

International Workshop on Benchmarking and Regulation in Transport

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Benchmarking for Highways: the Italian experience

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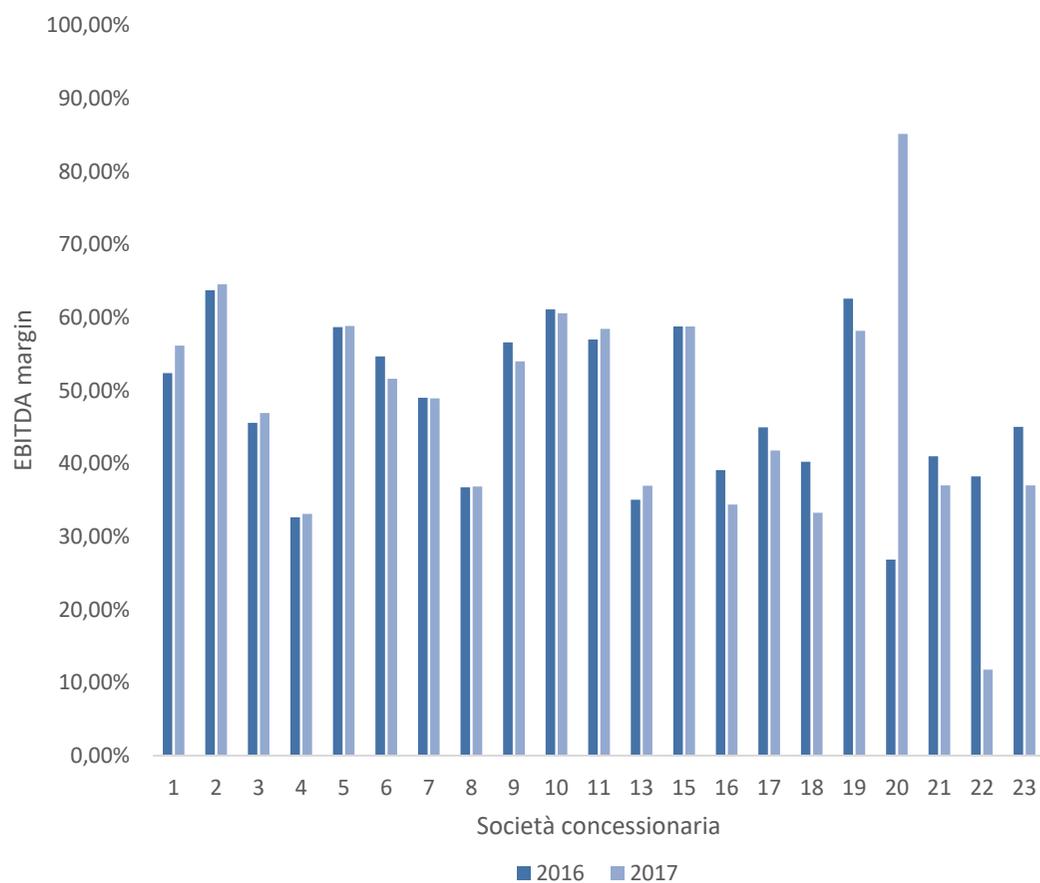


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Outline

1. Some key features of the Italian highway sector
2. A quick look at the ART regulatory interventions
3. The benchmarking analysis on concessionaries' efficiency
4. The tariff mechanism: the price cap
5. The safeguard mechanism for investments of existing concessions
6. Some conclusions

