The opinions expressed in this presentation are the author's own and do not reflect the view of ANAC or the Italian Government.
Some little problems in Italy
ONE SMALL PROBLEM!

Italian Public Debt

![Evoluzione del rapporto debito / PIL](image)
Reducing role of government

- Privatization (…and regulation in certain industries)

Reducing level of intervention

- Fiscal policy
  - Tax Reform
  - Public Expenditure Reform (i.e. pension reform)
SOME REMEDIES....

Public Expenditure Reform

✓ Austerity: systematic and linear cuts in spending (several reductions in infrastructure investments and in human capital)

✓ Spending review: increasing the efficiency of spending
  • reducing the amount of expenditure
  • delivering the same or better levels of public goods and services
SOME REMEDIES....

- Spending review in public procurement:
  - demand aggregation
  - and... scraping the bottom of the barrel

Reference Prices
What is a reference price?

✓ A sort of “fair” value in the context of public purchases
✓ An efficient price calculated through a survey
✓ Regulatory effect depends on sectors (ex. Health)
Why ANAC is responsible of this calculation?

Prevention of corruption in public administration and in public procurement

“ANAC [...] in order to promote the economic efficiency of public contracts and the transparency of purchasing conditions, [...] provides to prepare reference prices for goods and services [...] under the most efficient conditions, among those with the greatest impact in terms of cost to the public administration”.
How do we calculate reference prices?

- Survey
- Data Collection
- Statistical Analysis
- Reference Prices
- Regulation
According to the law, a reference price in the health sector, at the most efficient conditions, is a percentile (the 25th percentile or below) of the prices recorded for each good or service being analyzed on the basis of **statistical significance** and the **heterogeneity** of the goods and services.

**Prices of goods/services**

- \( P_5 \)
- \( P_{10} \)
- \( P_{20} \)
- \( P_{25} \)

In ascending order from the smaller to the bigger:

- Heterogeneity/Homogeneity \( \rightarrow \) intrinsic characteristics of the good/service
- Statistical significance \( \rightarrow \) variability of the prices detected
- \( \rightarrow \) number of observations available
Reference Price: on goods with a certain degree of homogeneity

It is necessary to identify comparable goods/services

The comparison of prices of completely different goods would lead to completely misleading results
Reference Prices - Standardization

**Standardization:**

The process of "construction" of goods / services comparable to each other

**Ex-ante Standardization**  ➔ before data collection

**Ex-post Standardization**  ➔ after data collection

using regression based methods
Reference Prices - Standardization

**Ex-ante Standardization**  ➔ **before** data collection

The expert merchandiser **selects** and **gives** some **value** to the **relevant features** to identify homogeneous products to collect prices and then calculate the percentiles.

*More viable method in the field of supplies rather than services used for:*

**Drugs** and simple **Medical Devices**
Example: "Hypodermic needles for syringe". The expert merchandiser identifies which characteristics are essential for obtaining comparable products. In the specific case, they are the material, the tip type, the gauge, the presence/absence of phthalates, latex, and the safety devices.

Subsequently, he also indicates the "values": "in lubricated stainless steel, triple sharp point, gauge G18 ÷ G25, without phthalates, latex free, with safety device".

Standardization for this product:

"Hypodermic needles for syringe in lubricated stainless steel, triple sharp point, gauge G18 ÷ G25, without phthalates, latex free, with safety device"

Collection of unit prices and the subsequent calculation of percentile.
# Reference Prices - Ex-ante Standardization

