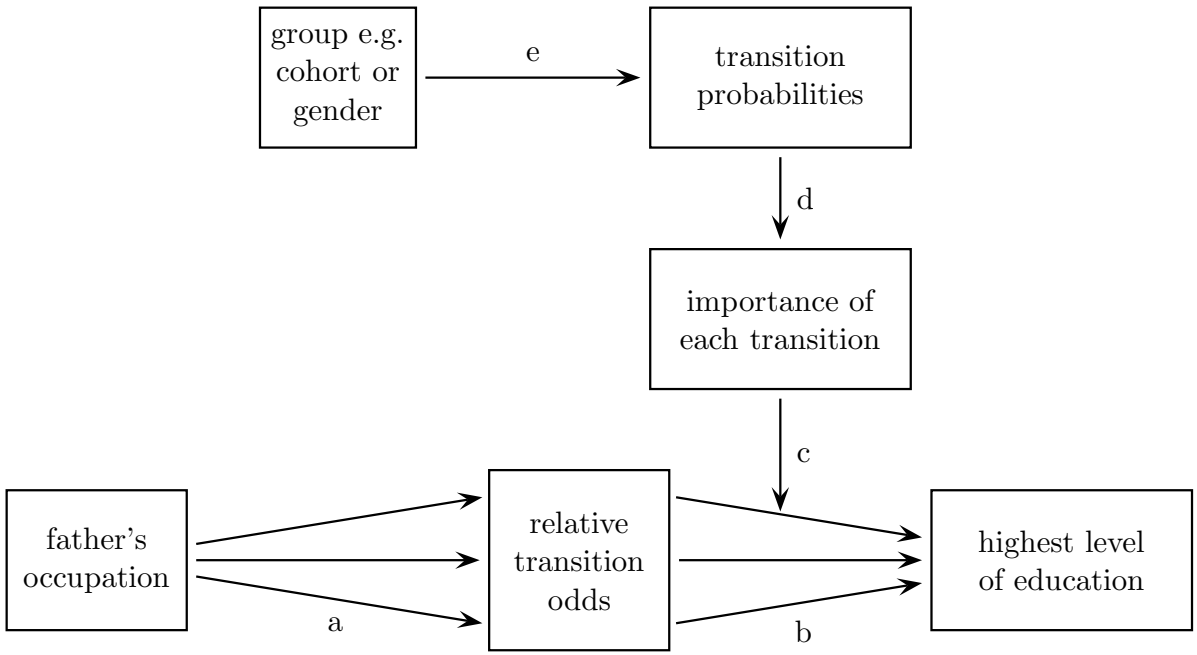

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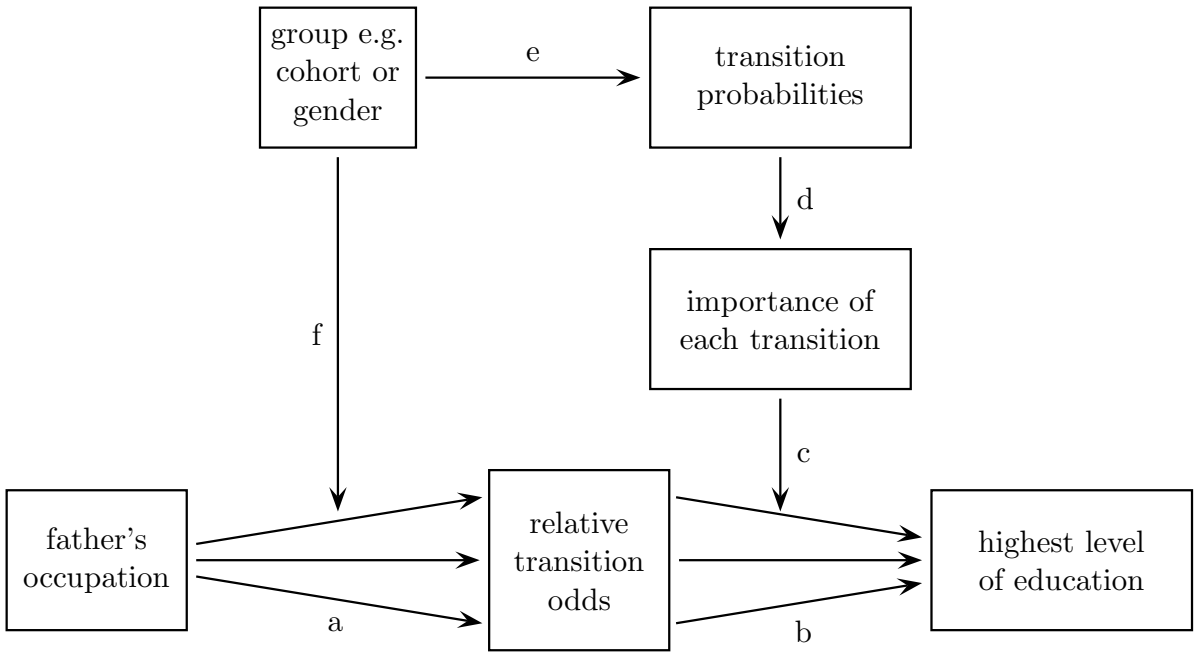
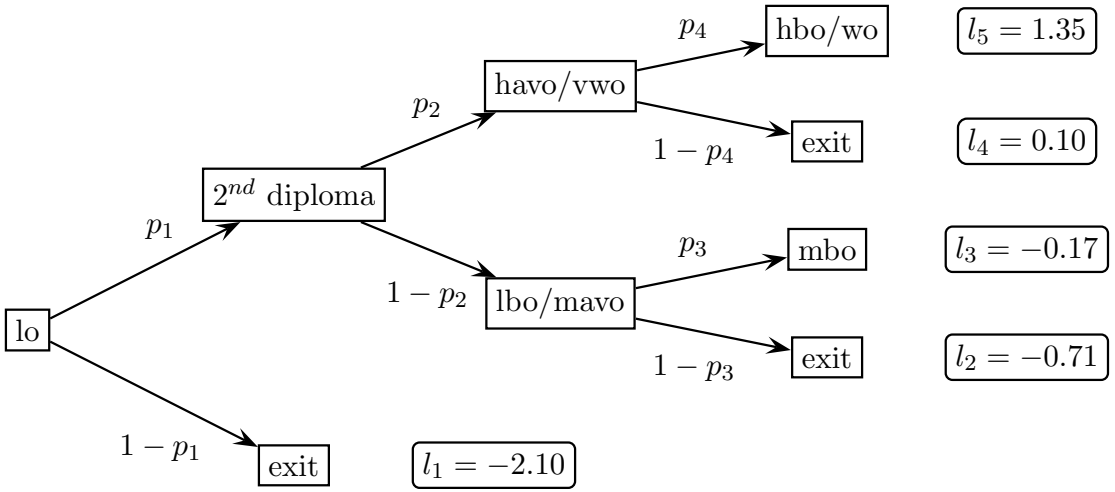


Outline

Simplified model of Dutch educational system



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- 51 surveys held between 1958 and 2005 with information on cohorts 1906-1990.
- 67,000 respondents aged between 27 and 65 have complete information on father's occupation, child's education, year of birth, and gender.
- Number of cases are unequally distributed over cohorts.

