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# Is there a Trade-off between Costs and Quality in Hospital Care? Evidence from Germany and the US

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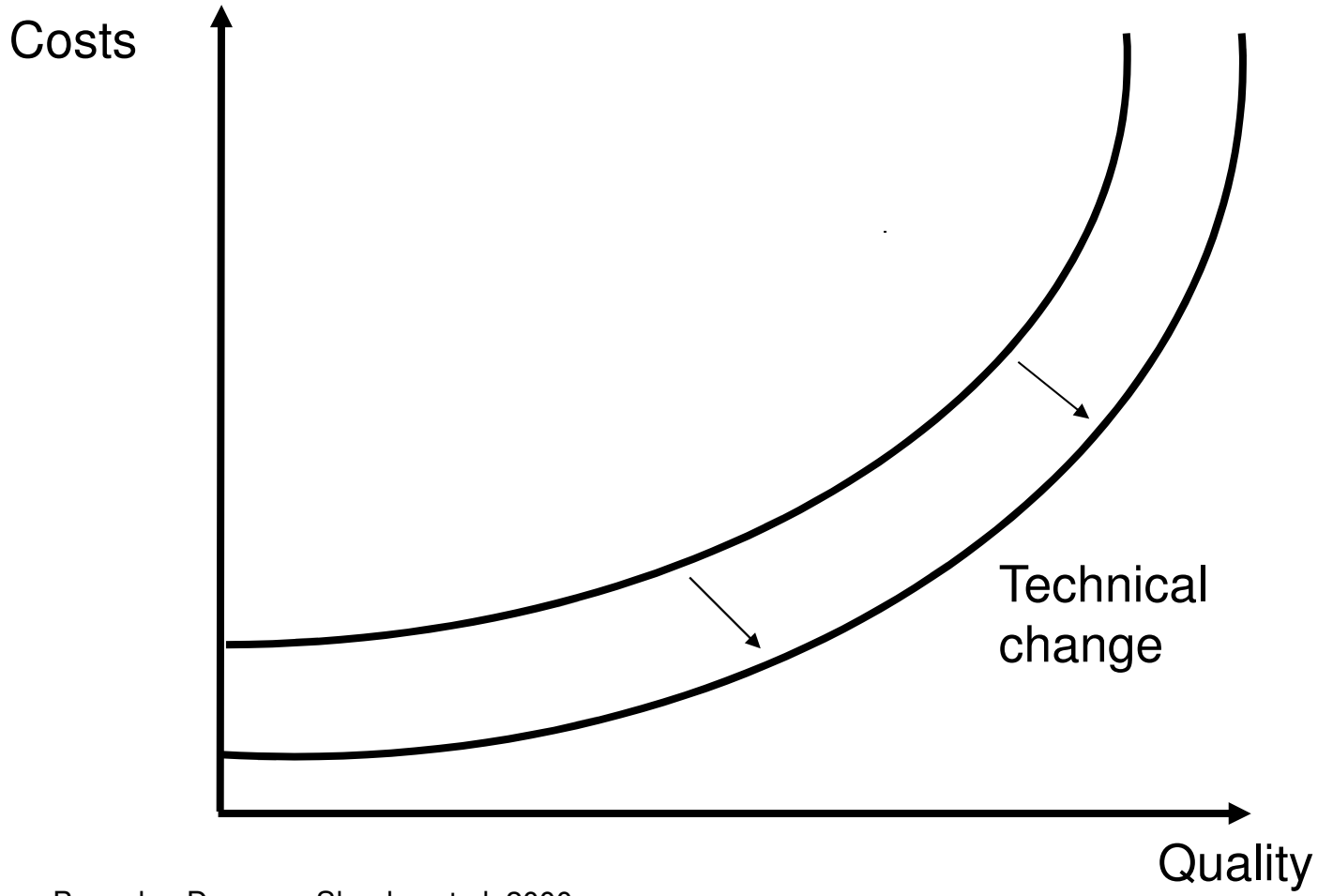
# Background

- Providing high quality health care at low costs is primary aim in almost any health care system
- Is the often proposed hypothesis “additional resource input increases health outcomes” correct?
- So far research mainly focused on single (esp. new) interventions – does not answer this question
- New approach:
  - It is often impossible to identify the activity with the greatest impact on outcomes (high nursing ratios maybe as important as choice of stents for AMI patients)
  - Some activities of care may even be substitutes
  - Combination of different resources and activities may be most promising

