Multidimensional poverty in Europe. A longitudinal perspective

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Multidimensional poverty measures are very popular, but we know very little about poverty dynamics at the micro level partly because

1. lack of data
2. lack of analytical tools

For chronic of multidimensional poverty see Alkire et al. (2017, 2021).

While some long-run panel datasets exist, **short-run panels** are more common (incl. EU); Suppa (2018) explores year-to-year transitions.

Previous research in monetary poverty (Biewen 2014; Fusco and van Kerm 2022): persistence, duration dependence, state-dependence, events associated to entries and exits, ...

Research question

Did deprivations accumulate or decouple over the last year?

1. short-run panels to learn about mid-run processes?
2. policy indicator possible? (Atkinson et al. 2002)

Hypotheses

- MD poor are more likely to enter a new deprivation and less likely to leave an existing deprivation than comparable non-poor.

Data and Measure

- EU-SILC (longitudinal component for 20+ countries)
- md. poverty measure broadly in line with previous work

Empirical approach

- analyse differences in deprivation transitions probabilities for poverty status
- relevant transition probabilities may be obtained from single (linear) model per indicator

Selected findings

- broadly speaking, evidence is supporting hypotheses.
- despite some variation over time relatively stable
- cross-countries heterogeneity

Selected conclusions

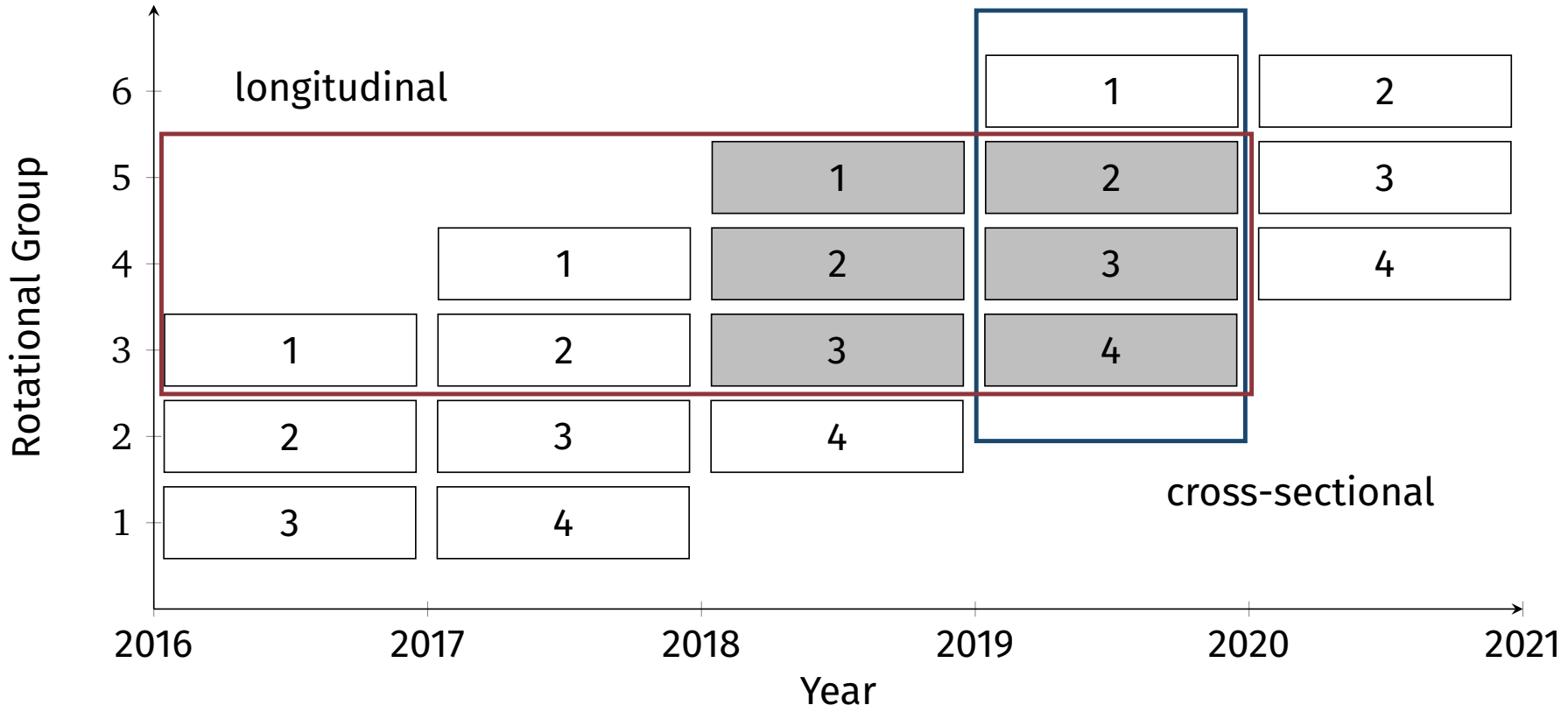
- useful summary measure for dynamics over the last year
- approach is not limited multidimensional poverty and may be applied to other indicators

