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UNIVERSITY

COOPERATION

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The ECHO project

- ECHO is an EU 7 funded project that
  - Pools hospital databases of six European countries
  - Makes aggregate data available via an online summary tool
- Objectives:
  - Describe how health care systems perform in terms of **quality** and **efficiency**
  - Provide insights for scientists, policy-makers and managers in the health sectors across Europe:
    - **Geographic variation**: unwarranted differences in *service utilisation*, *equity of access* and *allocative efficiency*
    - **Hospital variation:** quality, safety, and associated costs

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Background

- Healthcare providers (e.g. hospitals) pursue multiple objectives
  - High quality
  - Efficient resource use
- Substantial within-country variation has been documented for many health care systems
  - Dartmouth Atlas
  - NHS Atlas of Variation (Spain, England)
- Cross country variation are typically assessed:
  - Objectives in isolation (univariate assessment)
  - On aggregate level (between country variation; no account of within country variation)

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Objectives

- Study aim: to profile hospitals and countries in terms of their costs and effectiveness
  1. What is the general pattern of LOS and Mortality across hospitals and countries?
  2. Are there hospitals that can provide high quality care at below average resource use?
  3. What are the characteristics of these hospitals?

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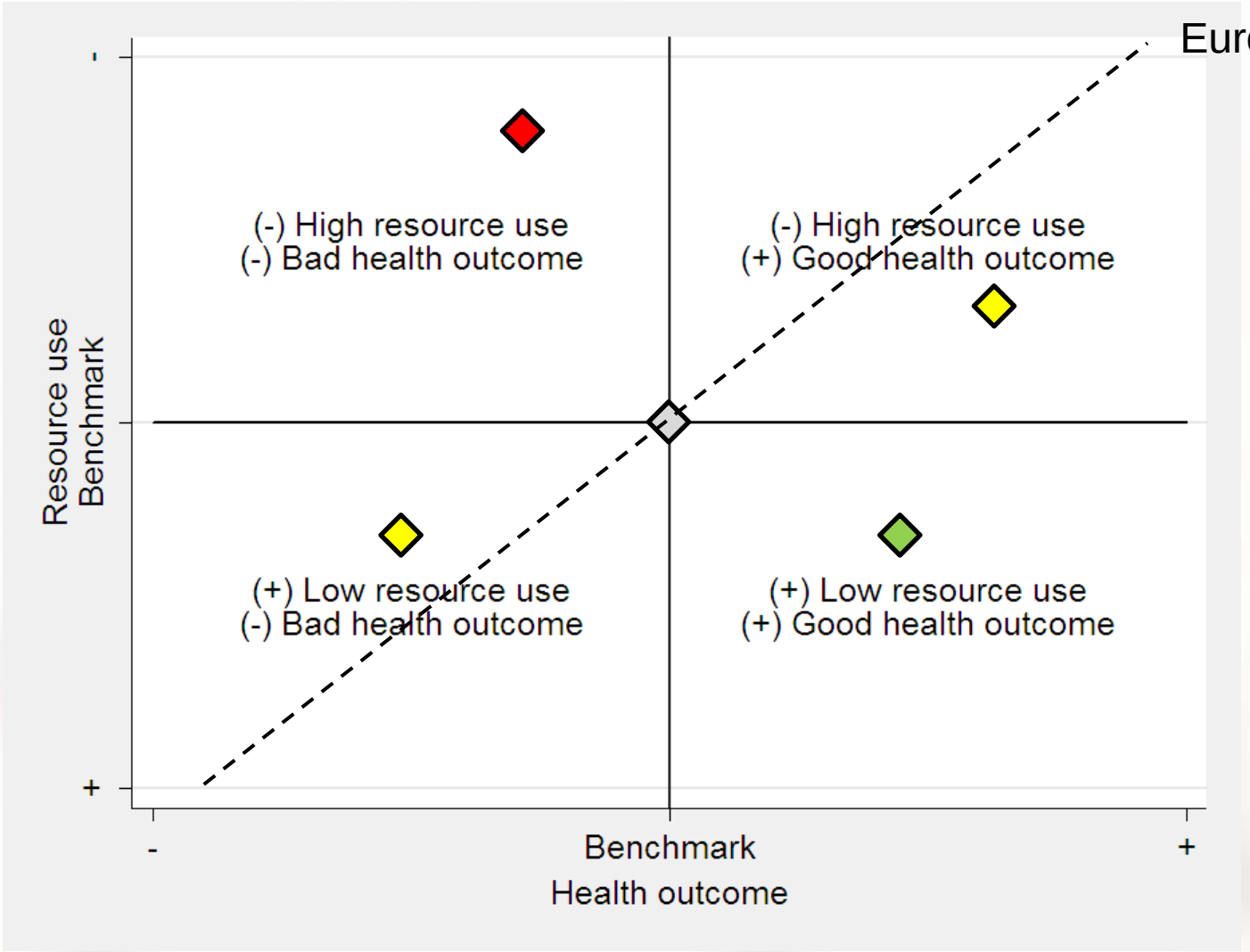
European WTP (?)