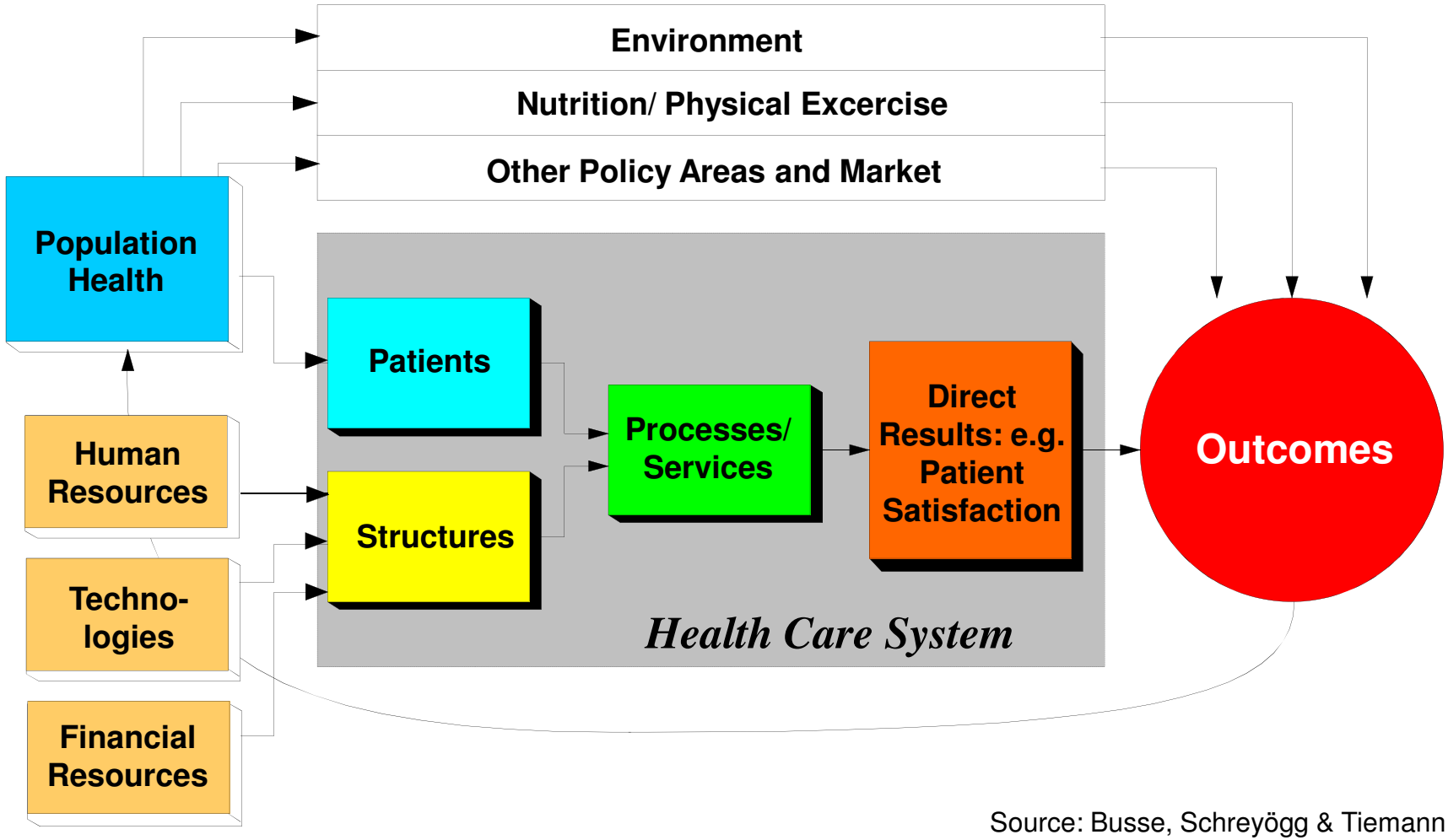
- Important for decision-makers to understand the potential trade-off between costs and outcomes
- Studies on the relationship between costs and outcomes are scarce

# Traditional Relationship between Costs and Quality




Source: Besanko, Dranove, Shanley et al. 2000.