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CND_CODE</th>
<th>DESCRIPTION</th>
<th>TECHNICAL SPECIFICATIONS</th>
<th>INTENDED USE</th>
<th>REFERENCE PRICE VAT excluded</th>
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<tbody>
<tr>
<td>Patches</td>
<td>M050101</td>
<td>Patches on spool band</td>
<td>TNT, height 2,5 cm, length ≥ 9 m</td>
<td>for fixing medications, probes and catheters</td>
<td>0.18000</td>
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<tr>
<td>Patches</td>
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<td>Patches on spool band</td>
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<tr>
<td>Patches</td>
<td>M050101</td>
<td>Patches on spool band</td>
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<td>for fixing medications, probes and catheters</td>
<td>0.52000</td>
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<tr>
<td>Patches</td>
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<td>Patches on spool band</td>
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<td>for fixing medications, probes and catheters</td>
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<tr>
<td>Patches</td>
<td>M050102</td>
<td>Medicated patches</td>
<td>ca. mm 19 x 75</td>
<td>for small wounds</td>
<td>0.00900</td>
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<tr>
<td>Patches</td>
<td>M050201</td>
<td>TNT stretch patches</td>
<td>height 5 cm, length ≥ 9 m</td>
<td>for fixing medications</td>
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<tr>
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<td>M050201</td>
<td>TNT stretch patches</td>
<td>height 10 cm, length ≥ 9 m</td>
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<td>Patches</td>
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<td>TNT stretch patches</td>
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<td>for fixing medications</td>
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<td>Patches</td>
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<td>TNT stretch patches</td>
<td>height 20 cm, length ≥ 9 m</td>
<td>for fixing medications</td>
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<tr>
<td>ATC</td>
<td>Active Pharmaceutical Ingredient</td>
<td>Dosage</td>
<td>Pharmaceutical form</td>
<td>P10</td>
<td>P20</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------------------------</td>
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<tr>
<td>A16AB03</td>
<td>ALGALSIDASI ALFA</td>
<td>1 MG/ML EV</td>
<td>FIALE</td>
<td>1,538.84</td>
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<tr>
<td>A16AB07</td>
<td>ALGLUCOSIDASI ACIDA UMANA RICOMBINANTE</td>
<td>50 MG + 1 FIALA 20 ML</td>
<td>FIALE</td>
<td>508.25</td>
<td></td>
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<tr>
<td>B01AB01</td>
<td>EPARINA SODICA</td>
<td>25000 UI 5 ML</td>
<td>FIALE</td>
<td></td>
<td>2.05</td>
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<tr>
<td>B01AB02</td>
<td>ANITITROMBINA III UMANA</td>
<td>1000 UI</td>
<td>FLACONE</td>
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<td>145</td>
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<tr>
<td>B01AB04</td>
<td>DALTEPARINA SODICA</td>
<td>UI AXA</td>
<td>FIALA/SIRINGA</td>
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<td>UI AXA</td>
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<td>B01AB06</td>
<td>NADROPARINA CALCICA</td>
<td>UI AXA</td>
<td>FIALA/SIRINGA</td>
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<td>B01AB07</td>
<td>PARNAPARINA SODICA</td>
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<td>B01AB08</td>
<td>REVIPARINA SODICA</td>
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<td>FIALA/SIRINGA</td>
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<tr>
<td>B01AB12</td>
<td>BEMIPARINA SODICA</td>
<td>UI AXA</td>
<td>FIALA/SIRINGA</td>
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<tr>
<td>B01AC11</td>
<td>ILOPROST</td>
<td>20 MCG 2 ML SOLUZIONE</td>
<td>FIALE</td>
<td>24.652</td>
<td></td>
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<tr>
<td>B01AC13</td>
<td>ABCIXIMAB</td>
<td>2 MG/ML 5 ML</td>
<td>FIALA</td>
<td>231.74</td>
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<tr>
<td>B01AC17</td>
<td>TIROFIBAN</td>
<td>0,25 MG/ML 50 ML</td>
<td>FIALE</td>
<td>157.71</td>
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<td>B02BD08</td>
<td>EPTACOG ALFA</td>
<td>1 MG POLVERE</td>
<td>FIALE</td>
<td>653.84</td>
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<tr>
<td>B02BD08</td>
<td>EPTACOG ALFA</td>
<td>2 MG POLVERE</td>
<td>FIALE</td>
<td>1,307.7</td>
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<tr>
<td>B03XA01</td>
<td>ERITROPOIETINA</td>
<td>UI</td>
<td>FIALA/SIRINGA</td>
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<tr>
<td>B03XA02</td>
<td>DARBEPOIETINA ALFA</td>
<td>MCG</td>
<td>FIALA/SIRINGA/PENNA</td>
<td>1.15</td>
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<tr>
<td>B03XA03</td>
<td>ERITROPOIETINA PEGILATO</td>
<td>MCG</td>
<td>FIALA/SIRINGA</td>
<td>1.16</td>
<td></td>
</tr>
</tbody>
</table>
Ex-post Standardization  $\rightarrow$ after data collection

How do we process Ex-post Standardization?