Outline

Data for analysis

- EU-SILC longitudinal component
- period of observation: 2017–2020
- countries:

Austria
Belgium
Bulgaria
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Greece
Hungary
Latvia
Lithuania
Luxembourg
Netherlands
Poland
Portugal
Romania
Slovenia
Spain
Sweden



Notes: Boxes refer to observations of rotational groups; grey boxes show subsamples used for the analysis of the 2018–2019 change. Further groups ending in 2016 or starting in 2020 are omitted

Analysis of each year-to-year change is based on dedicated sample.

	CS	LT					
	all	all	1	2	3	4	5	6
AT	12274	8114	2545	2616	2953			
BE	16105	13534	3256	2751	2243	2293	2991	
BG	16625	13268	2165	2657	2918		2872	2656
CZ	18758	13705	4373	4442	4890			
DK	13521	7885		1869	2436	3580		
EL	32962	26354		9907	11174	5273		
EE	15143	10706	3365	3503	3838			
ES	38011	21540	4436	5469	11635			
FI	22701	15446	5185	5622		4639		
FR	24758	12152				3246	3291	5615
HU	14363	9631	2624	3744		3263		
NO	14601	9963	3427		3244	3292		
LT	11354	8144	2832	2924		2388		
LV	13215	9657	2391	2541	2322		2403	
PL	38835	38835	10541	15638	5173	7483		
PT	27698	18129	6171	6093	5865			
RO	16966	12624		4259	4184	4181		
SE	14102	9666	3158	3134		3374		
SI	24794	16112	6245		4885	4982		

Notes: Sample sizes for cross-sectional (CS), longitudinal (LT) component and their rotational groups; most recent datasets provided by EU-SILC (usually 2020, sometimes 2019)

Outline

- individuals $i = 1, \ldots, N$ in $t = 1, \ldots, T$ periods of time
- achievements $y_{ijt} \in \mathbb{R}^+$ with $j = 1, \ldots, D$
- deprivations $d_{ijt} = \mathbb{I}(y_{ijt} < z_j)$ with z_j deprivation thresholds
- deprivation score $c_{it} = \sum_j w_j d_{ijt}$ where $w_j \in (0, 1)$ with $\sum_j w_j = 1$
- identification: $poor_{it} = \mathbb{I}(c_{it} \geq k)$, where k with $k \in (0, 1]$
- let $Q_t = \{i | poor_{it} = 1\}$ and q_t the number of all poor in t.
- aggregation:
  - headcount ratio is $H_t = \frac{q_t}{N}$
  - intensity $A_t = \frac{1}{q_t} \sum_{i \in Q_t} c_{it}$
  - adjusted headcount ratio: $M_t = H_t \times A_t$.