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Case study – acute myocardial infarction (AMI)

- Indicator – AMI mortality rate (AHRQ: #15)
  - Rationale:
    - mortality rate is related to better processes of care
    - timely and effective treatments are essential
    - evidence surrounding the validity of AMI mortality as a quality indicator is substantial
  - Emergency admissions – no patient selection effect
  - High mortality (~14%), long length of stay (~7.8 days)

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Case study – acute myocardial infarction (AMI)

- Three year pooled sample (2007-2009)

	Patients	Hospitals
England	246,992	159
Portugal	41,452	48
Slovenia	11,953	15
Denmark	50,816	36
Spain	138,840	196

- Outcome: In-hospital mortality
- Resource use: Length of inpatient stay for survivors
- All censored at 30 days

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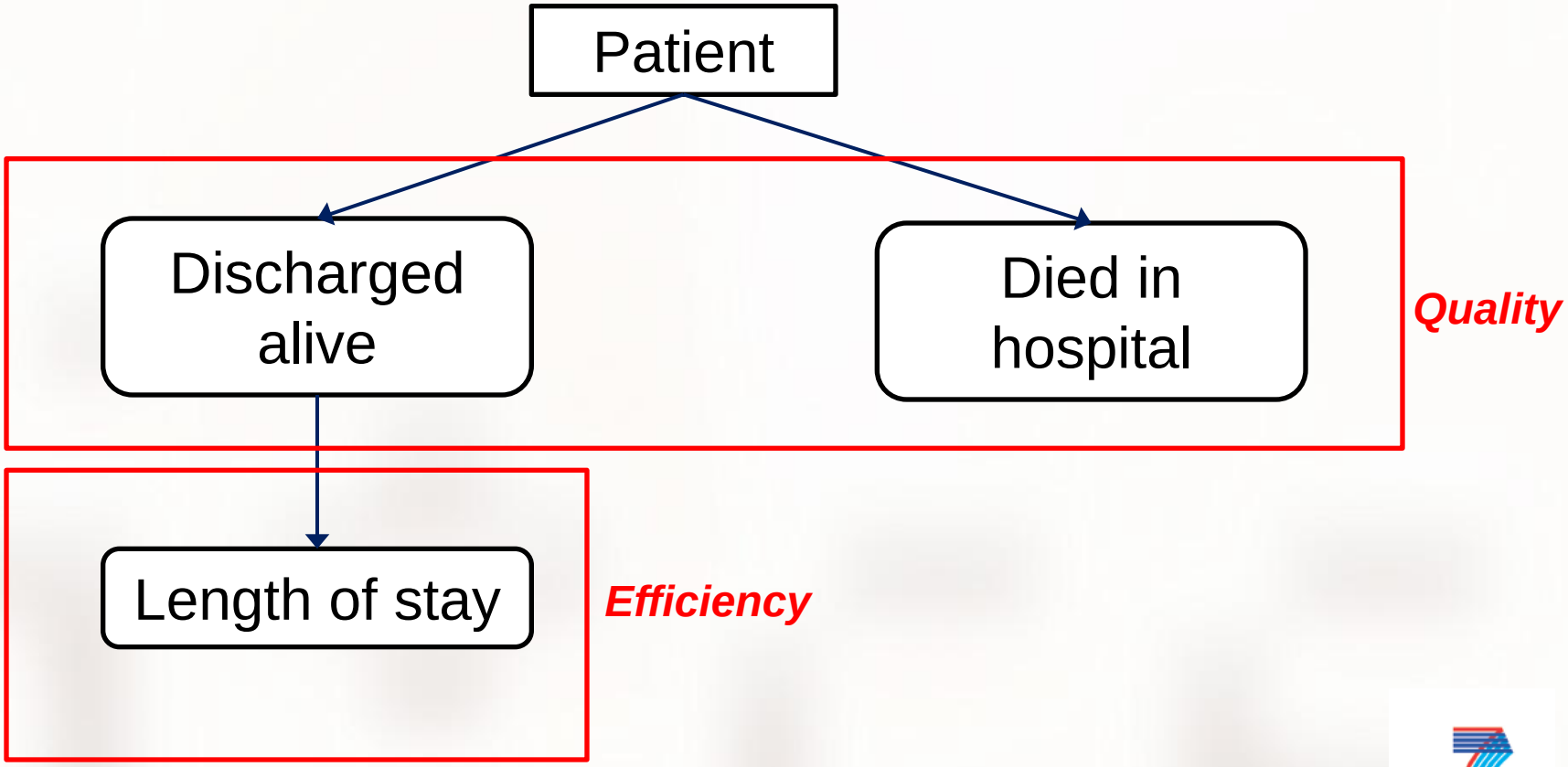
Resource use and outcome assessment



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Which correlation pattern would we expect?

1. Positive: High survival (+), high LoS (-)
   - High quality hospitals are able to keep the marginal patient alive, while they would die in low quality hospitals
   - Survivors are sicker/more severe -> longer LoS
2. None: Discharge management is independent of quality of care
3. Negative: High survival (+), short LoS (+)
   - Better processes (assessment, care, discharge) lead to lower mortality (+) and quicker discharge (+)
   - More adverse events / surgical errors lead to higher mortality (-) and subsequently longer LoS (-)
   - Or: Hospitals differ in unobserved case-mix

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Methods

- (Multivariate) hierarchical performance assessment

$$Y_{ij} = \mu = f(X_{ij}, \theta_j)$$

- Survival -> Logit
- LoS | Survival -> Poisson

- Risk-adjusters: Age, Gender, Elixhauser comorbidity index, Country effect, (Transfers in/out)
- Hospital effects:
  - Normally distributed -> precision-weighted EBE
  - Represent deviation from (inter-)national benchmark
- Non-linear model: effects shown for base-line patient