1. List of potentially relevant features of the good/service
2. Survey
3. Data collection
4. Features analysis
5. Selection of the sub-set of features that significantly influence the price
Reference Prices — Ex-post Standardization

- Non-parametric statistical tests
- Regression variables selection tools
- Linear and Quantile regression

Procedure designed and implemented by ANAC

<table>
<thead>
<tr>
<th>Parametric test</th>
<th>Non-Parametric equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paired t-test</td>
<td>Wilcoxon Rank sum Test</td>
</tr>
<tr>
<td>Unpaired t-test</td>
<td>Mann-Whitney U test</td>
</tr>
<tr>
<td>Pearson correlation</td>
<td>Spearman correlation</td>
</tr>
<tr>
<td>One way Analysis of variance</td>
<td>Kruskal Wallis Test</td>
</tr>
</tbody>
</table>
Reference Prices - Standardization

**Ex-post Standardization**

Example: *cleaning services in the health sector*
Reference Prices - Standardization

Ex-post Standardization

Example: cleaning services in the health sector

Sez. 1 – General data on the contract

1.  Cig Identification Code of tender
2.  Date of the contract
3.  **Contract amount** euro net of VAT, excluding renewals and possible extensions
4.  Contract duration in months, excluding renewals and possible extensions
5.  Award criteria.
6.  Price component weight in the case of economically most advantageous offer
7.  Contractor Tax Code
8.  Legal form of contractor
9.  Total amount of renewals and extensions euro net of VAT
10. **Total duration of renewals and extensions** in months
11. Number of facilities served by the contract
12. Number of actual beds in the facility served by the contract
13. Number of employees of the facility served by the contract

LIST of collected variables
Reference Prices - Standardization

**Ex-post Standardization**

**Example:** cleaning services in the health sector

Sec. 2a - Specific information on the conditions of the service

14. Breakdown of the square meters of hospital buildings between the pavilion, single-block and polyglot;
15. Presence of external windows requiring scaffolding or cleaning machinery;
16. Incidence of external glazing on the total external walls;
17. Staff made available to the company;
18. **Number of annual hours provided for the service**;
19. The possible presence of a clause for the absorption of outgoing personnel;
20. Any use of health care company employees in relation to cleaning services;
21. If present, the average daily number of employees re-proportioned full-time ;

Sec. 2b - Local section / risk areas

a. Area / local name
b. the surface MQ ;
c. the associated risk area HIGHEST RISK, HIGH RISK, MEDIUM RISK, LOW RISK, EXTERNAL AREA ;
d. the weekly frequency;
e. the inclusion or not of the revision intervention;
f. the number of checks;
g. the amount of the monthly fee per square meter
Ex-post Standardization

Sec. 2c - Services section provided for in the contract

1. Cleaning of vertical walls;
2. Emergency response team for spot operations on request;
3. Cleaning the air treatment system ducts;
4. Disposal of ordinary waste;
5. Disposal of special waste;
6. External transport of special waste;
7. Presidium during operative sessions for cleaning after each operation;
8. Call-by-call service at night / holidays;
9. The provision of continuous monitoring;
10. Basic cleaning in general and renovations;
11. Cleaning of furniture funds;
12. Internal handling of special waste;
13. Supply of sanitary materials;
14. Disinfection and deratting;
15. Washing disinfection dialysis machines;
16. Service inns cleaning and remaking beds post-resignation;
17. Supply of IT systems;
18. Porterage;
19. Material transport;
20. Other.

Example: cleaning services in health sector

LIST of collected variables
**Reference Prices - Standardization**

**Ex-post Standardization**

**REFERENCE PRICE FUNCTION**

\[ p_{\text{ref}} = f (X_1, X_2, X_3, \ldots, X_n) \]

sub-set of features, selected through the procedure
<table>
<thead>
<tr>
<th>Rischio</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ALTISSIMO RISCHIO</strong></td>
<td>$P_{n25}=\max(p_{25},p_{25}^{\text{quant}})$ con</td>
</tr>
<tr>
<td>$p_{25} = 4.9649066283 - 0.000412331 \cdot \text{Superficie} + 0.16088 \cdot \text{Addetti} + 0.96862 \cdot S7\text{compreso},$</td>
<td></td>
</tr>
<tr>
<td>$p_{25}^{\text{quant}} = 5.0069 - 0.0001447 \cdot \text{Superficie} + 0.0546 \cdot \text{Addetti} + 1.0351 \cdot S7\text{compreso}. $</td>
<td></td>
</tr>
</tbody>
</table>

