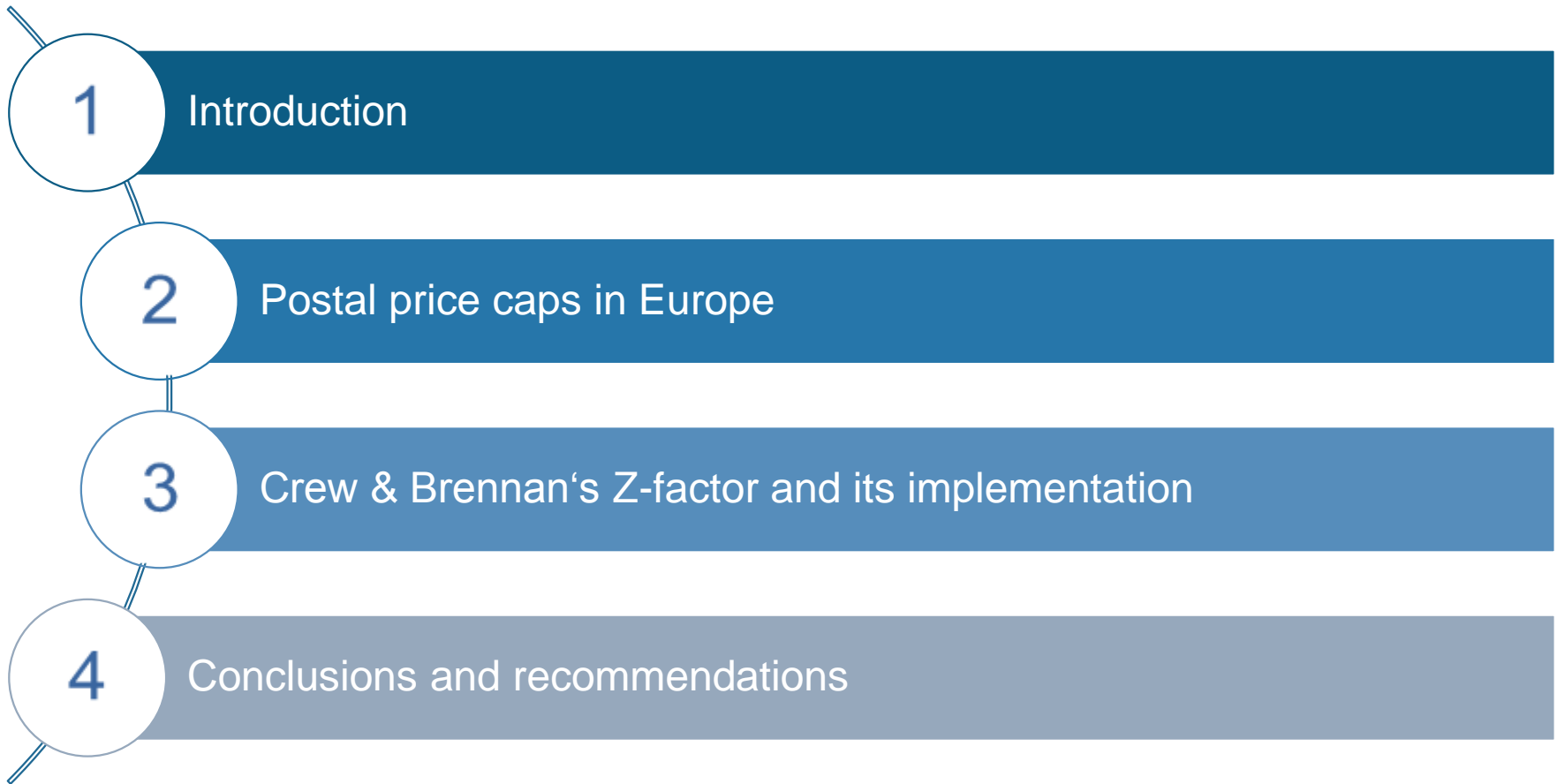


Linking price caps to volume: Options for making Z-factors work

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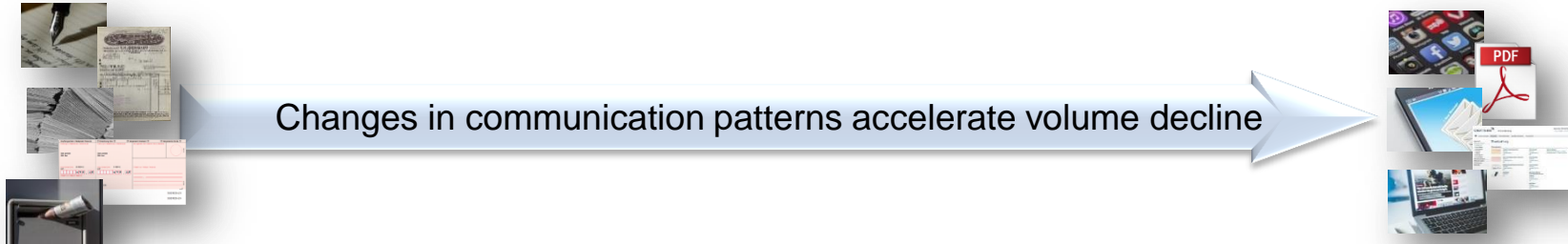
Postal regulators have implemented price cap regulations