Industry economic performance



N.	Nome autostrada
1.	AUTOSTRADE PER L'ITALIA S.P.A.
2.	SOCIETA' AUTOSTRADA TORINO-ALESSANDRIA-PIACENZA - S.P.A. (S.A.T.A.P.)
3.	AUTOSTRADA BRESCIA VERONA VICENZA PADOVA SPA
4.	SOCIETA' PER AZIONI AUTOSTRADA DEL BRENNERO (in sigla AUTOBRENNERO SPA o AUTOSTRADA DEL BRENNERO S.P.A.)
5.	SOCIETA' AUTOSTRADA LIGURE TOSCANA -P.A.
6.	AUTOSTRADA DEI FIORI S.P.A.
7.	MILANO SERRAVALLE - MILANO TANGENZIALI S.P.A.
8.	SOCIETA' PER AZIONI AUTOVIE VENETE (S.A.A.V.)
9.	STRADA DEI PARCHI SPA
10.	CONCESSIONI AUTOSTRADALI VENETE - CAV S.P.A.
11.	SOCIETA' ITALIANA TRAFORO AUTOSTRADALE DEL FREJUS, SOCIETA' PER AZIONI CON LA SIGLA S.I.T.A.F. S.P.A.
12.	AUTOCAMIONALE DELLA CISA S.P.A.
13.	AUTOSTRADE MERIDIONALI S.P.A.
14.	AUTOSTRADA TORINO SAVONA - SOCIETA' PER AZIONI
15.	SOCIETA' AUTOSTRADE VALDOSTANE S.A.V. - S.P.A.
16.	TANGENZIALE DI NAPOLI S.P.A.
17.	SOCIETA' PER AZIONI AUTOSTRADE CENTRO PADANE
18.	SOCIETA' ITALIANA PER AZIONI PER IL TRAFORO DEL MONTE BIANCO
19.	SOCIETA' AUTOSTRADA TIRRENICA P.A.
20.	R.A.V. - RACCORDO AUTOSTRADALE VALLE D'AOSTA - S.P.A.
21.	SOCIETA' DI PROGETTO AUTOSTRADA ASTI/CUNEO-SOCIETA' PER AZIONI (in breve AUTOSTRADA ASTI-CUNEO S.P.A.)
22.	SOCIETA' ITALIANA TRAFORO GRAN SAN BERNARDO - SOCIETA' PER AZIONI - SITRASB
23.	A.T.I.V.A. AUTOSTRADA TORINO - IVREA - VALLE D'AOSTA - SOCIETA' PER AZIONI

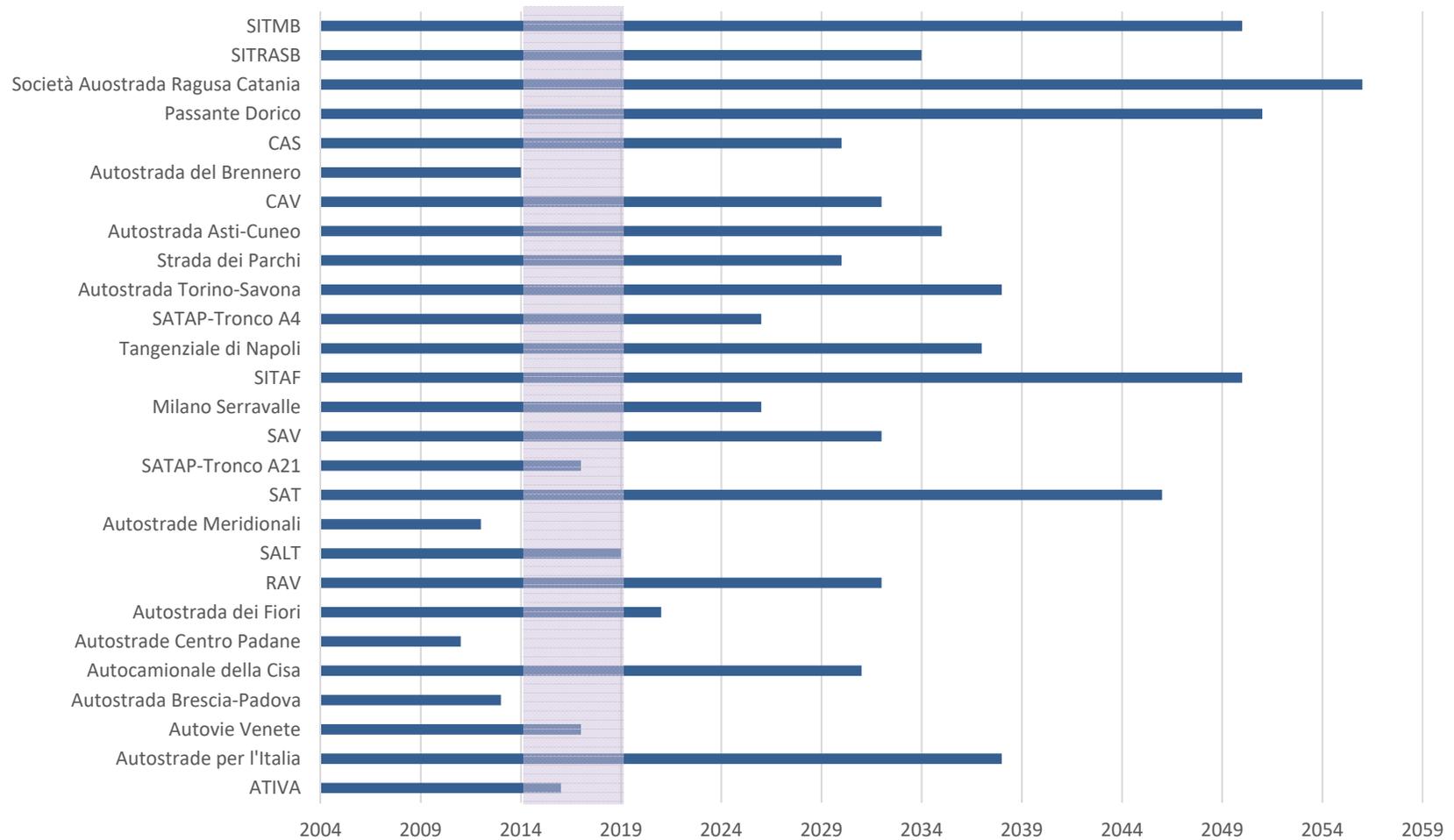
EBITDA/Revenues in 2016 and 2017. Source: AIDA