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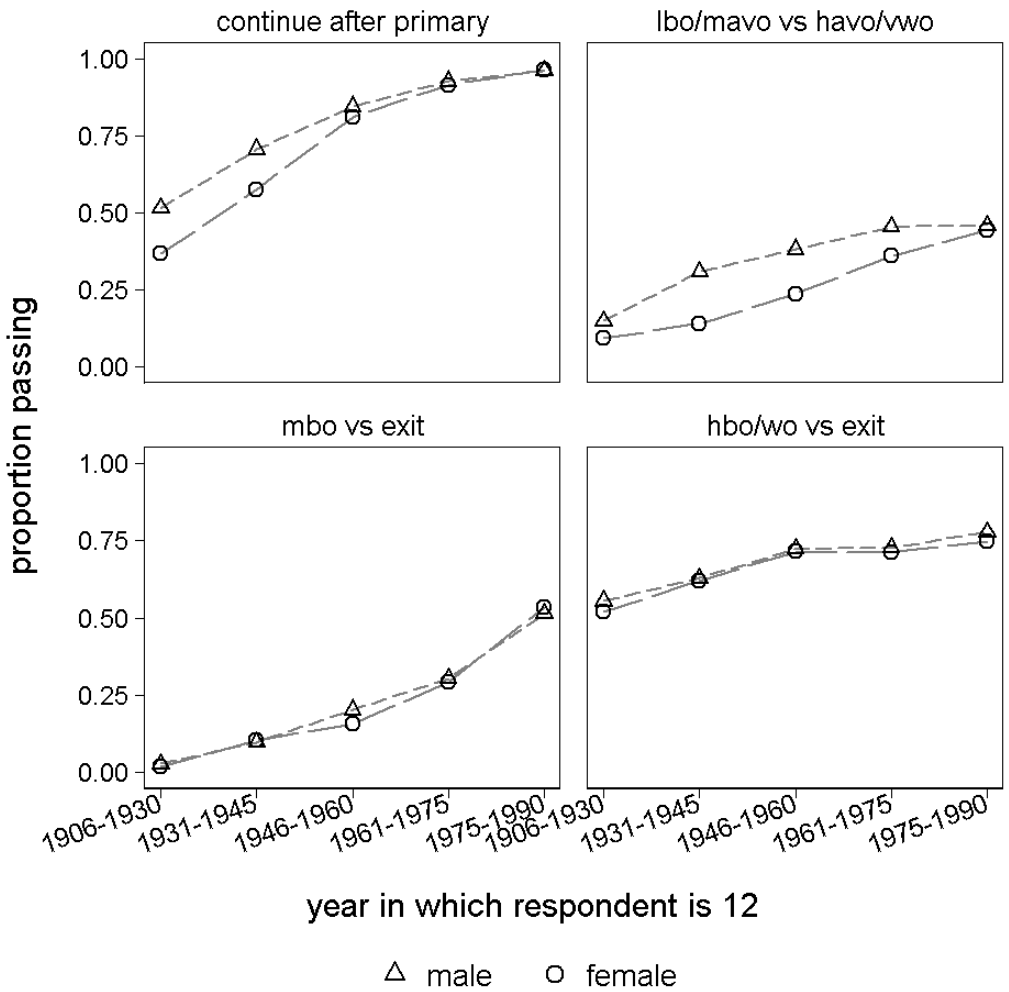
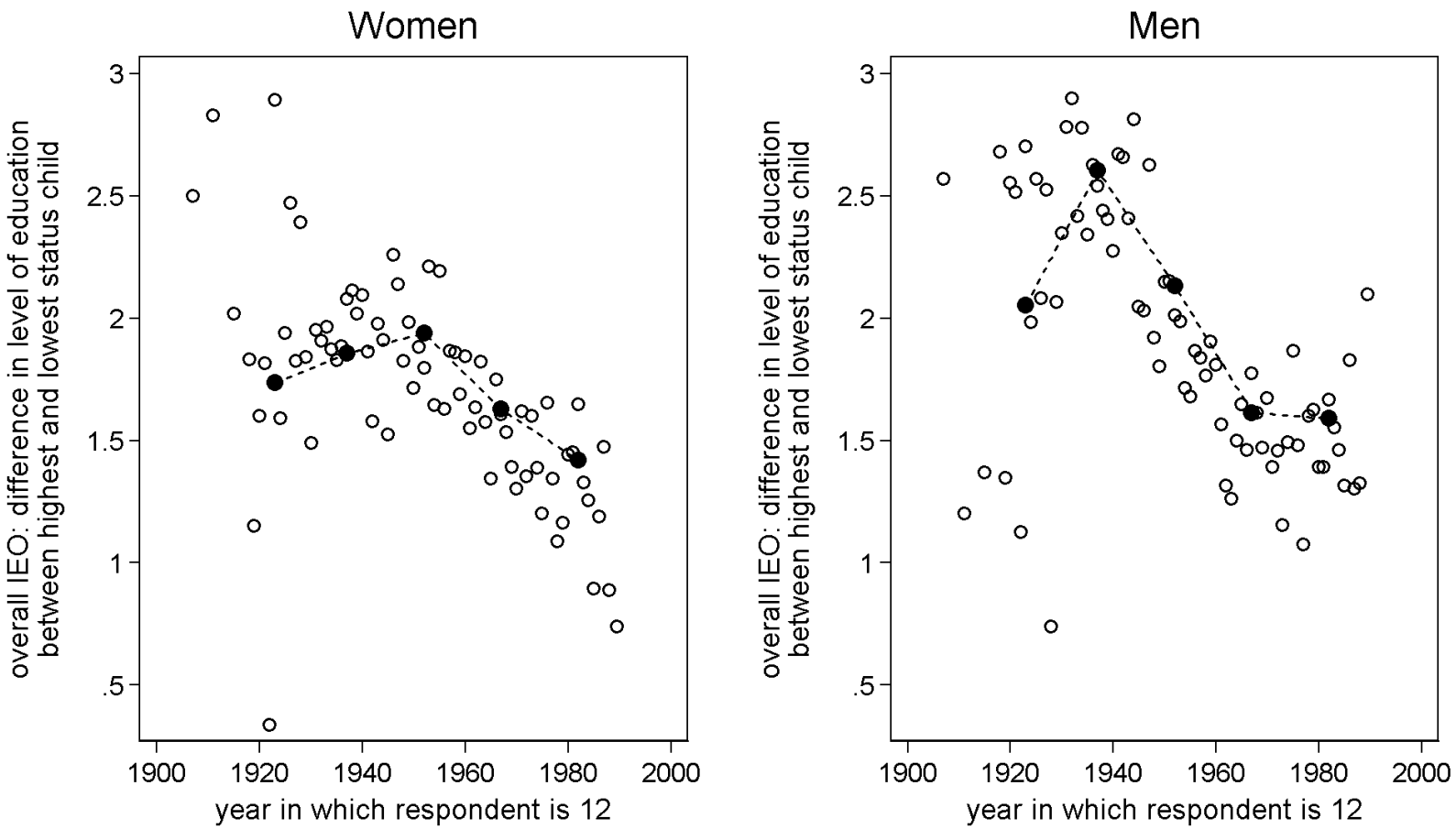
- Level of education is scaled such as to maximize the direct effect of education on income , and
- it is standardized.
- Five cohorts: 1906–1930, 1931–1945, 1946–1960, 1961–1975, 1975–1990.