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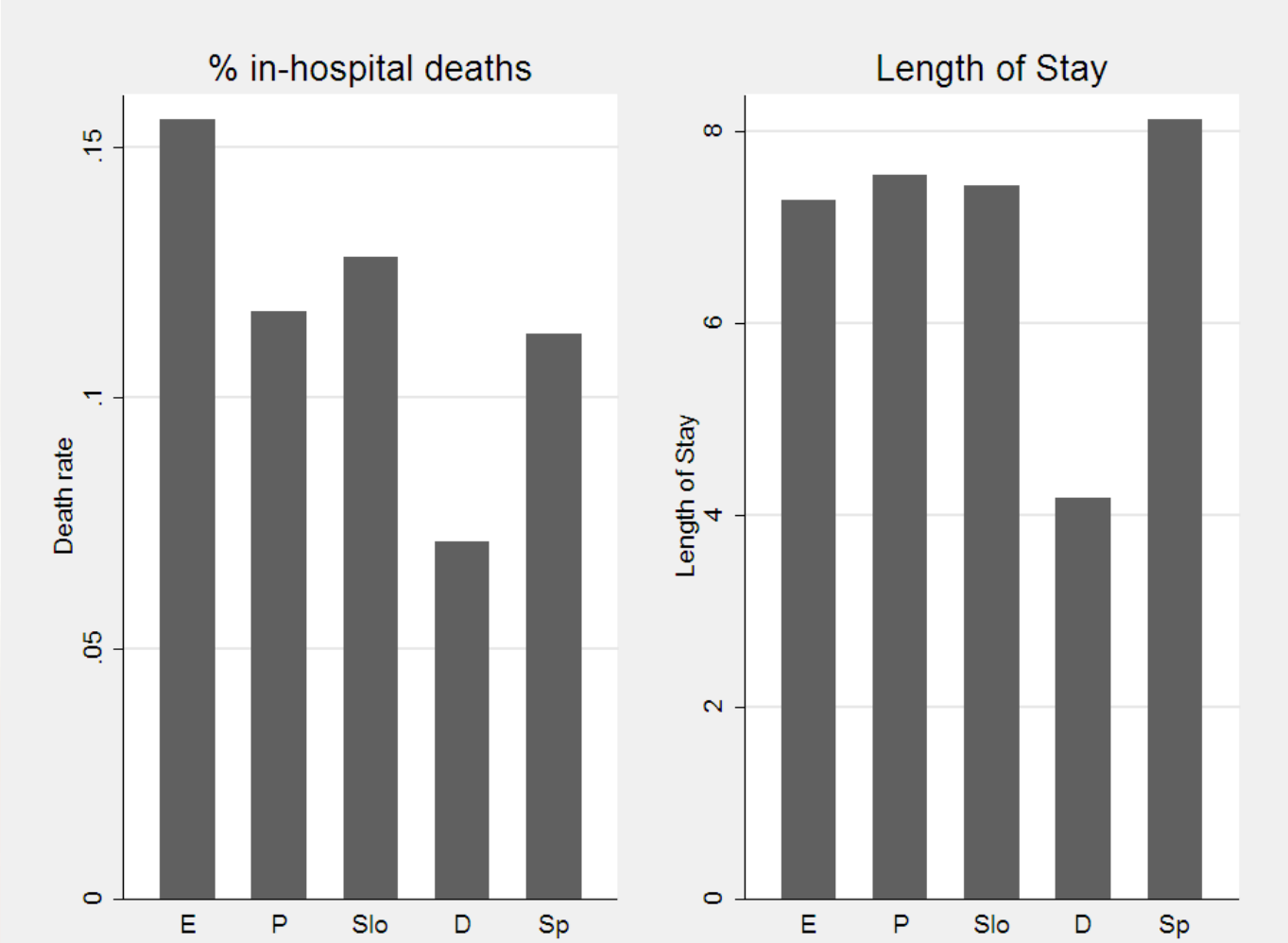
What we can tell from aggregate data (i.e. OECD)