The current «six» tariff regimes

<p>Delibera CIPE n.319/1996</p> $\Delta T \leq \Delta P - X_{prod} + \beta \Delta Q$ <p>Applied to 2 concessionaries</p> <p style="text-align: right;">I</p>	<p>Legge n.47/2004</p> $\Delta T \leq \Delta P_{prog} - X_{inv} + K$ <p>Applied to 1 concessionare</p> <p style="text-align: right;">II</p>	<p>Delibera CIPE n.39/2007</p> $\Delta T = \Delta P_{prog} - X_{rieq} + K_{inv} + \beta \Delta Q$ <p>Applied to 7 concessionaries</p> <p style="text-align: right;">III</p>
<p>Delibere CIPE n.319 e n.39</p> $\Delta T = \Delta P_{prog} - X_{prod} + K_{inv} + \beta \Delta Q$ <p>Applied to 2 concessionaries</p> <p style="text-align: right;">IV</p>	<p>Art. 3 D.L. n.185/2008</p> $\Delta T = \alpha \Delta P_{reale} - X_{rieq} + K_{inv}$ <p>Applied to 3 concessionaries</p> <p style="text-align: right;">V</p>	<p>Art.3 c.5 D.L. n.185/2008</p> $\Delta T = \alpha \Delta P_{reale} + K_{inv}$ <p>Applied to 3 concessionaries</p> <p style="text-align: right;">VI</p>

The Italian Concessions

Deadlines and end of the regulatory periods



The economic regulation of motorways in Italy



Based on the law establishing ART, a **uniform tariff-setting methodology** would have to be developed that would replace the six methods applied before.

Thereby the market would become more easily **understandable** and its operating conditions would become more **transparent**.

The law establishing the Authority also provided that such a methodology would be based on **price-cap**, with determination of a five-year “X productivity factor” for each concession.

In addition, «**optimal management areas**», to be identified with the aim of «*fostering competition by comparison*», would be set. ART defined the optimal management area as the length section of a motorway above and below which there are no significant economies of scale and scope.