# The Health Care „Production“




Source: Busse, Schreyögg & Tiemann 2010

# Empirical Evidence (1)

First approach: use of aggregate measures for costs and health outcomes on the hospital level without focusing on selected conditions

- Dominated by health economists/ health economic journals
- Measures: mortality at the hospital level as the only outcome measure
- Results: varied largely
  - some studies have found a positive association between hospital costs and health outcomes (Mukamel et al., 2001)
  - others have concluded that low hospital costs and strong health outcomes are not mutually exclusive (Carey and Burgess, 1999; Fleming, 1991)

-> Conclusion: contradictory results/ using aggregate measures limits the ability to control for case-mix and reduces the precision of estimates

# Empirical Evidence (2)

Second approach: investigates the cost-outcome relationship by concentrating on selected conditions treated in hospitals

- Dominated by outcomes researchers/ medical journals
- Measures: patient-level data to perform outcome-specific risk adjustment; post-hospital mortality, readmission, complications etc.; costs measured as reimbursement rates (not differentiated by case)
- Conditions: AMI, congestive heart failure, pneumonia, sepsis, surgical interventions
- Results: positive relationship for most conditions
  - Positive relationship: AMI, congestive heart failure, sepsis (Chen et al., 2010; Romley et al., 2011; Stukel et al., 2012),
  - Negative relationship: pneumonia (Chen et al., 2010)

-> Conclusion: relationship may differ by condition; studies have several limitations from an econometric perspective; studies based on data from the US and Canada only

## Research Approach

We studied the trade-off between cost and outcomes

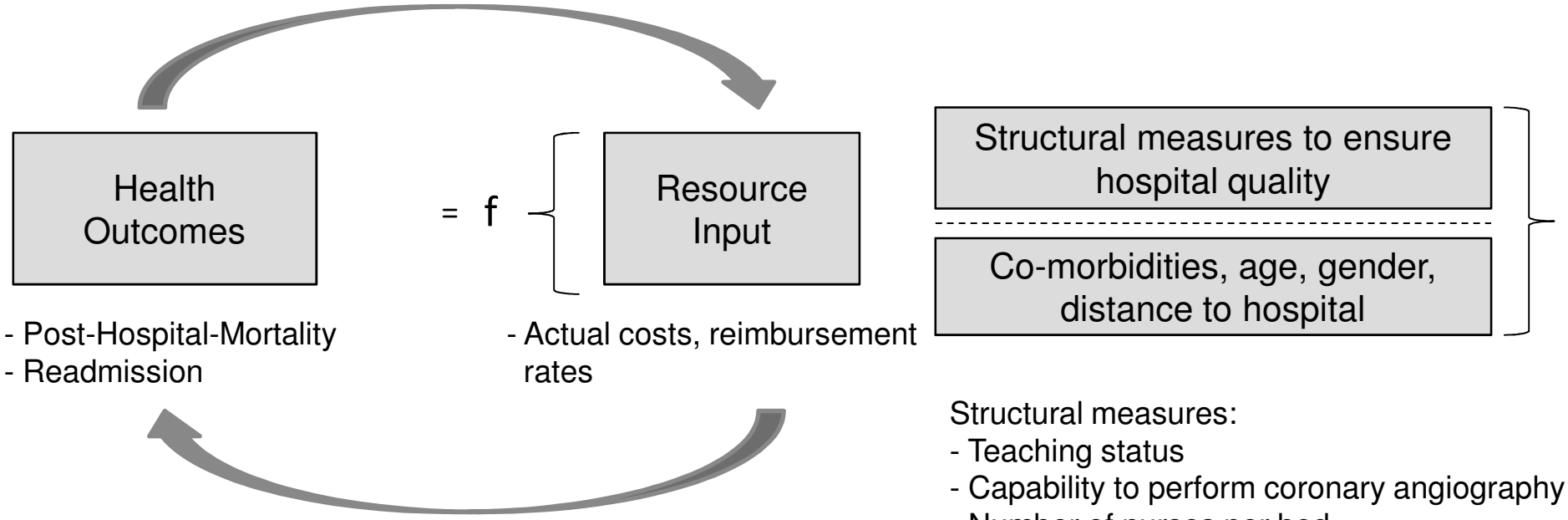
(a) by using patient-level data from administrative data