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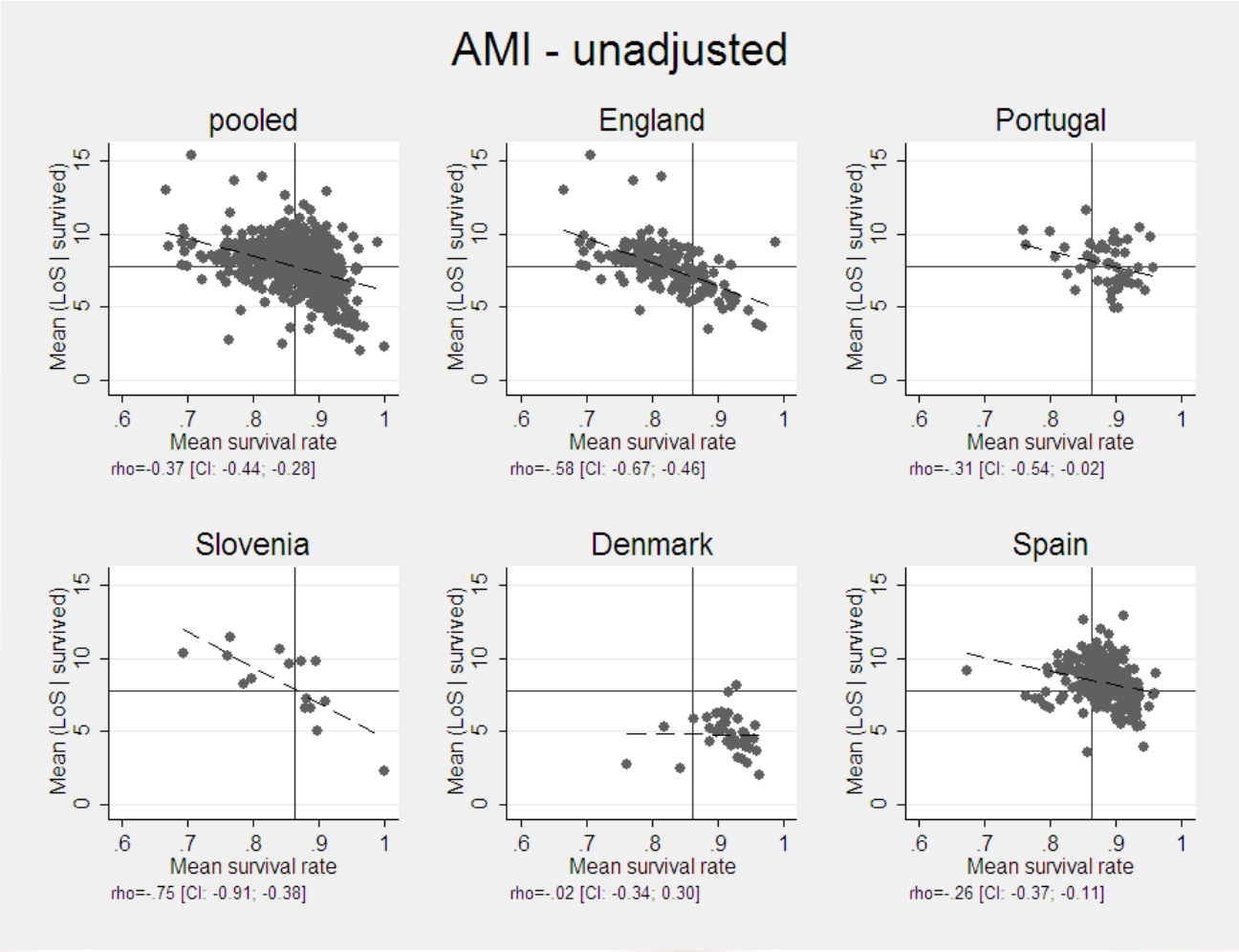
Unadjusted hospital effects, pooled benchmark



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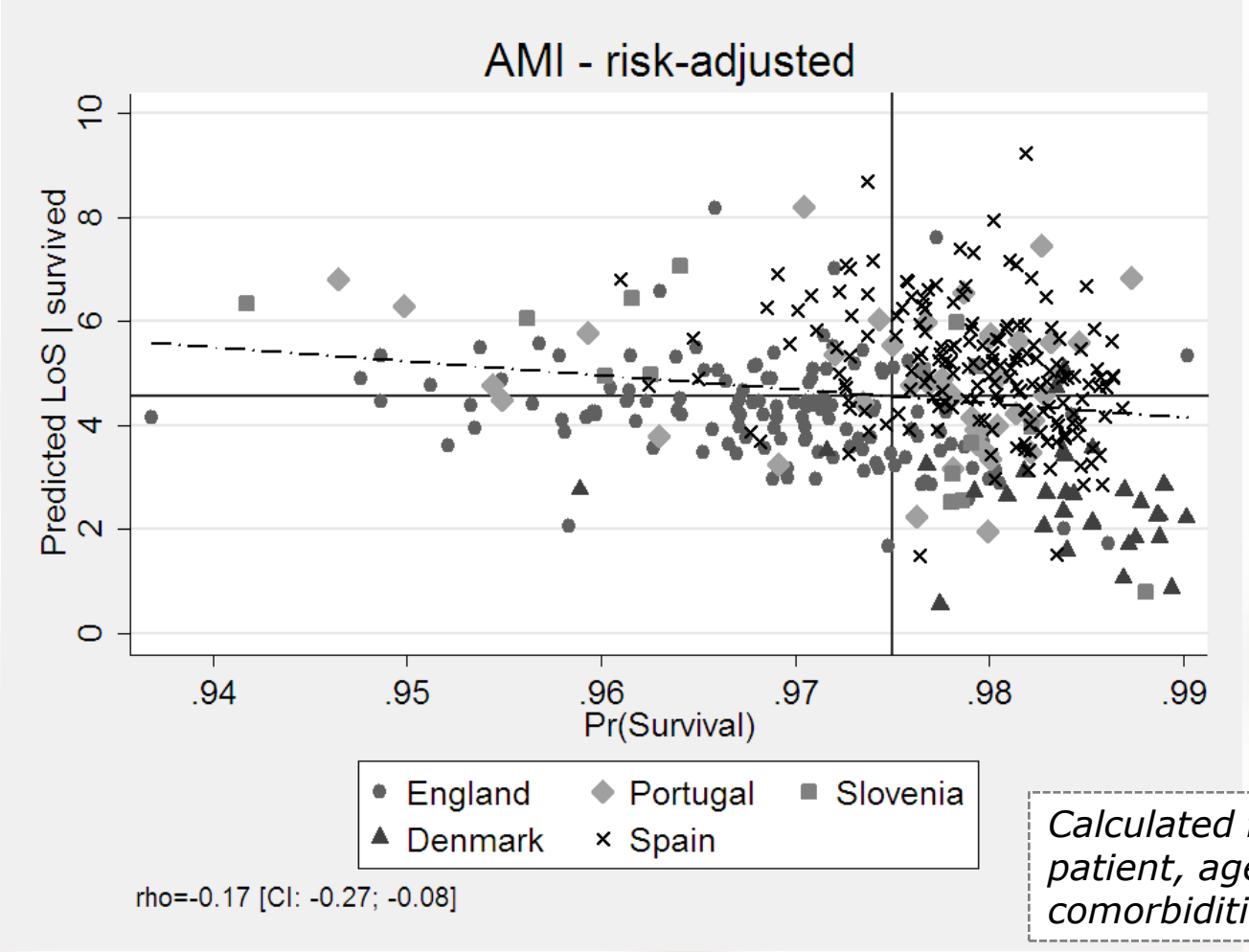
Adjusted hospital effects, pooled benchmark