ART's regulation

Based on its statutory provisions, the regulatory framework set by ART was to be applied to concessions awarded after its establishment («**new concessions**»).

ART developed charging systems (all based on the same methodology and framework) for **each new concession** submitted to it by the grantor (the Ministry of Infrastructure and Transport)



Upon the adoption of the so-called «**Genoa decree**» in 2018, ART was also entrusted with the economic regulation of «**existing concessions**».

Thereupon, the regulatory framework developed by ART in 2016 and 2017 would apply to **all concessions**.

The application of ART's regulation to **existing** concessions

In order to enact the 2018 legislation, ART launched a consultation and adopted general provisions concerning the **application of its regulatory framework to existing concessions** (decision n. 16/2019).

Based on the general provisions enshrined in decision n. 16/2019, ART adopted a number of **individual decisions** applicable as of 1 January 2020 to regulate:

- concessions for which the 5-year regulatory period has expired **after** the adoption of the Genoa decree;
- concessions for which the 5-year regulatory period has expired **before** the adoption of Genoa decree **but** the relevant «price-setting procedure» had not been finalized.

Regulatory interventions to new and **existing** concessions



The first benchmarking application by ART

- Decision no. 70/2016 aimed at determining the optimal dimension of Italian motorway concessionaries
- Various models were developed to estimate the cost function of motorway concessionaires following the most recent economic literature
- By applying different methodologies (stochastic frontier and regression analysis) and considering different cost functions (Cobb-Douglas and Translog), the scope is to determine the key factors that best explain the changes in production costs for small- and medium-large motorway concessionaires.

The efficiency model is based on a **cost function** as follows:

$$C_{i,t} = f \left(V_{i,t}, L_{km_{i,t}}, P_{j,i,t}, H_{i,t} \right)$$

where

- i is the i concession ($i = 1, \dots, 24$);
- t is the time variable ($t = 2005, \dots, 2017$);
- P_j are the input prices ($j = 1, \dots, 4$): labor, capital, maintenance and other costs;
- $C_{i,t}$ is the total cost of the i firm in time t . They include labor costs, maintenance costs, other costs, amortization and financial costs (to proxy capital costs);
- $V_{i,t}$ is the number of km travelled in the concession i in year t ;
- $L_{km_{i,t}}$ is the network extension of concession i in year t ;
- $H_{i,t}$ are additional firm-level and structural control variables.

The model closely follows the main economic literature (Benfratello et al., 2009 JRE). We use a dataset tracking the data of 24 concessionaries for the years 2005 to 2018

The variables used/2

- Input prices (P_i):

Labor price - PL = Labor costs/Average number of employees

Maintenance price - PM = Maintenance costs/ Number of km travelled

Other service price - PS = (Cost for third party services + other costs)/Network Length

Capital price - PK = (Amortization + financial expenses) / Network Length

The variables used/3

Based on economic literature and upon a protracted process of consultation, that begun in 2014, a set of *Control variables (H)* was defined as follows:

Structural control

- Stoneworks /Km = Length of viaducts, bridges, tunnels in Km/Network Length
- High lanes/Km = (3-lanes and 4 lanes km) / Network Length
- Quality = IPAV index – quality pavement indicator

Firm-level control

- Residual period/length of concession = Years at the end of the concession/Duration of the concession
- Debt/Equity= Debt to Equity ratio

Time and firm dummies

- **The methodology adopted is the *Stochastic frontier analysis*** (see Aigner et al., 1977; Schmidt, C. A. Knox Lovell, 1979; Kumbhakar & Knox Lovell, 2003).
- We used **time invariant** and **time varying estimates**.
- **It is aimed at identifying the «*efficiency frontier cost curve*»**
- The methodology used is **standard in the economic literature**.
- It has been also **adopted by several NRAs around Europe** for regulatory benchmarking in railways, electricity, gas, water and so on.
- The analysis uses alternative **functional forms** (Cobb-Douglas and Translog)
- To implement such analysis we use an **econometric software** (STATA) and we elaborate an ad hoc code to run different estimations.