Postal markets are changing:
declining demand for letter services

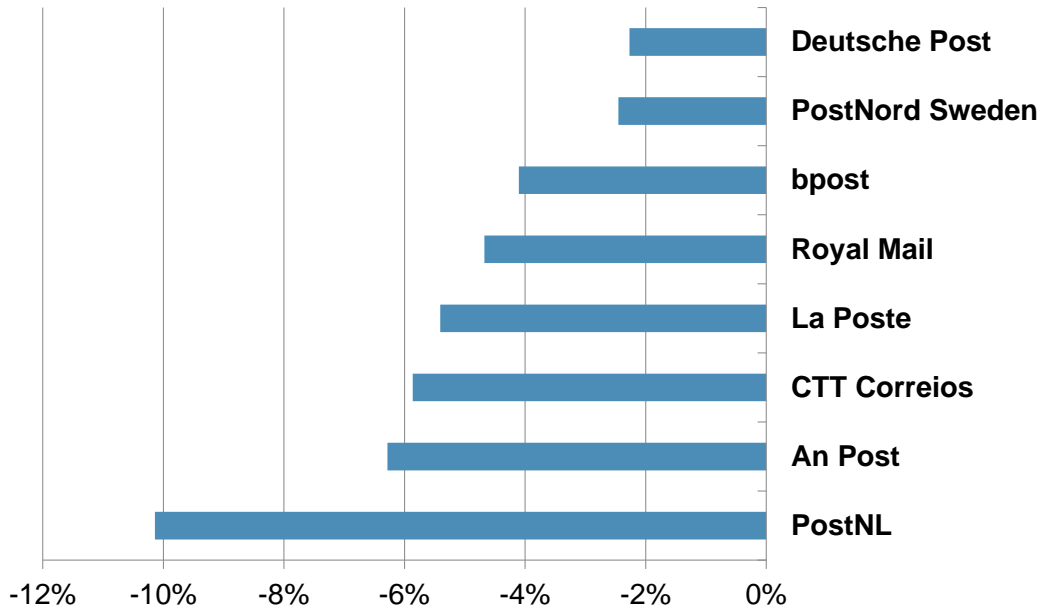
Regulators allow price hikes by reviewing and modifying their price caps

Crew & Brennan proposed an adjustment factor (Z-factor) to link price caps to volume decline