Calculated for female patient, aged 18-55, no comorbidities

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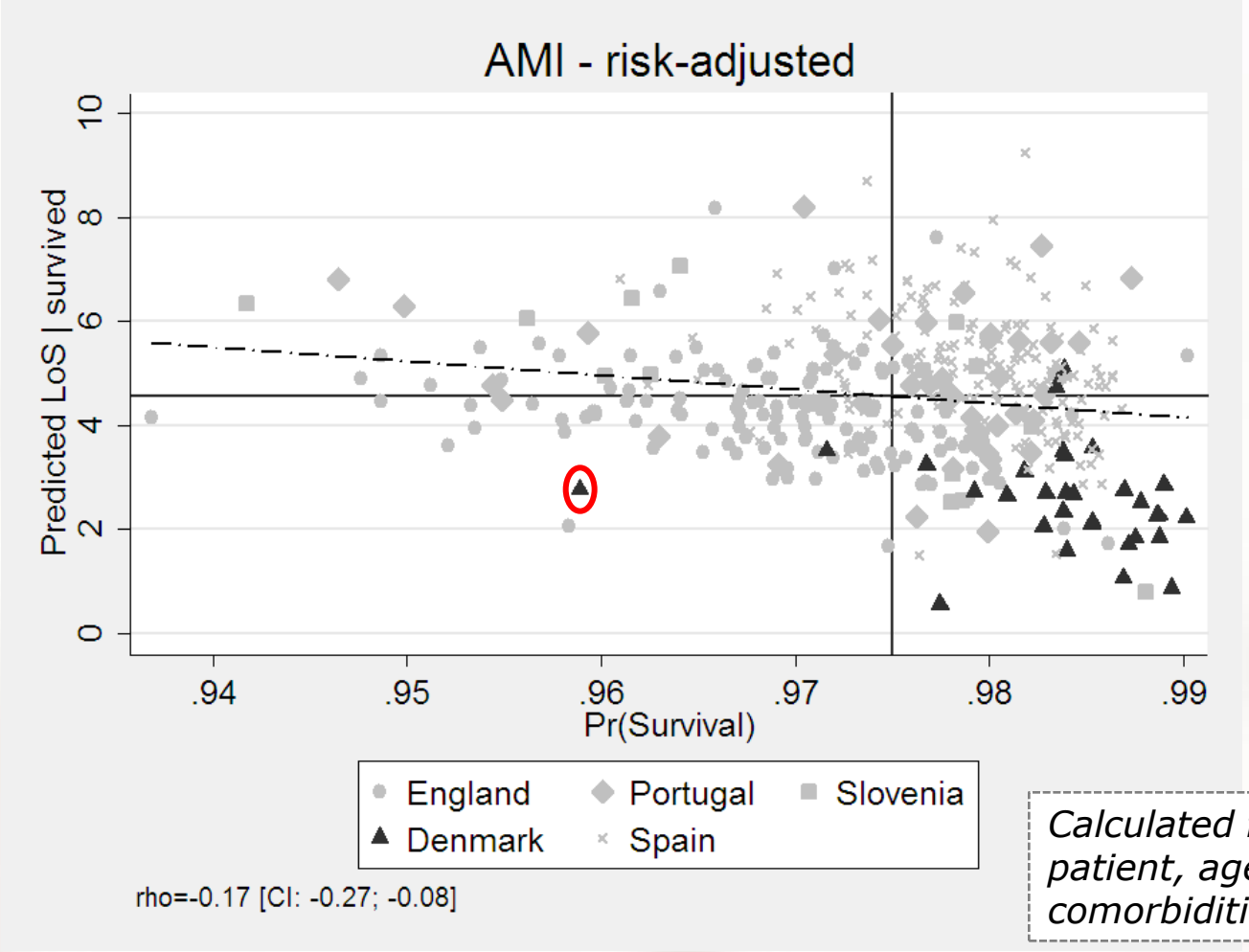