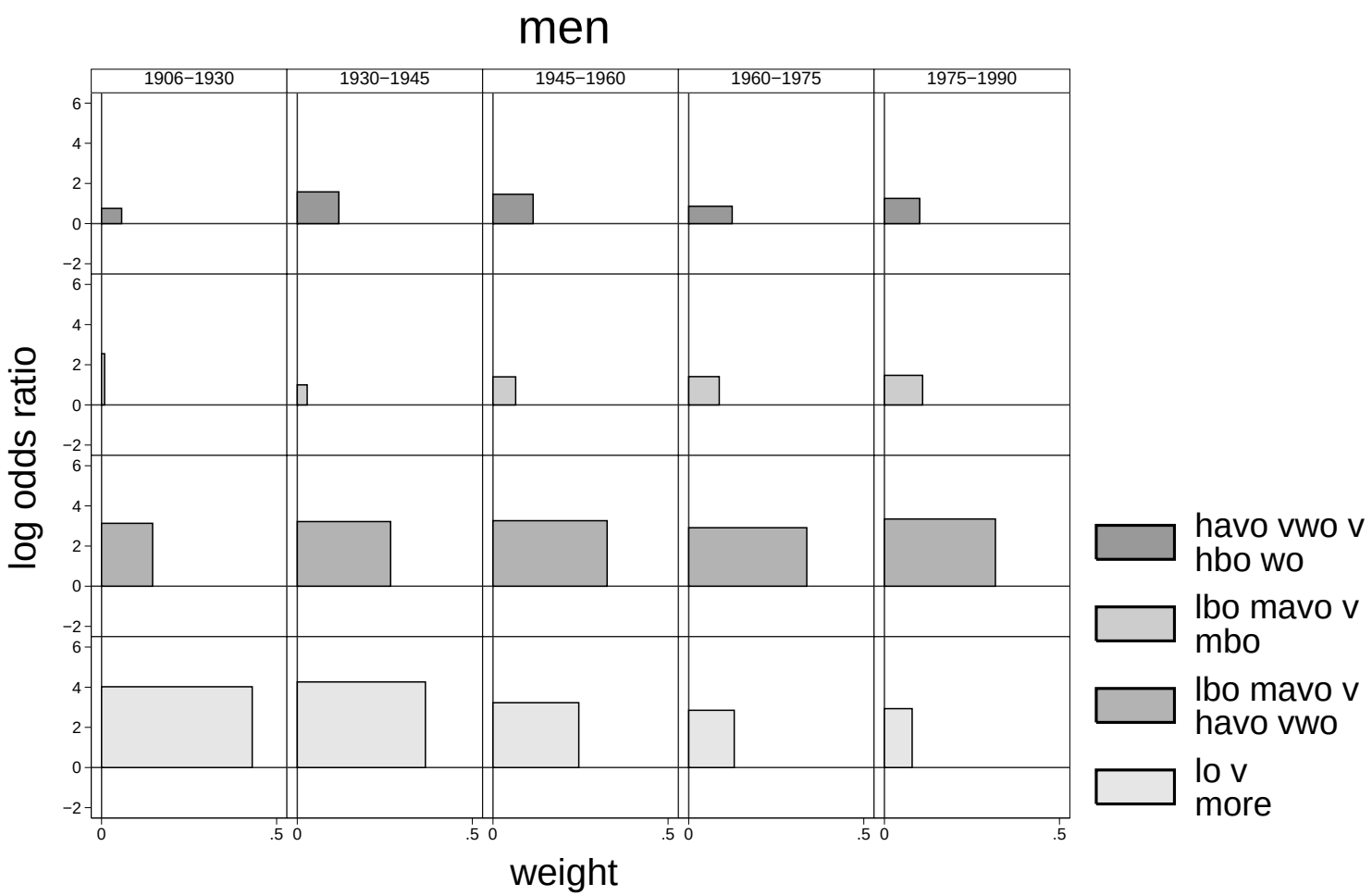
Proportions passing transitions



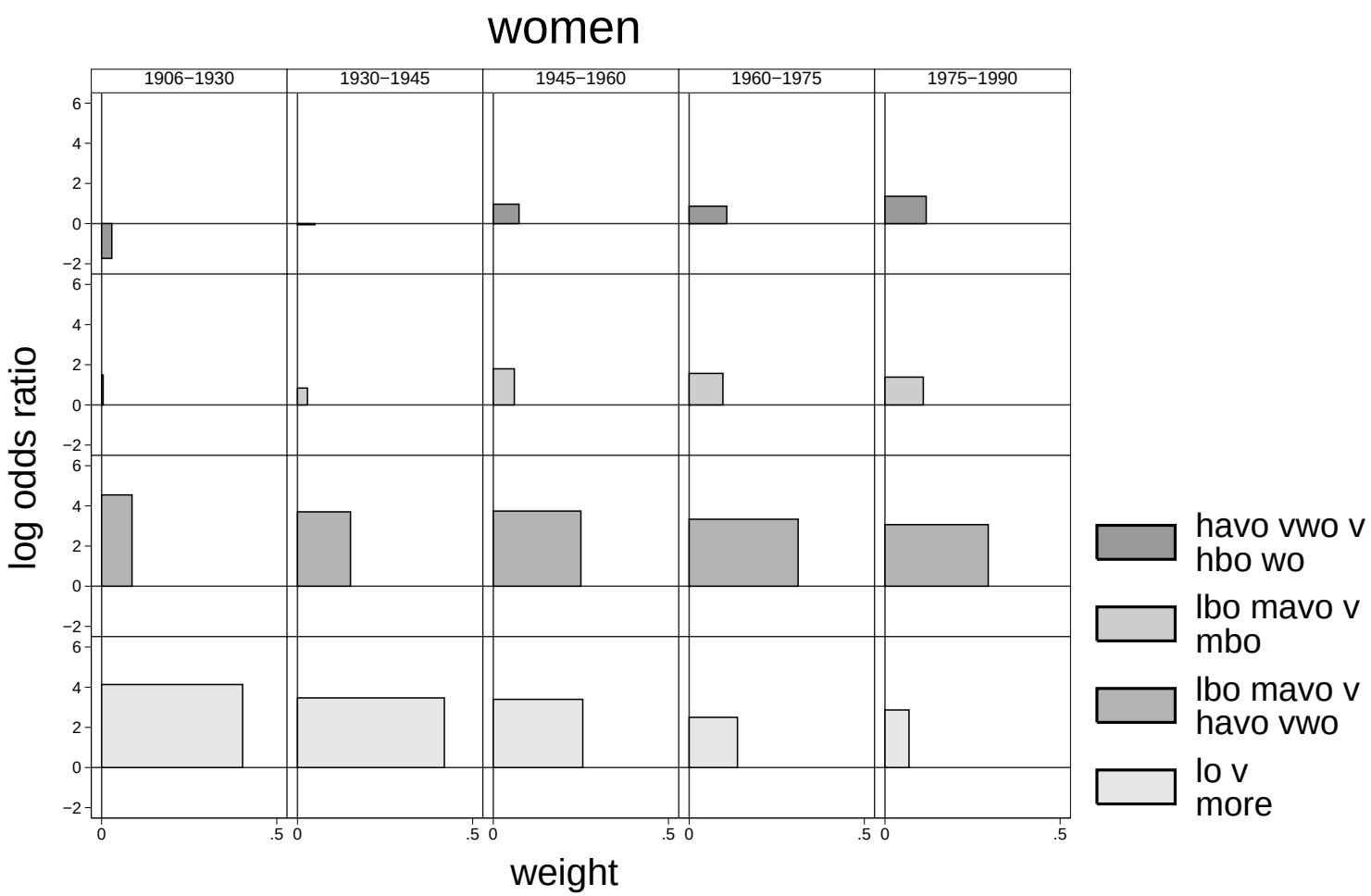
The pattern that needs to be explained



Partial IEOs and their weights for men



Partial IEOs and their weights for women



The `seqlogit` package

- These graphs where made with the `seqlogit` package in Stata.
- It can deal with any tree.
- To install type within Stata `ssc install seqlogit`.

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- Overall IEO later decreased because the contribution of the first transition decreased.
- This happened more slowly for women, and
- for women the increase and decrease partially canceled each other out.

differences in weights and differences in transition proportions

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  - the later increase in the proportion of women that went to the higher track.