| **ALTO RISCHIO** | $P_{n25}=\max(p_{25},p_{25}^{\text{quant}})$ con |
| $p_{25} = 0.856345548 - 0.00013401 \cdot \text{Superficie} + 0.07676 \cdot \text{Addetti} + 0.13779 \cdot \text{Freq} + 0.07281 \cdot \text{Ripasso} + 0.69507 \cdot S2\text{compreso} + 0.85663 \cdot S5\text{compreso} + 1.25419 \cdot S9\text{compreso} + 2.11109 \cdot S18\text{compreso},$ |
| $p_{25}^{\text{quant}} = 1.0478 - 0.0000492 \cdot \text{Superficie} + 0.0205 \cdot \text{Addetti} + 0.165 \cdot \text{Freq} + 0.0857 \cdot \text{Ripasso} + 0.5529 \cdot S2\text{compreso} + 0.2651 \cdot S5\text{compreso} + 0.3468 \cdot S9\text{compreso} + 1.0731 \cdot S18\text{compreso}. $ |

| **MEDIO RISCHIO** | $P_{n25}=\max(p_{25},p_{25}^{\text{quant}})$ con |
| $p_{25} = 1.515360612 - 0.00001311 \cdot \text{Superficie} + 0.00792 \cdot \text{Addetti} + 0.06972 \cdot \text{Freq} + 0.32496 \cdot S5\text{compreso} + 0.47288 \cdot S8\text{compreso} + 0.32743 \cdot S17\text{compreso} $ |
| $p_{25}^{\text{quant}} = 1.6377 - 0.0000009 \cdot \text{Superficie} + 0.0033 \cdot \text{Addetti} + 0.0456 \cdot \text{Freq} + 0.4434 \cdot S5\text{compreso} + 0.3937 \cdot S8\text{compreso} + 0.1816 \cdot S17\text{compreso} $ |

| **BASSO RISCHIO** | $P_{n25}=\max(p_{25},p_{25}^{\text{quant}})$ con |
| $p_{25} = 0.423712158 - 0.00000973 \cdot \text{Superficie} + 0.01872 \cdot \text{Addetti} + 0.07846 \cdot \text{Freq} + 0.30389 \cdot \text{Pongetti} $ |
| $p_{25}^{\text{quant}} = 0.9562 - 0.0000087 \cdot \text{Superficie} + 0.0101 \cdot \text{Addetti} + 0.0239 \cdot \text{Freq} + 0.2149 \cdot \text{Pongetti} $ |

| **AREA ESTerna** | $P_{n25}=\max(p_{25},p_{25}^{\text{quant}})$ con |
| $p_{25} = 0.06785737 - 0.00000811 \cdot \text{Superficie} + 0.07839 \cdot \text{Addetti} + 0.00917 \cdot \text{Freq} - 1.29312 \cdot \text{Dipinterni} + 0.06685 \cdot S10\text{compreso} + 0.03971 \cdot \text{Pongetti} $ |
| $p_{25}^{\text{quant}} = 0.0858 - 0.0000011 \cdot \text{Superficie} + 0.0242 \cdot \text{Addetti} - 0.0015 \cdot \text{Freq} + 0.0456 \cdot \text{Dipinterni} + 0.0092 \cdot S10\text{compreso} + 0.0143 \cdot \text{Pongetti} $ |
Health Sector — Reference Prices: Cleaning Services

\[ P_{\text{Cleaning}}^{\text{ref}} = \frac{\sum_{i=1}^{5} (P_{\text{ref}}^i \ast \text{Surface}_i)}{\sum_{i=1}^{5} \text{Surface}_i} \]

- **ALTISSIMO RISCHIO**
  \[ P_{\text{ref}} = \max(P_{25}^{\text{quant}}, P_{25}^{\text{quant}}) \]
  \[ P_{25}^{\text{quant}} = 4.9649066283 - 0.000412331 \ast \text{Superficie} + 0.16088 \ast \text{Addetti} + 0.96862 \ast S7\text{compreso}, \]
  \[ P_{25} = 5.0069 - 0.0001447 \ast \text{Superficie} + 0.0546 \ast \text{Addetti} + 1.0351 \ast S7\text{compreso}. \]