- To assess the presence of economies of scale, we adopt the approach by Caves, Christensen e Tretheway (1984, *RAND*).
- The degree of **economy of scale** is determined by the following ratio (for a Cobb-Douglas functional form):

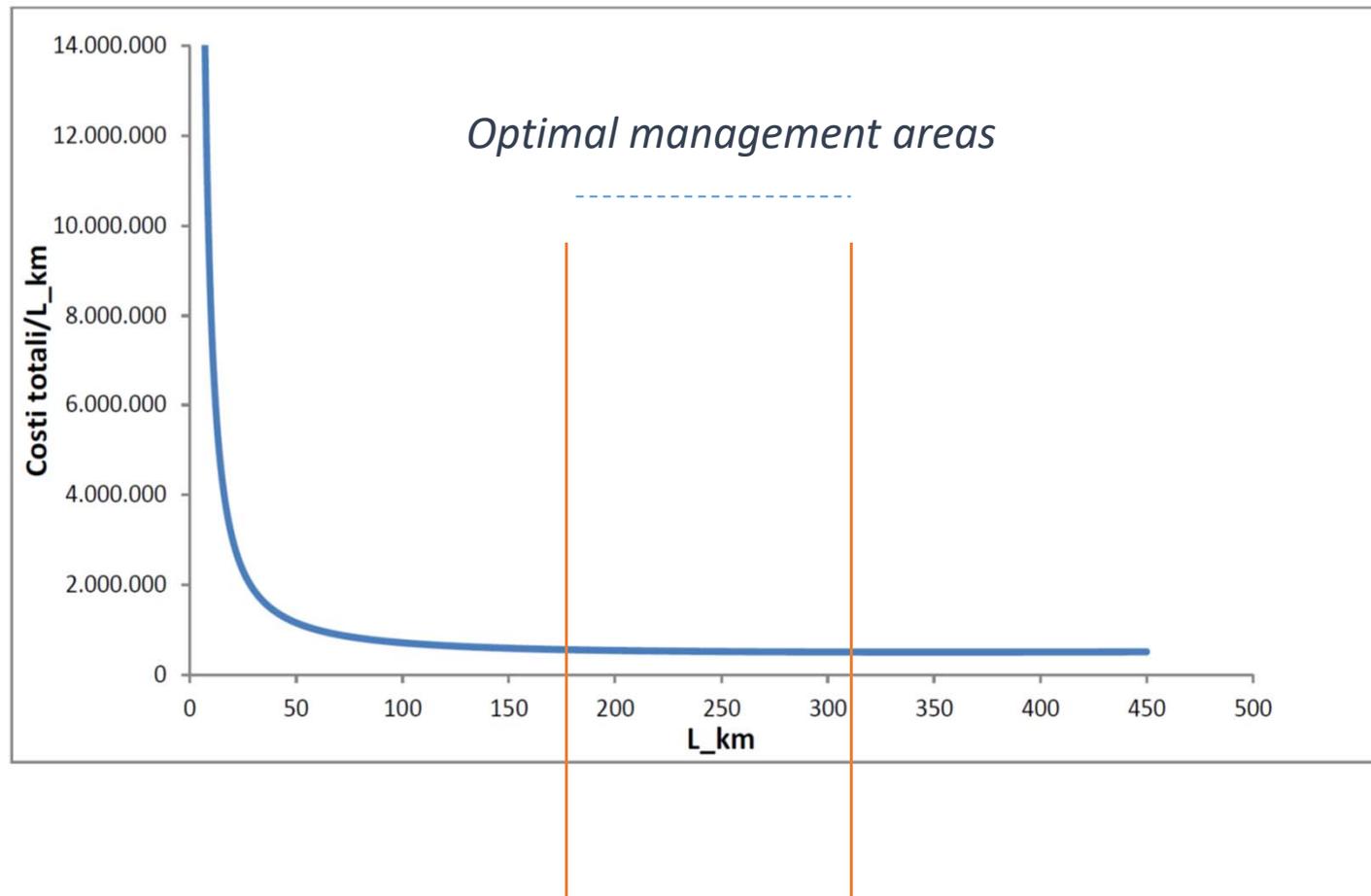
$$ES = 1/(\alpha_1 + \alpha_2)$$

- There exists economy of scale iff $ES > 1$ and diseconomy of scale iff $ES < 1$