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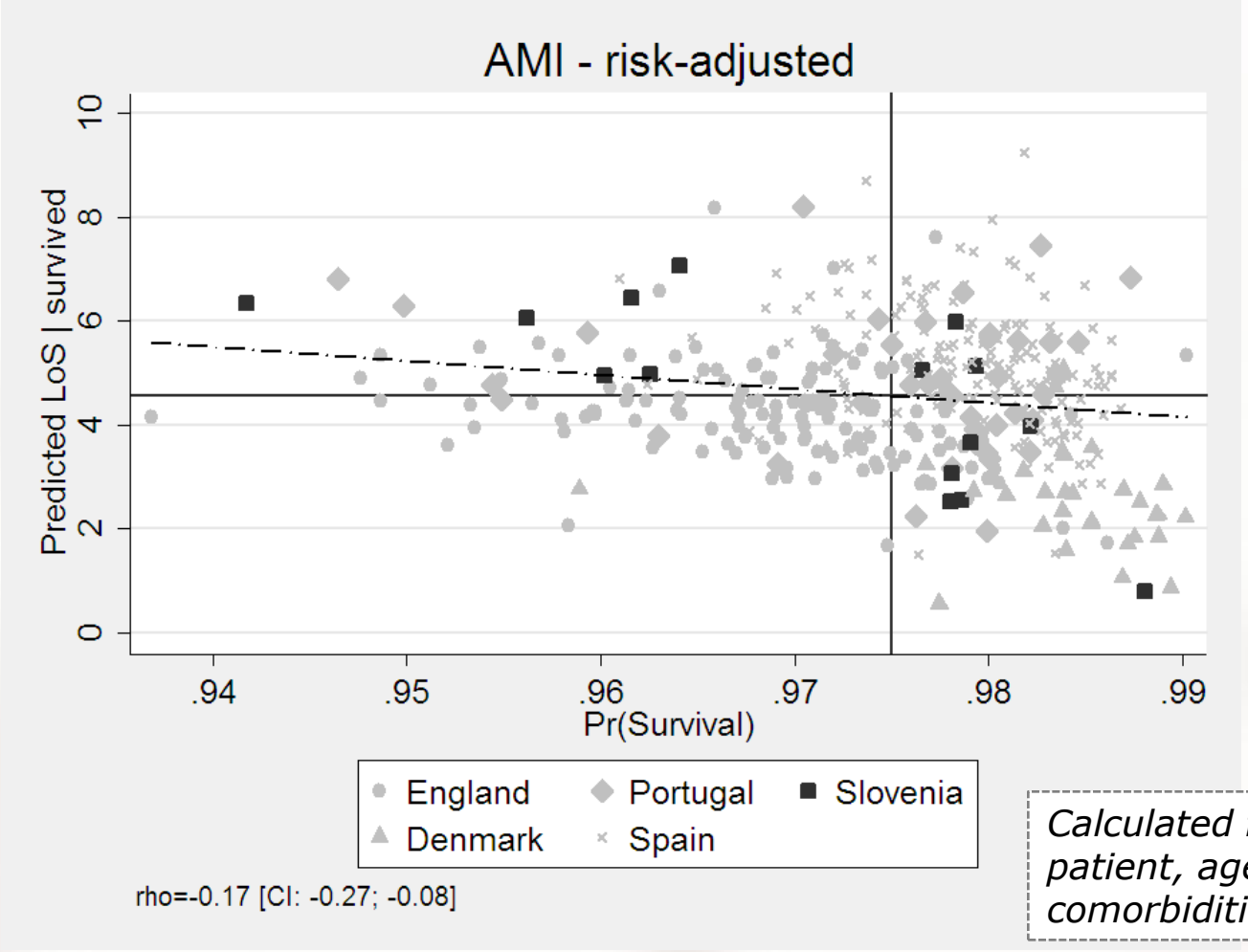

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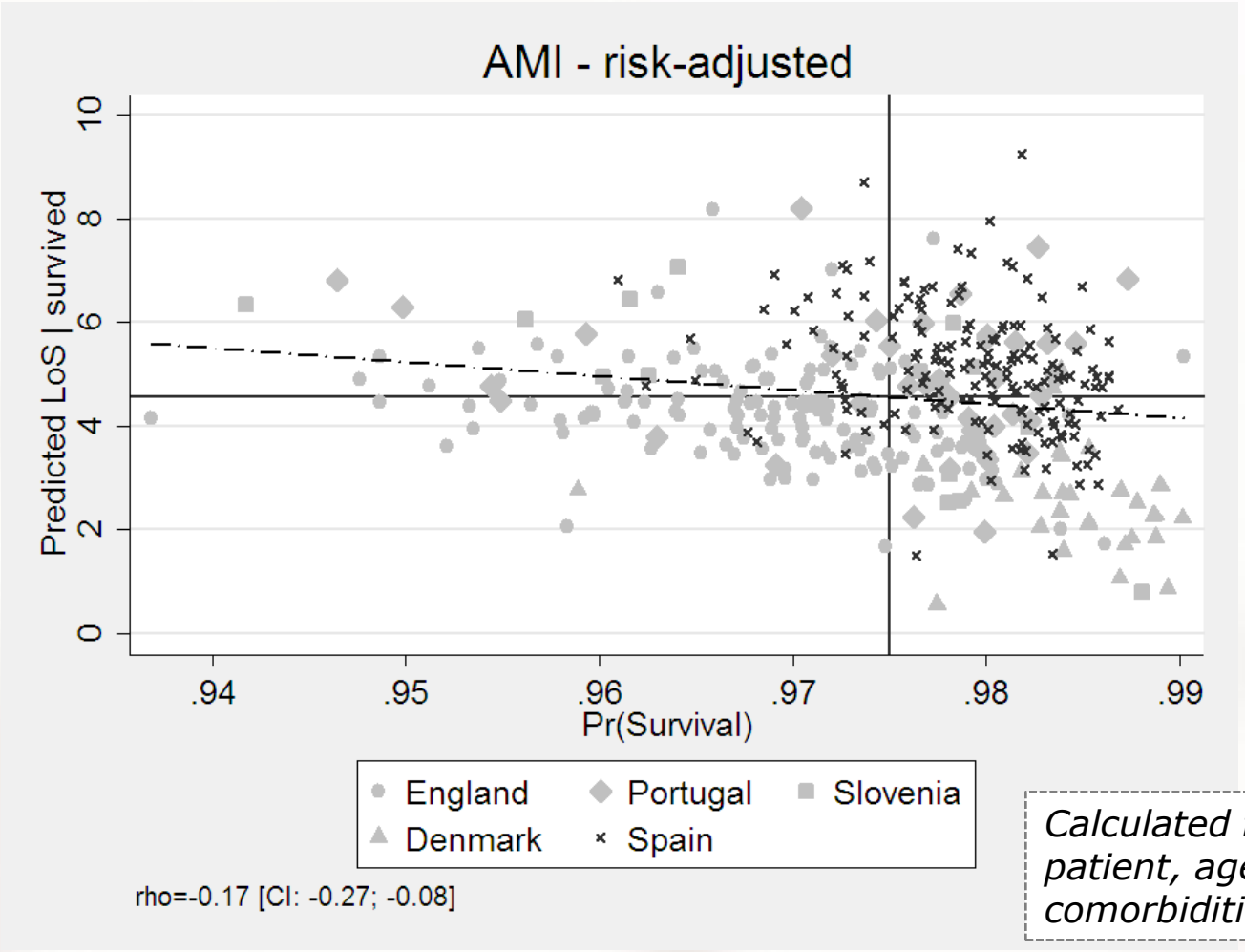