- **ALTO RISCHIO**
  \[ P_{\text{ref}} = \max(P_{25}^{\text{quant}}, P_{25}^{\text{quant}}) \]
  \[ P_{25}^{\text{quant}} = 0.856345458 - 0.00013401 \ast \text{Superficie} + 0.19423 \ast \text{Addetti} + 0.9178 \ast \text{Ripasso} + 0.69507 \ast S3\text{compreso} + 0.85663 \ast S5\text{compreso} + 1.25419 \ast S9\text{compreso} + 2.11109 \ast S18\text{compreso}, \]
  \[ P_{25} = 1.0478 - 0.0000492 \ast \text{Superficie} + 0.0251 \ast \text{Addetti} + 0.165 \ast \text{Freq} + 0.857 \ast \text{Ripasso} + 0.2651 \ast S5\text{compreso} + 0.3468 \ast S9\text{compreso} + 1.0731 \ast S18\text{compreso}. \]

- **MEDIO RISCHIO**
  \[ P_{\text{ref}} = \max(P_{25}^{\text{quant}}, P_{25}^{\text{quant}}) \]
  \[ P_{25}^{\text{quant}} = 1.515360612 - 0.00001311 \ast \text{Superficie} + 0.19423 \ast \text{Addetti} + 0.9178 \ast \text{Ripasso} + 0.69507 \ast S3\text{compreso} + 0.85663 \ast S5\text{compreso} + 0.47288 \ast S8\text{compreso} + 0.32743 \ast S17\text{compreso}, \]
  \[ P_{25} = 1.6377 - 0.0000009 \ast \text{Superficie} + 0.19423 \ast \text{Addetti} + 0.9178 \ast \text{Ripasso} + 0.4434 \ast S5\text{compreso} + 0.3937 \ast S8\text{compreso} + 0.1816 \ast S17\text{compreso}. \]

- **BASSO RISCHIO**
  \[ P_{\text{ref}} = \max(P_{25}^{\text{quant}}, P_{25}^{\text{quant}}) \]
  \[ P_{25}^{\text{quant}} = 0.423712158 - 0.00000973 \ast \text{Superficie} + 0.19423 \ast \text{Addetti} + 0.07846 \ast \text{Freq} + 0.30389 \ast \text{Ponteggi}, \]
  \[ P_{25} = 0.9562 - 0.0000087 \ast \text{Superficie} + 0.0101 \ast \text{Addetti} + 0.0839 \ast \text{Freq} + 0.2149 \ast \text{Ponteggi}. \]

- **AREA ESTERNA**
  \[ P_{\text{ref}} = \max(P_{25}^{\text{quant}}, P_{25}^{\text{quant}}) \]
  \[ P_{25}^{\text{quant}} = 0.06785737 - 0.00000811 \ast \text{Superficie} + 0.07839 \ast \text{Addetti} + 0.09197 \ast \text{Freq} - 1.29312 \ast \text{Dipinterni} + 0.06685 \ast S10\text{compreso} + 0.3971 \ast \text{Ponteggi}, \]
  \[ P_{25} = 0.0858 - 0.0000011 \ast \text{Superficie} + 0.0242 \ast \text{Addetti} - 0.0015 \ast \text{Freq} + 0.0456 \ast \text{Dipinterni} + 0.0092 \ast S10\text{compreso} + 0.0143 \ast \text{Ponteggi}. \]
REFERENCE PRICE FUNCTION: High risk area

\[ \hat{p}_{25} = 0.856345548 - 0.00013401 \times \text{Surface}^2 + 0.07676 \times \text{Employees} + 0.13779 \times \text{Freq} + 0.07281 \times \text{Review} + 0.69507 \times S2\text{compreso} + 0.85663 \times S5\text{compreso} + 1.25419 \times S9\text{compreso} + 2.11109 \times S18\text{compreso}; \]

\[ \hat{p}_{25}^{\text{quant}} = 1.0478 - 0.0000492 \times \text{Surface}^2 + 0.0205 \times \text{Employees} + 0.165 \times \text{Freq} + 0.0857 \times \text{Review} + 0.5529 \times S2\text{compreso} + 0.2651 \times S5\text{compreso} + 0.3468 \times S9\text{compreso} + 1.0731 \times S18\text{compreso} \]

Reading key

**Surface**: Surface of risk area in square meters;

**Employees**: Number of full-day equivalent employees per day;

**Freq**: Weekly frequency;

**Review**: Weekly review intervals;

**s2compreso**: Emergency response team for spot operations on request;

**s5compreso**: Disposal of special waste;

**s9compreso**: Continuous monitoring;

**s18compreso**: Porterage;
Health Sector — Reference Prices: Cleaning Services

With the same surface area, if the number of employees increases you can also observe an increase in the fee per square meter.