The results (Deliberation n. 70/2016)

- The value of 180 km (corresponding to the 75th percentile of distribution in the sample examined) is the minimum threshold value for the optimal length (km) of the motorway infrastructure subject to a concession.
- The maximum threshold, despite varying according to model and sample used, was estimated at approximately 315 km, whereas for lengths exceeding 315 km no additional efficiency gains related to industrial and structural aspects of motorway concessionaires seem to be generated.

The results (Deliberation n. 70/2016)



The tariff mechanism: Goals and main features

Preserving investment plans and incentives to invest,
while enhancing efficiency and providing a ROI at fair and market-oriented values

A uniform **tariff method**
based on a **five-year**
regulatory period

Separation between the **Capex for the investment already executed or in progress** and the **Capex for the new investment to be done** (even in terms of ROI; see below) → «**Safeguard mechanism**» for concessionaries

Incentives to enhance
efficiency (through price cap), applied to **Opex**

Penalties for **investment planned but not executed** &
rewards/penalty tariff
schemes for **quality targets**

Better focussed **regulatory accounting**

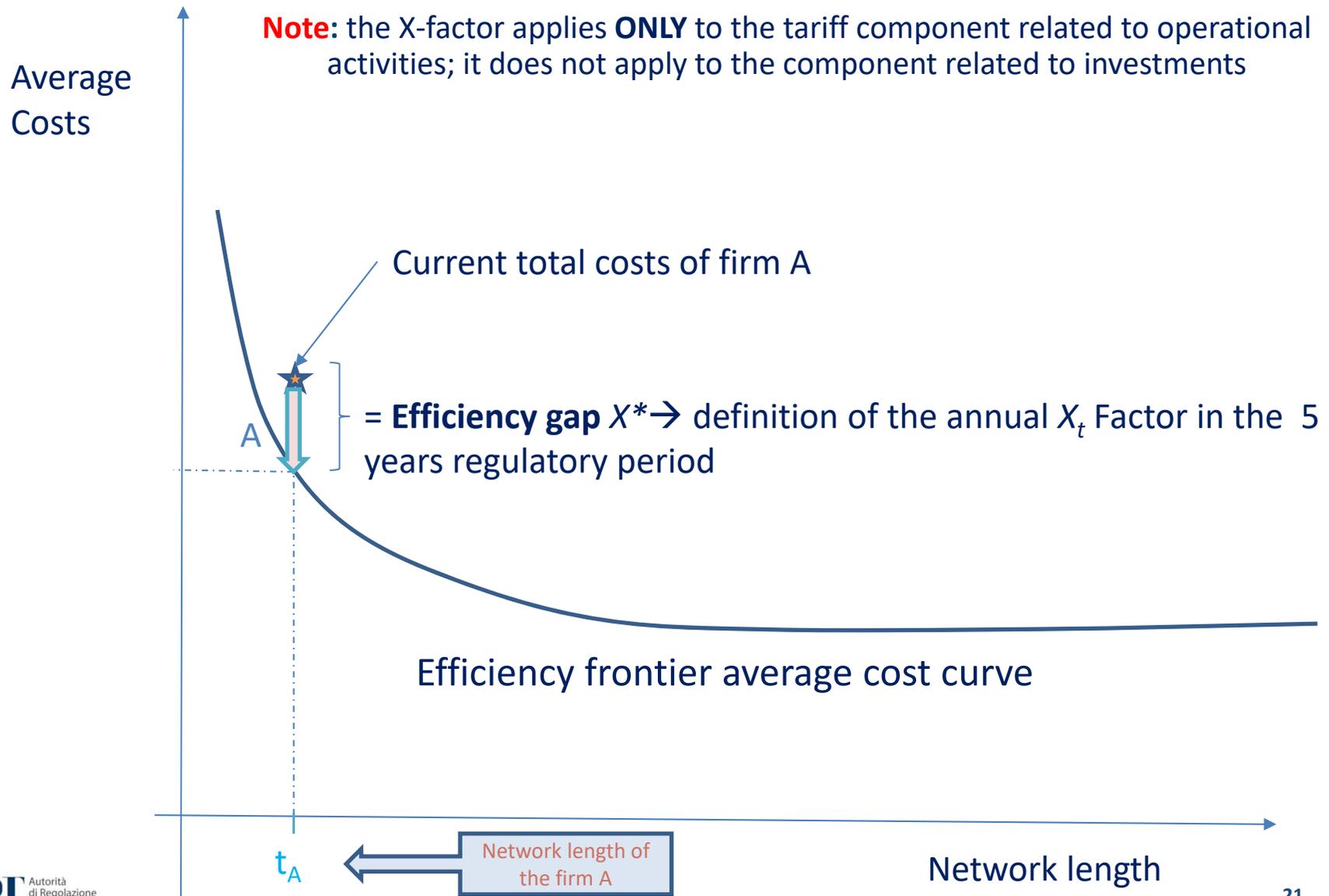
The pricing method

The per unit-tariff for the generic year $t+1$ is given by the sum of three building-blocks:

1. **“Construction charge” component**, aimed at allowing the recovery of capital costs (depreciation and cost of capital) related to those assets which are reversible upon expiry of the concession, including takeover value (i.e. Terminal Value) already paid to the previous outgoing concessionaire, and including capital costs for planned investments in extraordinary maintenance (T_K);