Dimension	Deprivation indicator	Variable	Weight
Health	Self-reported health (Bad or very bad)	`d_ghlt`	1/12
	Limitation in activities due for health problems	`d_hlim`	1/12
Education	Primary education or less	`d_educ`	1/6
Housing	Housing conditions (e.g. leaking roof)	`d_hqua`	1/12
	Overcrowding index	`d_ovrc`	1/12
Employment	Low work intensity	`d_lwi`	1/6
Material depr.	Material and social deprivation index	`d_msdi`	1/12
	Wealth deprivation (no house & no car)	`d_wlth`	1/12
Income	HH net equiv. income less than 40% of median	`d_in40`	1/6

Notes: poverty cutoff: mostly k = 33%.

Outline

Initial deprivations, beget further deprivations.

Multidimensional poor individuals are

1. more likely to enter an new deprivation
2. less likely to leave an already experienced deprivation

than comparable non-poor.

Conditional probabilities of interest

$$\Pr(d_{ijt} = 1 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 0) \quad \text{(CP.1)}$$

$$\Pr(d_{ijt} = 1 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 0) \quad \text{(CP.2)}$$

$$\Pr(d_{ijt} = 0 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 1) \quad \text{(CP.3)}$$

$$\Pr(d_{ijt} = 0 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 1) \quad \text{(CP.4)}$$

deprivation entries

$$\Delta_j^{\text{entry}} = \Pr(d_{ijt} = 1 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 0) - \Pr(d_{ijt} = 1 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 0) > 0 \quad \text{(H.1)}$$

deprivation exits

$$\Delta_j^{\text{exit}} = \Pr(d_{ijt} = 0 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 1) - \Pr(d_{ijt} = 0 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 1) < 0 \quad \text{(H.2)}$$

entries vs exits

$$| \Delta_j^{\text{entry}} | \neq |\Delta_j^{\text{exit}} | \quad \text{(H.3)}$$

deprivation persistence

$$\Pr(d_{ijt} = 1 \mid d_{ijt-1} = 1) > \Pr(d_{ijt} = 1 \mid d_{ijt-1} = 0) \quad \text{(H.4)}$$

1. (complementary) staying probabilities follow immediately

$$\Pr(d_{ijt} = 1 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 1) \qquad \text{(CP.3*)}$$
$$\Pr(d_{ijt} = 1 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 1) \qquad \text{(CP.4*)}$$
$$\Pr(d_{ijt} = 0 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 0) \qquad \text{(CP.1*)}$$
$$\Pr(d_{ijt} = 0 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 0) \qquad \text{(CP.2*)}$$

2. contemporaneous model is uninformative

$$\Pr(d_{ijt} = 1 \mid poor_{it})$$

3. panel data *per se* insufficient

$$\Pr(d_{ijt} = 1 \mid poor_{it-1})$$

Outline

How can we obtain the transition probabilities of interest?

➜ avg. predicted probabilities from dynamic binary choice model

In principle, separate entry and exit models possible:

- $\Pr(d_{ijt} = 1) = F(\alpha_1 + \beta_1\ poor_{it-1} + \epsilon_{1ijt}) \quad \forall d_{ijt-1} = 0 \quad \forall j$
- $\Pr(d_{ijt} = 0) = F(\alpha_0 + \beta_0\ poor_{it-1} + \epsilon_{0ijt}) \quad \forall d_{ijt-1} = 1 \quad \forall j$

However, joint estimation is preferable:

dynamic binary choice model

$$\Pr(d_{ijt} = 1) = F(\alpha + \beta poor_{it-1} + \gamma d_{it-1} + \delta poor_{ijt-1} \times d_{ijt-1} + \epsilon_{it}) \quad (1)$$

Use `margins` as needed!