With the same number of employees, if the surface increases you can observe a decrease in the fee per square meter.
Health Sector — Reference Prices: Cleaning Services

What is the least efficient price?

Price

7,0€

6,0€

Number of employees

10

11

Reference Price function
What is the least inefficient price?
Health Sector — Reference Prices: Savings in health sector

~6 billions
Yearly value of the public expenditure covered by reference prices in health sector

~935 millions
Yearly potential savings in health sector
## Health Sector – Reference Prices: Savings

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>Annual expenditure</th>
<th>Annual Savings</th>
<th>Annual Savings %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning services</td>
<td>1.200</td>
<td>210</td>
<td>17.5%</td>
</tr>
<tr>
<td>Hospital catering</td>
<td>750</td>
<td>95</td>
<td>12.7%</td>
</tr>
<tr>
<td>Laundry services</td>
<td>500</td>
<td>100</td>
<td>20.0%</td>
</tr>
<tr>
<td>Drugs</td>
<td>3.000</td>
<td>300</td>
<td>10.0%</td>
</tr>
<tr>
<td>Medical devices</td>
<td>75</td>
<td>15</td>
<td>20.0%</td>
</tr>
</tbody>
</table>

**Notes:**
- Cleaning services include cleaning and disinfection of medical equipment and facilities.
- Hospital catering includes meal preparation and distribution.
- Laundry services include washing and distribution of medical textiles.
- Drugs include 70 different active ingredients.
- Medical devices include syringes, cotton wool, and patches.
## INVESTIGATION ON DIABETES CONTROL DEVICES

Published in September 2018

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
<th>Quantity</th>
<th>Brand</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Glucose Test Strips</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pen Needles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lancing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulin Syringes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**~500 Millions** yearly expenditure