(b) by focusing on AMI as one episode of care using patient level data in order to allow for disease specific risk-adjustment

- requires immediate medical attention (patient selection between hospitals is less relevant than for other conditions)
- incidence of AMI is high and it is the leading cause of death in the elderly
- there is evidence that hospitals that provide higher-quality of care can achieve substantially lower mortality rates (Landrum et al., 2004; McClellan and Staiger, 2000; Shen, 2002)

# Research Model

- Hypothesis:




Structural measures:
- Teaching status
- Capability to perform coronary angiography
- Number of nurses per bed
- Number of AMI cases per year
- Hospital size in beds

# Methods

- Cox-proportional-Hazard-Model: 1) Time to death und 2) Time to readmission

- Endogeneity of costs: expected health outcomes may have impact on costs

  -> Instrumental variable approach: 2 Stage Residual Inclusion (2SRI) approach

- Hierarchical Data: each hospital treats more than one patients, so costs and health outcomes within hospitals are correlated

  -> Mulilevel Model: Frailty-Cox-Proportional-Hazard-Model

- Competing Risk: Event ‘death’ is a competing risk for the event ‘readmission’, i.e. death at a specific point in time thereafter excludes readmission

  -> Observations that died were treated as censored in the readmission model

# Setting 1: US Veterans‘ Health Administration (1)

- Due to fragmentation of health care systems (purchaser provider split) patient-level data usually provides either
    1. the payer perspective (e.g. Medicare) including information on post-hospitalization outcomes, but not on actual costs per patient, or
    2. the hospital perspective including actual costs per patient, but no information on post-hospitalization outcomes

- VHA is largest vertically integrated health care provider in the US providing both perspectives

- VHA only treats US-Veterans and family members

- Problem: VHA is a very specific setting

# Setting 1: US Veterans‘ Health Administration (2)

- VHA has detailed modular accounting approach allowing us to separate costs according to diagnostic services, laboratory, drugs, personnel costs, and overhead costs

  -> Costs were defined as costs incurred during the index hospitalization for treatment of AMI

- Measures of clinical outcome:
  1. Mortality assessed until one year after the index hospitalization with AMI (time to death)
  2. Readmission assessed until one year after the index hospitalization due to AMI, angina pectoris und congestive heart failure) (time to readmission)

- Exclusion criteria: AMI as complication, AMI in year before index admission, admission and discharge on the same day