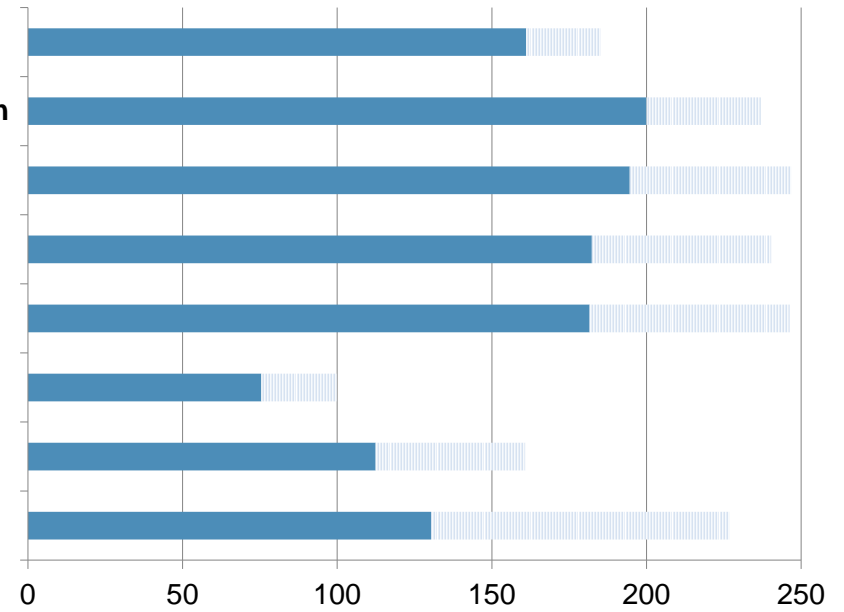
Postal operators face declining demand for letter services



Average annual volume decline (2011-2016)

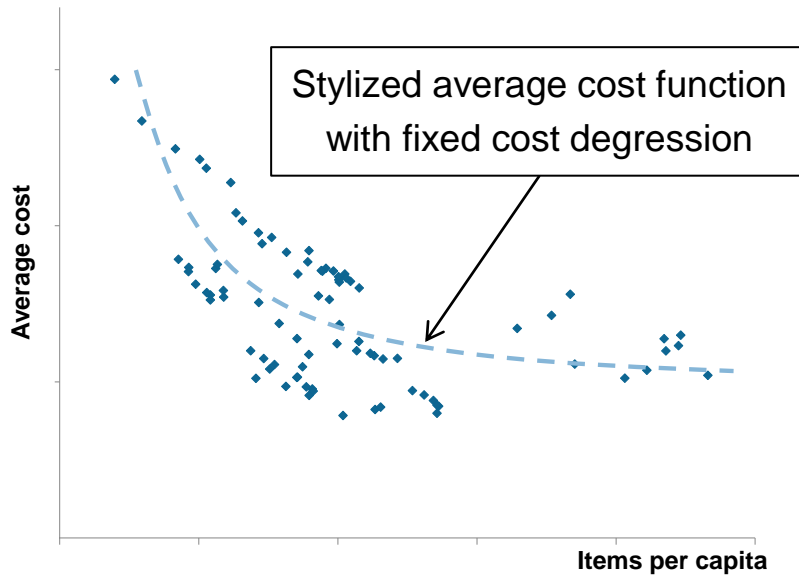


Letter post items per capita (2011, 2016)



Average costs and prices increase

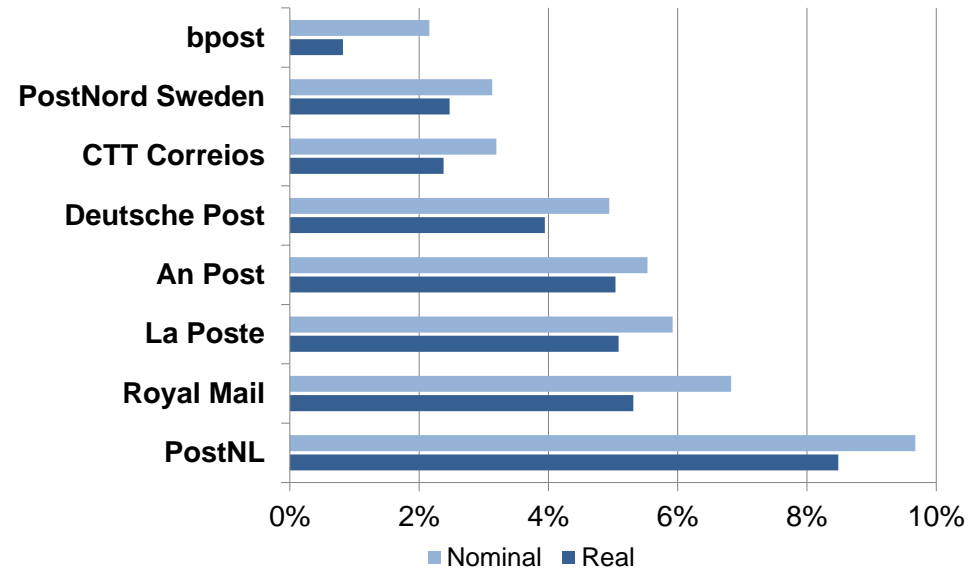
Average cost increase with volume decline