**~4 millions** Patients

REGION BY REGION
## Investigation on Diabetes Control Devices

### Prices, by Device, by Region

<table>
<thead>
<tr>
<th>Region</th>
<th>Strips of Blood Glucose Control</th>
<th>Needle Pen</th>
<th>Lancet Puncture</th>
<th>Insulin Pen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abruzzo</td>
<td>0.277</td>
<td>0.076</td>
<td>0.033</td>
<td>0.059</td>
</tr>
<tr>
<td>Basilicata</td>
<td>0.558</td>
<td>0.150</td>
<td>0.100</td>
<td>0.100</td>
</tr>
<tr>
<td>Calabria</td>
<td>0.567</td>
<td>0.122</td>
<td>0.110</td>
<td>0.141</td>
</tr>
<tr>
<td>Campania</td>
<td>0.518</td>
<td>0.100</td>
<td>0.050</td>
<td>0.090</td>
</tr>
<tr>
<td>Emilia Romagna</td>
<td>0.191</td>
<td>0.051</td>
<td>0.016</td>
<td>0.049</td>
</tr>
<tr>
<td>Friuli</td>
<td>0.524</td>
<td>0.149</td>
<td>0.096</td>
<td>0.136</td>
</tr>
<tr>
<td>Lazio</td>
<td>0.590</td>
<td>0.165</td>
<td>0.113</td>
<td>0.146</td>
</tr>
<tr>
<td>Liguria</td>
<td>0.211</td>
<td>0.015</td>
<td>Dato non disponibile</td>
<td>0.033</td>
</tr>
<tr>
<td>Lombardia</td>
<td>0.439</td>
<td>0.106</td>
<td>0.090</td>
<td>0.105</td>
</tr>
<tr>
<td>Marche</td>
<td>0.384</td>
<td>0.101</td>
<td>0.061</td>
<td>0.086</td>
</tr>
<tr>
<td>Molise</td>
<td>0.317</td>
<td>0.075</td>
<td>0.054</td>
<td>0.097</td>
</tr>
<tr>
<td>Piemonte</td>
<td>0.400</td>
<td>0.150</td>
<td>0.133</td>
<td>0.120</td>
</tr>
<tr>
<td>Prov. Aut. Bolzano</td>
<td>0.650</td>
<td>0.140</td>
<td>0.130</td>
<td>0.160</td>
</tr>
<tr>
<td>Prov. Aut. Trento</td>
<td>0.620</td>
<td>0.141</td>
<td>0.130</td>
<td>0.140</td>
</tr>
<tr>
<td>Puglia</td>
<td>0.530</td>
<td>0.125</td>
<td>0.125</td>
<td>0.115</td>
</tr>
<tr>
<td>Sardegna</td>
<td>0.462</td>
<td>0.145</td>
<td>0.064</td>
<td>0.109</td>
</tr>
<tr>
<td>Sicilia</td>
<td>0.500</td>
<td>0.140</td>
<td>0.090</td>
<td>0.150</td>
</tr>
<tr>
<td>Toscana</td>
<td>0.366</td>
<td>0.066</td>
<td>0.043</td>
<td>0.058</td>
</tr>
<tr>
<td>Umbria</td>
<td>0.447</td>
<td>0.128</td>
<td>0.112</td>
<td>0.121</td>
</tr>
<tr>
<td>Valle d’Aosta</td>
<td>0.215</td>
<td>0.038</td>
<td>Dato non disponibile</td>
<td>0.039</td>
</tr>
<tr>
<td>Veneto</td>
<td>0.450</td>
<td>0.140</td>
<td>0.099</td>
<td>0.106</td>
</tr>
<tr>
<td><strong>Italia</strong></td>
<td><strong>0.191</strong></td>
<td><strong>0.015</strong></td>
<td><strong>0.016</strong></td>
<td><strong>0.033</strong></td>
</tr>
<tr>
<td><strong>Prezzo medio nazionale</strong></td>
<td><strong>0.460</strong></td>
<td><strong>0.114</strong></td>
<td><strong>0.084</strong></td>
<td><strong>0.102</strong></td>
</tr>
<tr>
<td><strong>Prezzo massimo nazionale</strong></td>
<td><strong>0.650</strong></td>
<td><strong>0.165</strong></td>
<td><strong>0.133</strong></td>
<td><strong>0.160</strong></td>
</tr>
</tbody>
</table>
Conclusions:

- Significantly different purchase conditions
- Different type of waste: quantity and prices
- From 130 to 215 millions potential yearly savings
Reference Prices: savings and differences with linear cuts

Savings with the same performance/supply

Reference prices

Public Spending = Price \times Quantity

Spending reduction

<table>
<thead>
<tr>
<th>Price</th>
<th>Expenditure</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

35
Reference Prices: savings and differences with linear cuts

Excess expenditure depending on the price component
estimates for sanitary cleaning services

~17.5% of total expenditure
Reference Prices: savings and differences with linear cuts

Excess expenditure depending on the price component vs linear spending cut estimates for sanitary cleaning services

17.5% ‘Linear’ cut

Ineffectiveness

Unfairness
Reference Prices: savings and differences with linear cuts

Excess expenditure depending on the price component
estimates for sanitary cleaning services
Reference Prices: above and beyond Spending Review

Other benefits using the reference prices

• Decrease information asymmetry between public buyers and suppliers

• Facilitate the preparation of tender specifications

• Promote transparency

• Reduce inefficient/fraudulent behavior

• Identify corruption risk behavior
Reference Prices: above and beyond Spending Review