2. **“Operational charge” component**, allowing the recovery of efficient operating costs, including those for ordinary maintenance and use of the provision for cyclical maintenance of the motorway infrastructure, as well as of incremental operating costs associated with new investments and new laws and regulations (T_G); this component is evaluated with reference to the base year costs for each regulatory period and its yearly dynamic is regulated by a «price cap».
3. **Component for additional charges**, aimed at recovering specific other charges, by identifying an annual fee that is not subject to the price cap dynamics ($T_{OI,t}$).

$$T_{t+1} \leq T_{K,t+1} + T_{G,t} \cdot (1 + \hat{P}_{t+1} - X_{t+1}) + T_{OI,t+1}$$

The frontier cost curve, the efficiency gap and the X factor



The evaluation of the construction component/1

The net invested capital (NIC) is given by the amounts of the following tangible and intangible fixed assets, net of depreciation, provided they are recognized by the grantor of the concession:

- a) **non-reversible assets**, related to initial endowment or acquired during the concession, as quantified as at the 1st of January of the base year of each regulatory period, provided they are related and pertinent to motorway operations;
- b) **reversible assets**, related to investments made in the concession period, quantified as at the 1st of January of each year of the regulatory period, including the takeover value that has been already paid.

The **NIC** related to the reversible assets is in turn **divided into two categories**:

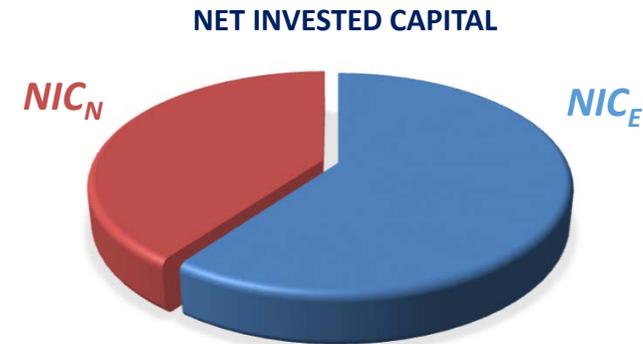
- i. **NIC of the works executed or in progress**, to which the *“safeguard system”* applies, aimed at ensuring the same **IRR** provided for under the previous charging system;
- ii. **NIC of the works to be executed**, to which the **WACC** defined by ART applies