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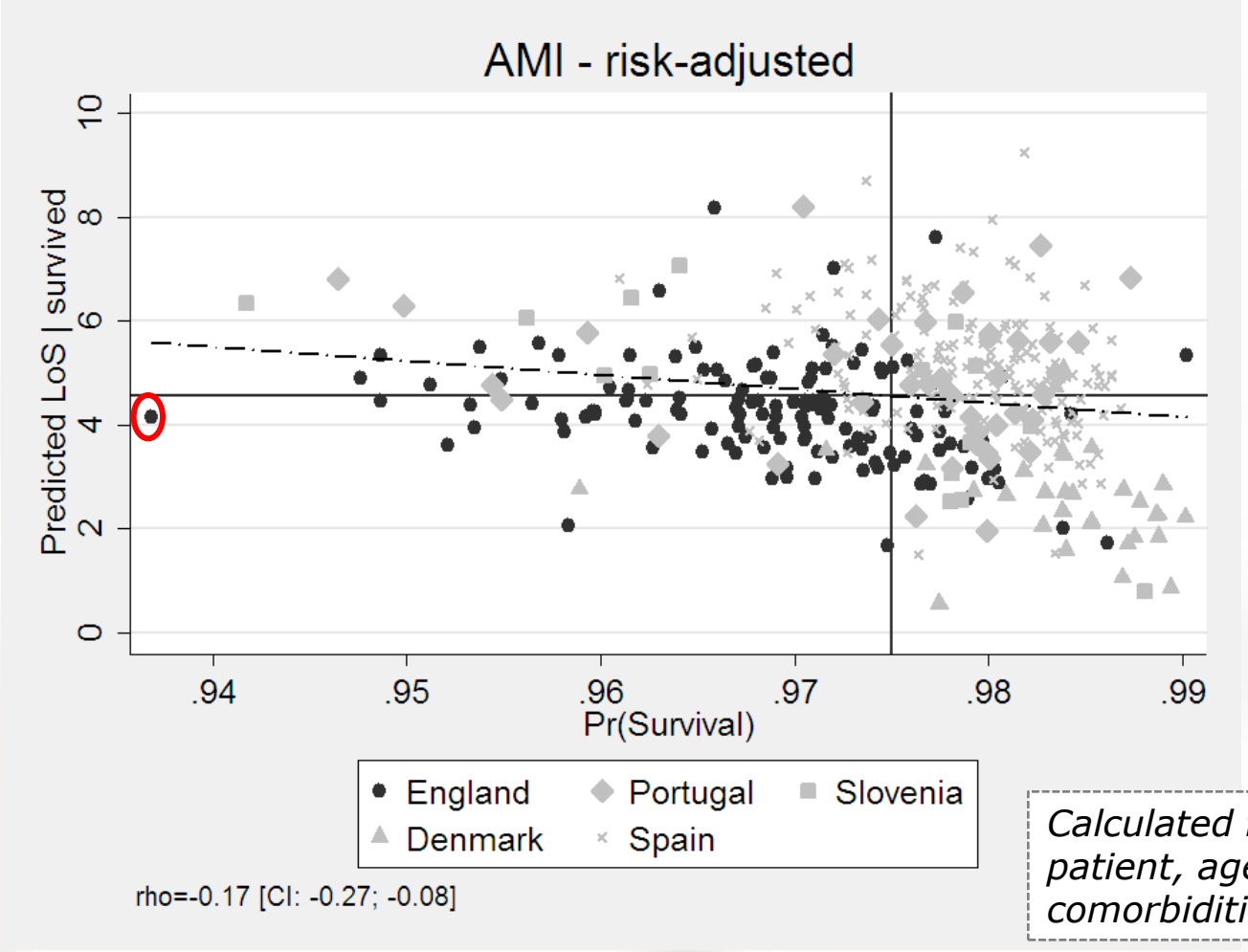