For interest in *average* predicted probabilities, a linear model (with robust SE) may suffice; see also Wooldridge (2010, p.562–565) (virtually identical with logit model's)

linear transition model

$$\Pr(d_{ijt} = 1) = \alpha + \beta poor_{it-1} + \gamma d_{ijt-1} + \delta poor_{ijt-1} \times d_{ijt-1} + \epsilon_{it} \quad (2)$$

Average predicted probabilities can be directly obtained from the coefficients of the linear model, i.e.

$$\Pr(d_{ijt} = 1 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 0) = \alpha$$
$$\Pr(d_{ijt} = 1 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 0) = \alpha + \beta$$
$$\Pr(d_{ijt} = 0 \mid poor_{it-1} = 0 \ \wedge \ d_{ijt-1} = 1) = 1 - (\alpha + \gamma)$$
$$\Pr(d_{ijt} = 0 \mid poor_{it-1} = 1 \ \wedge \ d_{ijt-1} = 1) = 1 - (\alpha + \beta + \gamma + \delta)$$

difference in deprivation entry probabilities

$$\Delta_j^{\text{entry}} = \beta \tag{3}$$

difference in deprivation exit probabilities

$$\Delta_j^{\text{exit}} = -(\beta + \delta) \tag{4}$$

Interpretation of coefficients

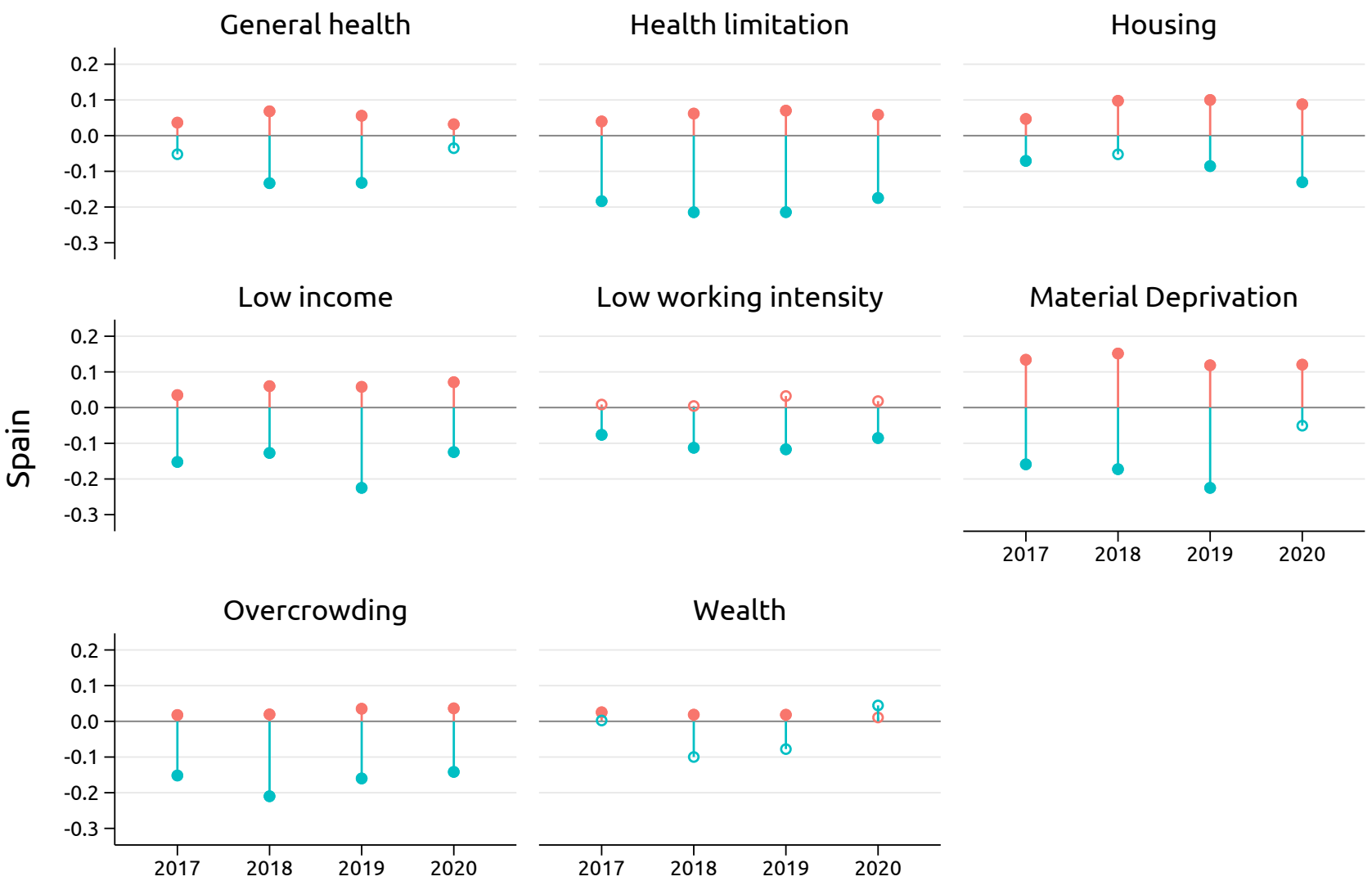
- β: poverty status (entries)
- γ: persistence of deprivation
- δ: different role of poverty status in entries and exits
  - Consider $\delta = 0$ and $\beta + \delta = 0$