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Conclusion

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- Overall IEO is a weighted sum of partial IEOs, and the weights increase if:
  - the proportion at risk increases,
  - the proportion that passes is closer to .50,
  - the expected increase in level of education increases

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  - identify important and less important transitions,
  - Partial and overall IEO can be related to one another
  - to explain differences in overall IEO with well documented phenomena like educational expansion or the decreased disadvantaged position of women in education.

References

Robert D. Mare.
Change and Stability in Educational Stratification.
American Sociological Review, 46(1):72–87, 1981.

levels of education

English name	before 1968	after 1968	years†	ISCED
primary	LO	lo	6	1
extended primary	VGLO	-	7	1
junior vocational	LTS / ambachtschool	lbo	10	2C
junior vocational	LHNO / huishoudschool	lbo	10	2C
junior general secondary	ULO / MULO	mavo	9 / 10	2B‡
senior secondary vocational	MTS	mbo	14	3C
senior general secondary	MMS	havo	11	3B‡
pre-university	HBS	vwo	12	3A‡
pre-university	lyceum	vwo	12	3A
pre-university	gymnasium	vwo	12	3A
higher professional	HTS	hbo	15	5B
university	universiteit	wo	16	5A

† Years refer to the situation after 1968 except VGLO.

‡ These levels were originally intended to be terminal levels of education for most students (so 2C or 3C) but evolved into levels that primarily grant access to subsequent levels of education.

Mare and OLS


men
women
expected level of education
father's occupational status in isei scores
1
0
-1
-2
20
40
60
80
1912-1930
1930-1945
1945-1960
1960-1975
1975-1988

Scaling of education

$$\ln(inc) = \beta_0 + \underbrace{\beta_1}_{0} lo + \beta_2 lbo\_mavo + \beta_3 havo\_vwo + \beta_4 mbo + \beta_5 hbo\_wo + \cdots$$

Scaling of education

$$\ln(inc) = \beta_0 + \underbrace{\beta_1}_{0} lo + \beta_2 lbo\_mavo + \beta_3 havo\_vwo + \beta_4 mbo + \beta_5 hbo\_wo + \cdots$$

$$ed = \underbrace{\alpha_1}_{0} lo + \alpha_2 lbo\_mavo + \alpha_3 havo\_vwo + \alpha_4 mbo + \underbrace{\alpha_5}_{1} hbo\_wo$$

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$$\begin{aligned} \ln(inc) &= \beta_0 + \gamma_1 ed + \cdots \\ &= \beta_0 + \gamma_1 (\underbrace{\alpha_1}_{0} lo + \alpha_2 lbo\_mavo + \alpha_3 havo\_vwo + \\ &\quad \alpha_4 mbo + \underbrace{\alpha_5}_{1} hbo\_wo) + \cdots \end{aligned}$$

Scaling of education

$$
\begin{aligned}
\gamma_1 &= \beta_5 \\
\alpha_1 &= 0 \\
\alpha_2 &= \frac{\beta_2}{\beta_5} \\
\alpha_3 &= \frac{\beta_3}{\beta_5} \\
\alpha_4 &= \frac{\beta_4}{\beta_5} \\
\alpha_5 &= 1
\end{aligned}
$$

Scaling of education

		b	se
α			
	lo	0	.
	lbo/mavo	.391	.017
	mbo	.562	.023
	havo/vwo	.659	.022
	hbo/wo	1	.
γ			
	1958-1975	.060	.050
	1975-1990	-.166	.025
	1990-2005	.192	.027
	constant	.474	.074
other			
	1958-1975	.865	.034
	1975-1990	.347	.019
	1990-2005	.161	.022
	fisei	.496	.125
	1958-1975Xfisei	-.077	.086
	1975-1990Xfisei	-.132	.044
	1990-2005Xfisei	.073	.042
	age	.115	.004
	age2	-.071	.003
	constant	4.88	.049

Causality, bias, and unobserved heterogeneity

Partial IEO can be measured at two levels:

group level difference between the group high status children and the group low status children.

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- The model used in this presentation will provide unbiased estimates at the group level,
- but not at the individual level.