The evaluation of the Construction component/2

Safeguard system for “works executed or in progress” (NIC_E)

Those works are defined as follows: «*the works approved by the grantor of the concession are considered to be executed or in progress where, on the date of publication of this charging system on the Authority's website, they are: (i) already executed, (ii) in progress, as the contract for awarding of the works has already been concluded or, if earlier, works have been already delivered.*»

The capital remuneration due to the concessionaire on the Net Invested Capital (NIC) of the works executed or in progress is determined on the basis of the internal rate of return of motorway activities, arising from the application of the previous charging system, before financial charges and taxes (IRR).



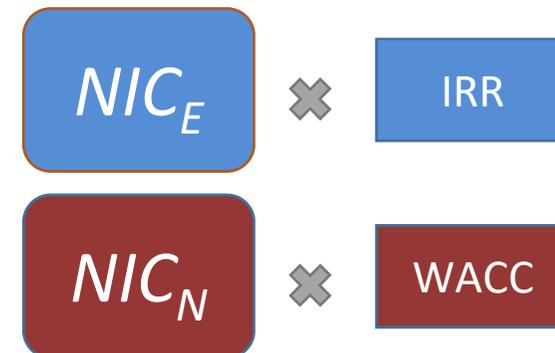
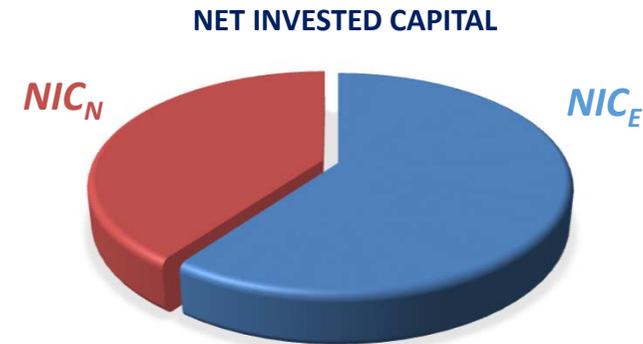
$$NIC_E \times IRR$$

The evaluation of the Construction component/3

Works yet to be executed (NIC_N)

Those works are defined as follows: « *the works approved by the grantor of the concession are considered to be executed where, on the date of publication of this charging System on the Authority's website, they are: (i) works to be carried out, for which no awarding contract has been concluded yet or, if earlier, works have not been delivered yet, or (ii) subject to new agreements* »

The rate of return on the NIC of works yet to be executed as well as on non-reversible assets, is determined according to the method based on the weighted average cost of the capital (equity and debt capital) (see below)



With no prejudice for the value of the overall recovery percentage X^* , in the early application of ART's regulatory framework, the **grantor may define a different allocation of the productivity factor** (instead of the standard allocation on a five-year basis), when at least one of the following conditions is met:

- **structural inefficiency** deriving from a total length*km of the motorway sections covered by the concession below the 180 km minimum threshold of the optimal management area (as defined in decision n. 70/2016);
- **existing constraints to efficiency measures** based on clear, objective and documented evidence, that prevent the achievement of the targeted recovery of production efficiency;
- **impairment**, despite the adoption of objective and documented efficiency measures, of the requirements of “financial soundness” (as per article 11 (5) of Italian Law No 498 of 23 December 1992).

The other incentives tools within the ART tariff mechanism

Revenue sharing system, in case the effective (ex post) volume of traffic differs from the (ex ante) one forecasted

Investment dynamics: in case of unrealized investments, the tariff will be reduced taking in to account the % of unrealized investments on the total planned investments. Moreover, a *penalty* is applied in case the delay in making the investments is attributable to the concessionaire

Rewards/penalty schemes for quality

Use of notional values to smooth price dynamics

Expected outcomes

Stability and predictability of regulation

Long-term investment strategy and vision

Remuneration of invested capital at fair and market-oriented value

Economic sustainability and higher efficiency of concessions

Benefits for the end-users