# General internists at the hospital: cost savers or big spenders?

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## Background

- Are the internists working at your hospital big spenders? Or do they help saving costs?

- One might be tempted to take the amount of money they spend as their contribution to the hospital budget

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# Background

- ▶ Are the internists working at your hospital big spenders? Or do they help saving costs?

- ▶ One might be tempted to take the amount of money they spend as their contribution to the hospital budget

- ▶ What lies beneath those costs?

# Methodology

1. Production function

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# Methodology

1. Production function
2. Production outcomes

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# Methodology

1. Production function
2. Production outcomes
   - Resource utilization

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1. Production function
2. Production outcomes
   - Resource utilization
     - Matching estimators
     - Length of stay
   - Health outcome

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# Methodology

1. Production function
2. Production outcomes
   - Resource utilization
     - Matching estimators
     - Length of stay
   - Health outcome
     - Probit
     - Change in the probability of death

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## Matching estimators

► First best
  ► to have the same patient treated in both types of services

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## Matching estimators

► First best
   ► to have the same patient treated in both types of services
   ► compare resources and outcome

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## Matching estimators

- ▶ First best
  - ▶ to have the same patient treated in both types of services
  - ▶ compare resources and outcome
- ▶ Abadié & Imbens (2002) - define two groups, match the observations

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# Matching estimators

- ▶ First best
  - ▶ to have the same patient treated in both types of services
  - ▶ compare resources and outcome
- ▶ Abadié & Imbens (2002) - define two groups, match the observations
  1. define measure of distance - covariates
  2. measure effect of the treatment both in the whole sample (SATE) and in the treated ones (SATT)

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## Probit

- Goal: estimate what drives the probability of leaving the hospital alive
- Same covariates as in the matching process

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## Probit

- ▶ Goal: estimate what drives the probability of leaving the hospital alive
- ▶ Same covariates as in the matching process
- ▶ Sign and magnitude of the internal medicine marginal effect

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# The data

- ▶ Portuguese hospitals, 2005
- ▶ Diagnosis Related Group (DRG) database

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# The data

- Portuguese hospitals, 2005
- Diagnosis Related Group (DRG) database
    - age
    - gender
    - length of stay
    - service codes
    - ICD-9-CM codes for diagnosis and procedures
    - discharge

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- Patient complexity and comorbidity measured by

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    - ▶ discharge
- ▶ Patient complexity and comorbidity measured by
    - ▶ Charlson comorbidity index (CCI) - Deyo approach
    - ▶ Index for procedure complexity
    - ▶ Observation room (OR)

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## Selecting the observations

▶ Focus on speficic type of DRG - patients can be assigned to
both internal medicine and specialty

|  | DRG | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Pneumology | 79 | 82 | 88 | 89 | 90 | 96 | 97 |
| Cardiology | 127 | 134 | 138 | 139 | 140 | | |
| Gastroenterology | 174 | | | | | | |
| Nephrology | 316 | | | | | | |

▶ Valid observation: the patient was treated at either internal
medicine or the corresponding specialty

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# Matching estimates per DRG (1)

Figure: Stata output: DRG 88 - Average treatment effect (SATE)

```
Matching estimator:  Average Treatment Effect

Weighting matrix: inverse variance        Number of obs        =        1683
                                          Number of matches  (m) =           1

         los  |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
        SATE  |  -1.408693   .6742706    -2.09   0.037    -2.730239   -.0871467

Matching variables:  so g_cci sexo gravidade age age2 amad vise guar covi guim
        feir
Bias-adj variables:  so g_cci sexo gravidade age age2 amad vise guar covi guim
        feir
```

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# Matching estimates per DRG

Figure: Sign and significance level for each DRG



SATE:Sample average treatment effect
SATT: Sample average treatment effect for the treated group
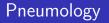m(1) - one match      m(4) - match the average of the closest four

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# Pneumology

Figure: Sign and significance level for each *top 5* hospital

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# Cardiology

Figure: Sign and significance level for each *top 5* hospital

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# Mortality - Probit estimates per DRG

Figure: Marginal effects *per* DRG

| DRG | Marginal effect | DRG | Marginal effect |
|-----|-----------------|-----|-----------------|
| 79  | -0.086 **       | 90  | -0.085***       |
| 82  | n.s.            | 96  | -0.071***       |
| 88  | n.s.            | 127 | -0.064***       |
| 89  | -0.058***       | 316 | n.s.            |

Significance levels:   $*: 10\%$    $**: 5\%$    $***: 1\%$

▶ Mg. effect $=$-0.086 $\Rightarrow$ the probability of alive discharge decreases by almost 9% if the patient was treated in internal medicine, when compared to pneumology

## Main results

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## Main results

- Are the internists working at your hospital big spenders? Or do they help saving costs?

- There is evidence that the internal medicine affects health care production in an inpatient setting

- In some cases, it decreases resource utilization (measured by the length of stay), but the reverse is also true

- The probability of death has shown to be higher if the patient is treated in the internal medicine, *caeteris paribus*