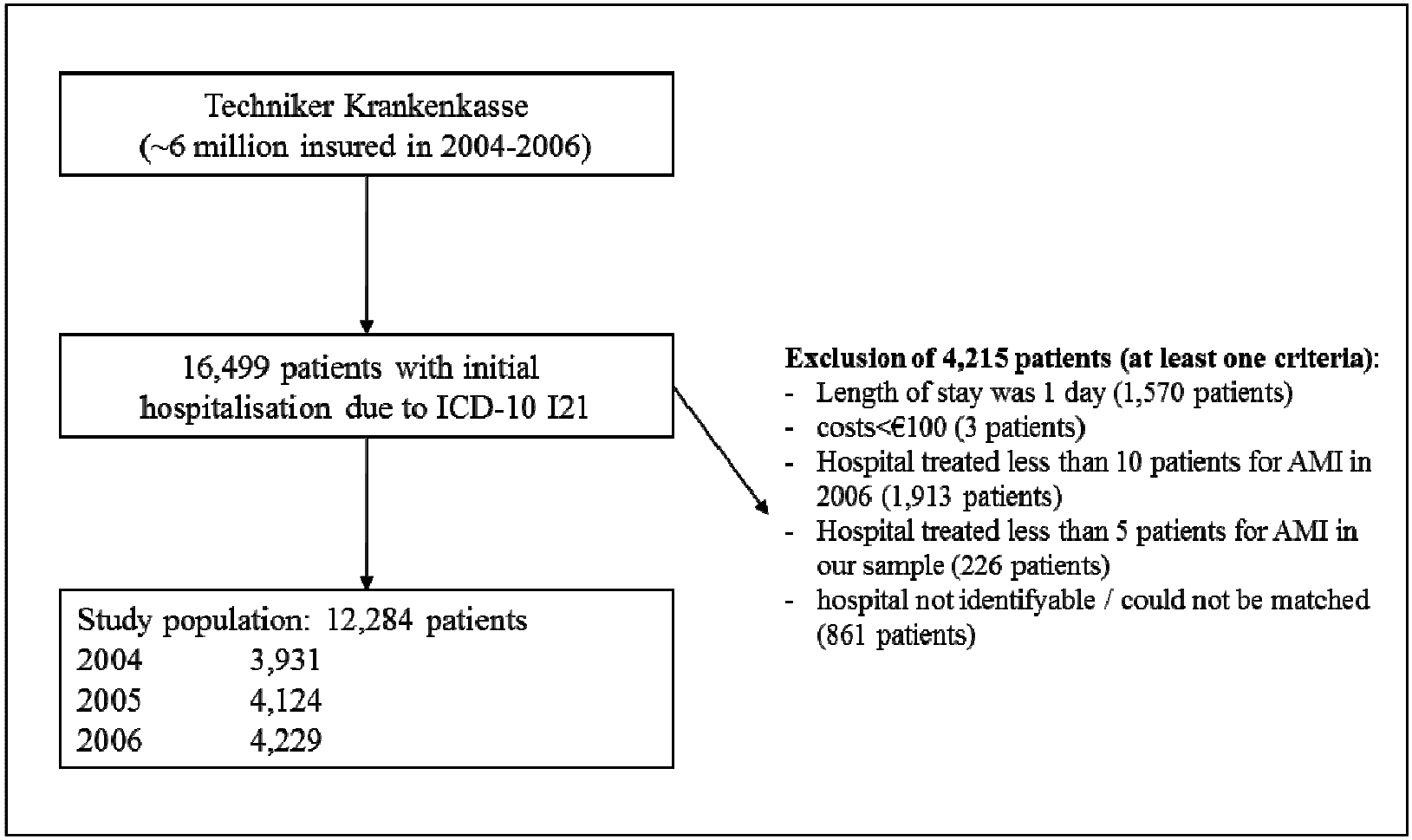
-> 115 VHA hospitals with 35,279 AMI patients remained in the sample (years 2000-2006)

# Setting 2: Germany (1)

- Sharp contrast to VHA system: sharp separation of in- and outpatient care, separation of payer and provider, no obligatory gatekeeper system
- Problem: sickness funds have rich data, but only see prices paid to providers/ hospitals see actual costs, but do not see how patients fare after hospitalization
- Measures of clinical outcome and exclusion criteria: definition identical with VHA study
- Data was based on the Techniker Krankenkasse one of the largest German sickness funds

-> 318 German hospitals with 12,284 AMI patients remained in the sample (years 2004-2006)

# Setting 2: Germany (2)



# Results

US Veterans‘ Health Administration:

-> Increase of costs by US$100 leads to a **0.6% reduction** of risk for mortality

-> Increase of costs by US$100 leads to a **1.23% reduction** of risk for readmission

Germany:

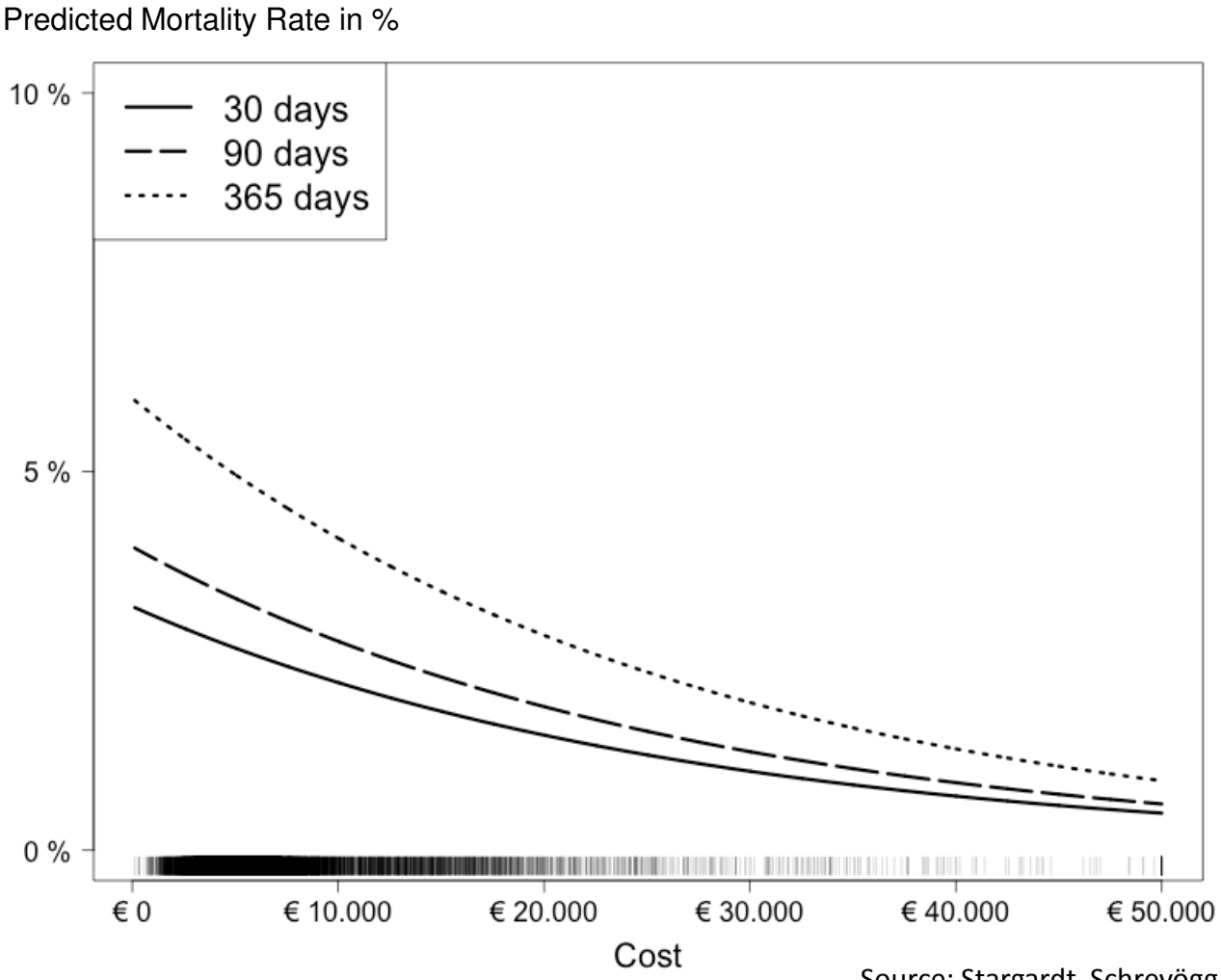
-> Increase of costs by €100 leads to a **0.4% reduction** of risk for mortality

-> Increase of costs by €100 leads to a **1.83% increase** of risk for readmission

Example: average risk for mortality after AMI of around 4%
-> €1000 more -> reduction of mortality of 0.16 percentage points to 3.84%

Source: Schreyögg & Stargardt (2010); Stargardt, Schreyögg & Kondofersky (2012)

# Relationship of Costs and Mortality for German Hospitals




Source: Stargardt, Schreyögg & Kondofersky (2012)

# Discussion

- Higher resource input → lower mortality and higher resource input → lower number of readmissions (for VHA)
  - Negative association confirms the often-stated hypothesis that increased resource input for patients leads to better outcomes.

- Higher resource input → higher number of readmissions (for Germany)
  - Nature of readmissions as an outcome measure: readmission always requires a decision to readmit a patient; for patients with multiple co-morbidities a readmission might have not been considered appropriate
  - Event death: leads to reduced time at risk for a readmission for those who died

# Limitations

- Other important information, such as the volume of procedures performed by a particular surgeon or staffing patterns of the nursing units were not available to us
- Others parts of the health care sector should be taken into consideration e.g. rehabilitation
- Certain combinations of highly multimorbid conditions may not be identified by the models

# Discussion

- We have developed a robust methodological framework to investigate the cost-outcome relationship exploiting the available information
- Relationship between costs and outcomes…
  - may vary according to the health care context
  - may vary by the selected outcome parameter
  - may even vary by hospital
- Outcomes should be monitored closely when introducing cost-containment programs
- Future studies should try to answer the question, why the cost-outcome relationship may vary according to conditions and settings investigated:
  - researchers will have to decompose hospital treatment processes into numerous activities
  - identifying mechanisms that drive the cost-outcome relationship

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