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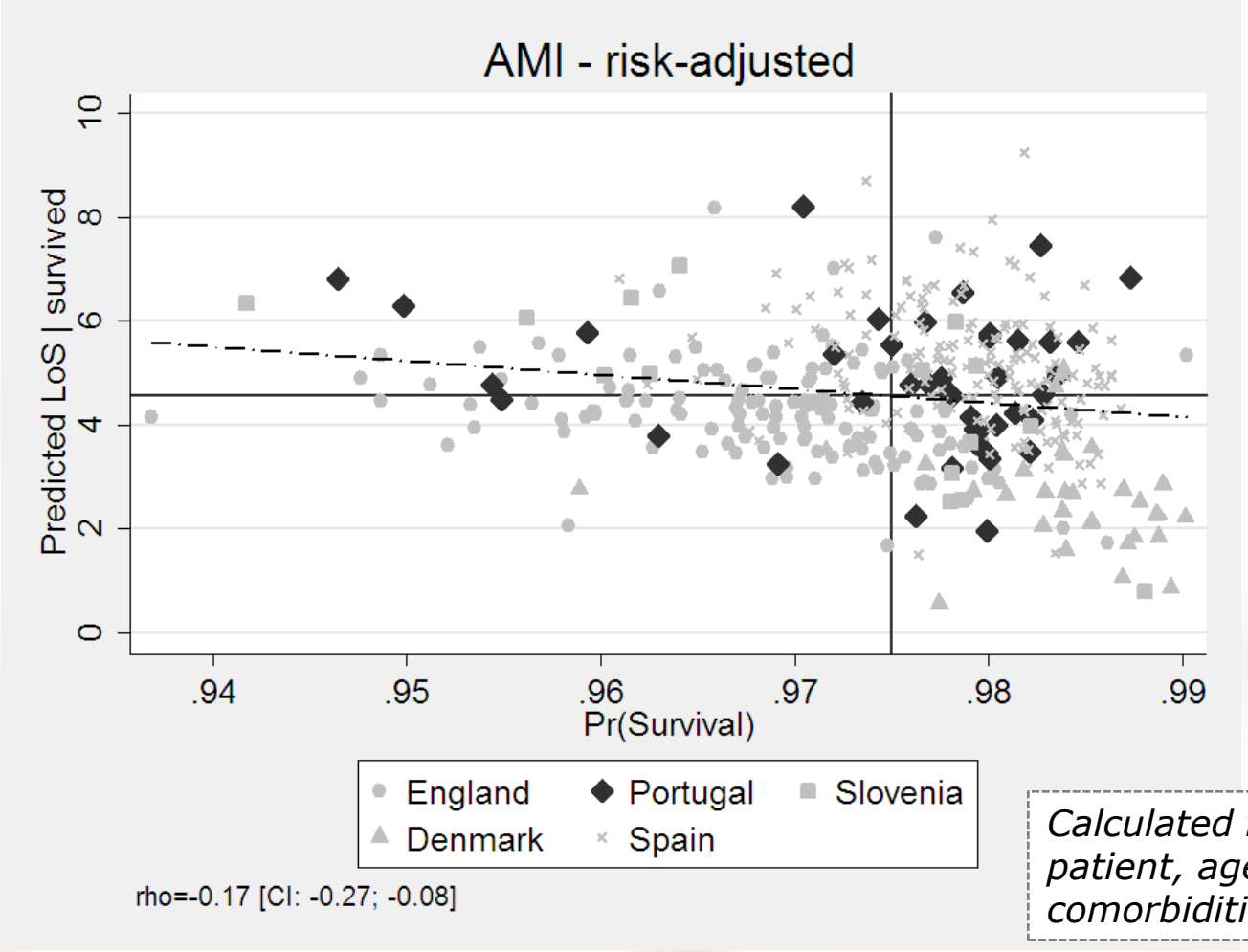

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Summary of preliminary (!) results

1. Negative or no correlation before and after risk-adjustment
   - No evidence of a positive correlation(!)
2. Substantial country-level differences
   - Denmark great on everything
   - Spain keeps patients in quite long
   - England efficient in discharging, but not always great in keeping patients alive
3. More rounded view on performance
   - Not all Slovenian hospitals are bad, not all Danish hospitals are outstanding
   - Good average survival ≠ good survival rates in each hospital

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Strengths and Limitations

1. Assess correlation by country and pooled
   - But: correlation ≠ causation
2. Length of stay ≠ cost
   - But: comparable across countries, easy to measure
3. Discharge alive ≠ alive after 30 days
   - ECHO does not collect mortality data outside the hospital – many countries cannot provide these data
   - No information about re-admissions
   - But: In-hospital AMI mortality good proxy for 30-day mortality (e.g. Borzecki et al., MedCare, 2010)
4. No clinical data / severity of condition
   - Cannot be sure that case-mix adjustment is complete

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Further work

- Conditions:
  - Extend to coronary artery bypass graft (CABG) and stroke
- Methods:
  - Identify good/good or bad/bad hospitals based on Bayesian tail probability
  - What are their characteristics (e.g. specialisation)? Where are they located (country)?
- Sensitivity analysis:
  - Drop 30 day constraint
  - Drop outliers – does the correlation hold?