- **Reduction of inefficient/fraudulent behavior**

Price = 10 €

Price = 6 €

excess price → Promotes corruption

competitive price

Direct effect
## Reference Prices: above and beyond Spending Review

### Variability

<table>
<thead>
<tr>
<th>Active Pharmaceutical Ingredient (ATC)</th>
<th>Dosage</th>
<th>Pharmaceutical form</th>
<th>Minimum euro</th>
<th>Median euro</th>
<th>Maximum euro</th>
<th>Reference price euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paclitaxel L01CD02</td>
<td>6 MG/ML 30 MG</td>
<td>Fiale</td>
<td>1,72</td>
<td>4,00</td>
<td>8,50</td>
<td>2,180</td>
</tr>
<tr>
<td>Paclitaxel L01CD01</td>
<td>6 MG/ML 100 MG</td>
<td>Fiale</td>
<td>5,77</td>
<td>10,50</td>
<td>20,00</td>
<td>7,090</td>
</tr>
<tr>
<td>Paclitaxel L01CD00</td>
<td>6 MG/ML 150 MG</td>
<td>Fiale</td>
<td>8,74</td>
<td>15,40</td>
<td>30,81</td>
<td>10,760</td>
</tr>
<tr>
<td>Paclitaxel L01CD01</td>
<td>6 MG/ML 300 MG</td>
<td>Fiale</td>
<td>17,60</td>
<td>27,00</td>
<td>59,85</td>
<td>21,240</td>
</tr>
<tr>
<td>Human Antithrombin III B01AB02</td>
<td>1000 UI</td>
<td>Flacone</td>
<td>109,00</td>
<td>230,00</td>
<td>305,00</td>
<td>145,000</td>
</tr>
<tr>
<td>Lenogratim L03AA10</td>
<td>263 MCG</td>
<td>Fiala/siringa</td>
<td>50,00</td>
<td>63,00</td>
<td>79,38</td>
<td>60,000</td>
</tr>
<tr>
<td>Sevoflurane N01AB08</td>
<td>250 ML GAS</td>
<td>Flacone</td>
<td>63,18</td>
<td>89,50</td>
<td>114,18</td>
<td>77,003</td>
</tr>
</tbody>
</table>
Reference Prices: above and beyond Spending Review

For each drug we have calculated two indices:

\[ I_{i,j}^R = \frac{Rango_{ij}}{\max Rango_j} \quad I_{i,j}^P = \frac{Pr_{ij}}{\text{Median} Pr_j} \]

where \( i=1,\ldots,n_{sa} \) identifier for contractor and \( j=1,\ldots,m \) identifier for drug. Consequently, since each contractor has purchased more drugs, for each of them there are two distributions available, composed respectively by \( n_i \) indexes based on rank \( I_{i,j}^R \) and as many indexes based on price \( I_{i,j}^P \). For each distribution, we then proceeded to calculate two synthetic measures of central tendency: simple arithmetic average and median thus obtaining, for each contractor, four indicators \( I_{i,j}^R, I_{i,j}^Y, I_{i,j}^P, I_{i,j}^y \).

Finally, we proceeded to aggregate them by calculating a simple arithmetic average, ultimately obtaining a pair of indicators for each contractor:

\[ I_i^R = \frac{I_{i,j}^R + I_{i,j}^R}{2} \quad I_i^P = \frac{I_{i,j}^P + I_{i,j}^P}{2} \]
Reference Prices: above and beyond Spending Review

Plot Indicators: Drugs

\[ I_i = \text{Ranking index} \]
\[ P_i = \frac{\text{Price}}{\text{Median price}} \]

Critical situation

Most critical situation

Best performance

MIGLIORE PERFORMANCE

CRITICITÀ

MAX CRITICITÀ

Plot indicatori

Indicatore1 - Range

Indicatore2 - Prezzo/Prezzo mediano
Reference Prices: above and beyond Spending Review
Reference Prices: above and beyond Spending Review

Price Overspending Index

Indicator of excess expenditure due to the price component, defined as:

\[ P_{OS} = \frac{P_{eff} \times Q_{eff} - P_{Rif} \times Q_{eff}}{P_{Rif} \times Q_{eff}} \times 100 \]

Reading key:

- \( P_{eff} \) = actual price
- \( Q_{eff} \) = actual quantity
- \( P_{Rif} \) = reference price

The indicator calculates the excess expenditure due to the difference between the price actually paid and the reference price.

In general, very high values of this index can be symptomatic of anomalies.
Reference Prices: above and beyond Spending Review

Price-Overspending Index

- Theoretical expenditure with reference prices
- Price overspending
Reference Prices: above and beyond Spending Review

Price Overspending and other dimensions: catering service in the health sector
Reference Prices: above and beyond Spending Review

Price Overspending and other dimensions

<table>
<thead>
<tr>
<th>Regione X – Asl 8</th>
<th>Regione X – Asl 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Regione X – Asl 12</td>
<td>Regione X – Asl 13</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

... Qualità
Asl13
In conclusion, reference prices:

- Can be considered a “smart” spending review tool

- Directly **reduce** the economic over-income (incentive for corruption)

- summarize a multitude of **information**, promoting transparency and accountability of public administration purchases

- Allow for the construction of **overspending indicators**, which, together with other indicators, are capable of signaling potential anomalies (especially in cases where different indicators converge in the same direction)
Thank you for your attention

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