Outline

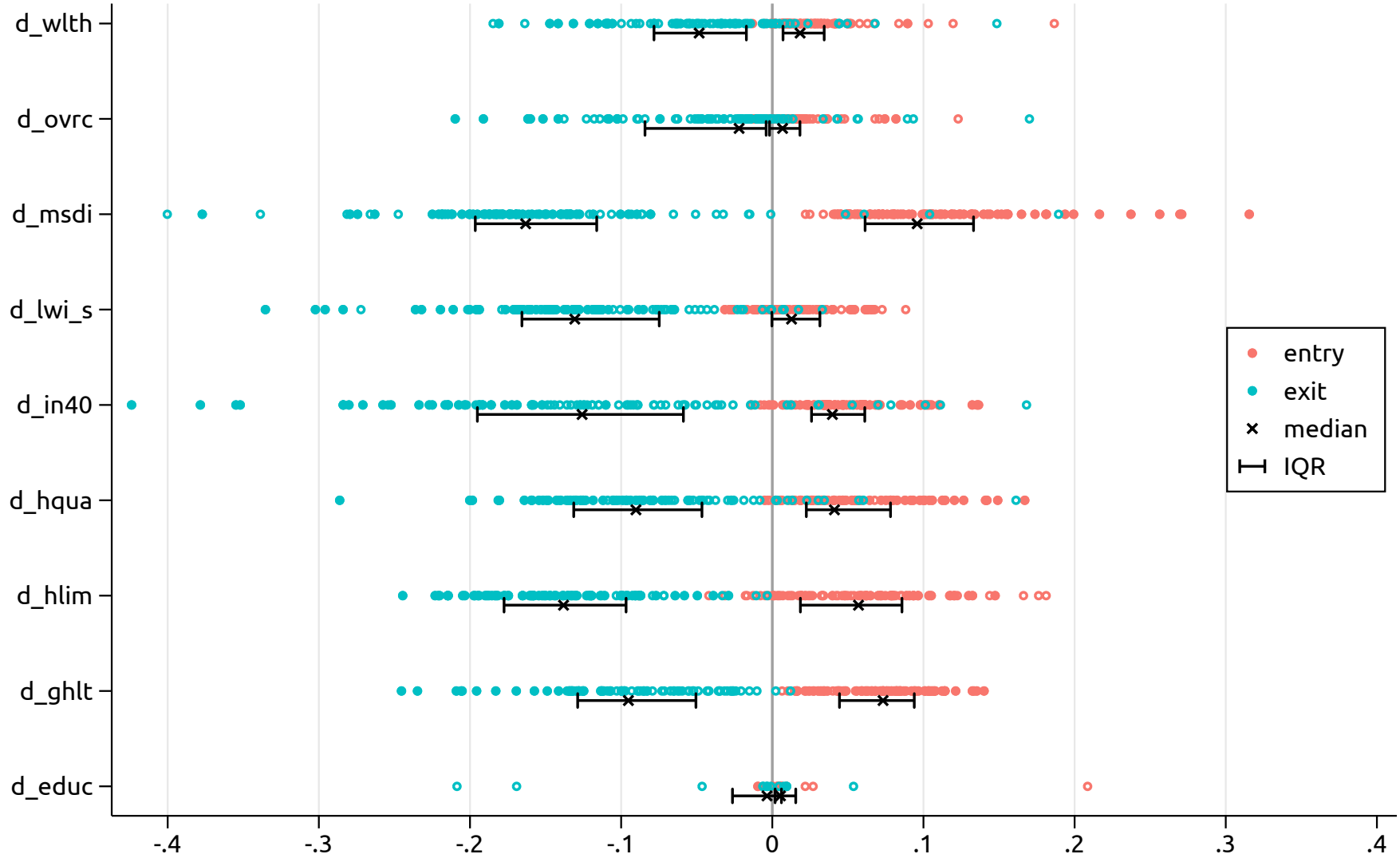
Spain 2019

	d_msdi	d_wlth	d_lwi_s	d_educ	d_hqua	d_ovrc	d_ghlt	d_hlim	d_in40
poor	0.12***	0.02***	0.03**	0.02*	0.10***	0.04***	0.06***	0.07***	0.06***
	(0.013)	(0.005)	(0.014)	(0.009)	(0.013)	(0.007)	(0.009)	(0.016)	(0.010)
dep	0.28***	0.71***	0.61***		0.26***	0.58***	0.40***	0.41***	0.41***
	(0.024)	(0.033)	(0.017)		(0.017)	(0.032)	(0.034)	(0.015)	(0.035)
poor x dep	0.11***	0.06	0.08***		-0.01	0.12***	0.08*	0.14***	0.17***
	(0.034)	(0.042)	(0.027)		(0.031)	(0.047)	(0.042)	(0.027)	(0.042)
Obs.	14824	14824	14824	3599	14824	14824	14824	14824	14824
Entries	873	161	713	182	1496	200	553	1373	489
Exits	597	139	552	0	1175	230	511	1013	419

Notes: Cells show point estimates for coefficients of linear model with standard errors in parentheses; Columns in panels are separately estimated; explanatory variables refer to poverty and deprivation status in $t-1$; indicated levels of significance are *** for $p < 0.01$, ** for $p < 0.05$ and * for $p < 0.1$, respectively.



Notes: Difference in deprivation entry (●) and exit (●) probabilities between poor and non-poor; hollow markers indicate insignificance.



Notes: 20+ countries and years 2017–2020 pooled, hollow markers indicate insignificance.

Outline

Causal interpretation? Certainly not!

1. no identification strategy (e.g., observed and unobserved heterogeneity) may be correlated with poverty status
2. various indicator-specific mechanism (different poverty profiles)

What may transition probability differences reflect?

- functioning of health care system (eg required resources)
- business cycle (employment probabilities); employers' decision, labour market regulations
- summary measure ('net effect')

Δ_j^{entry}	Δ_j^{exit}	Description
> 0	< 0	anti-poor
$= 0$	$= 0$	neutral
< 0	> 0	pro-poor

How to make use of these findings?

1. evidence may be read as **instrumental relevance** of indicators , but is **not a required property** of 'good' deprivation indicators
   - indicators reflect 'essence of problem' (Marlier and Atkinson 2010)
2. policy relevance
   - cross-country variation in transition probability differences may point to social structures and arrangements, which lead to different degrees of deprivation accumulation.
3. The proposed approach may be used beyond MD poverty.
   - current use of LT EU-SILC component for informing policy has been questioned (Jenkins and van Kerm 2014)
   - "Further development of portfolio" includes transitions (Social Protection Committee 2022).

- repeated person IDs in panel component over years (e.g., in Portugal)
- some variable only available in cross-section, but not in panel release (e.g., unmet medical needs)
- changes in survey / data collection? (e.g., income information from register, complex survey design)
- incomplete information for standard error computation or advice how to derive required variables from given information (e.g., PSU selection order)

Questions, comments, and suggestions are always welcome under

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