Postal services characterized by high fixed costs

- Economies of scale and scope

Average annual tariff increase (20g D+1 letters, 2011-2016)



Postal operators respond with price increases

- Operators require pricing flexibility

Many European regulators apply price cap regulation

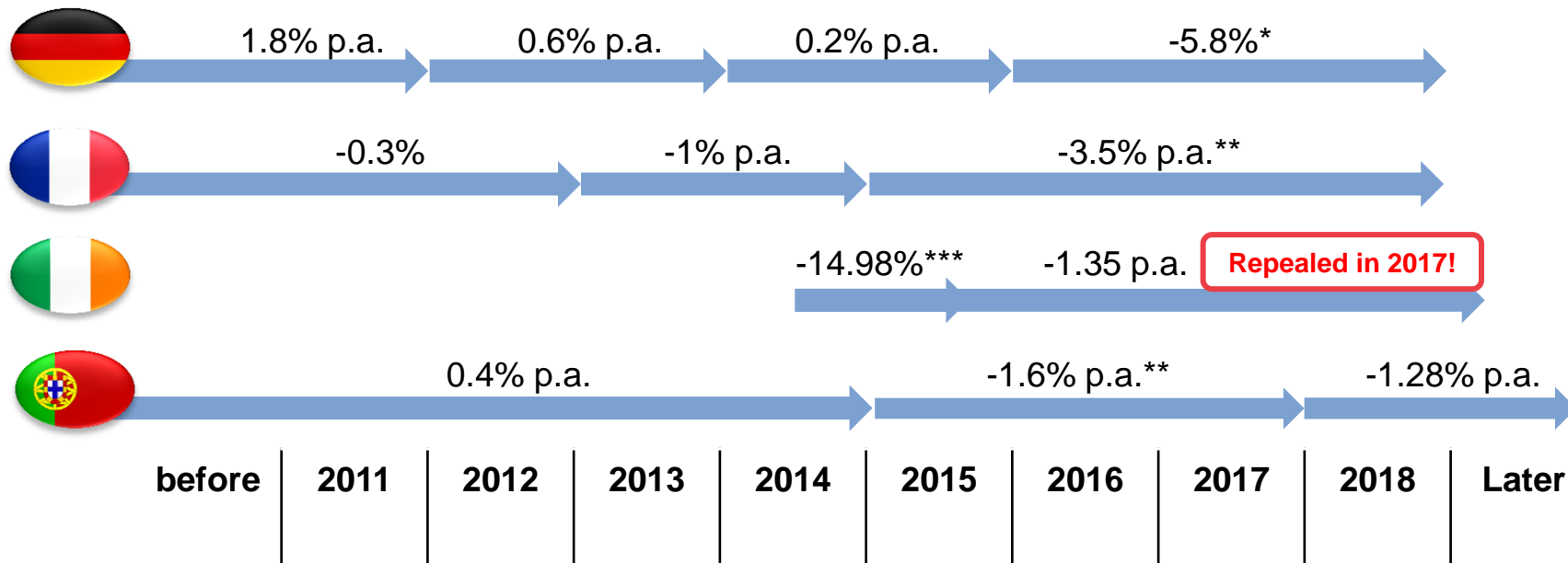
- Price cap regulation simulates prices in competitive markets by formula

$$\Delta\%P = \Delta\%I - X$$

The diagram illustrates the formula for price cap regulation. It consists of three ovals arranged horizontally: the first contains $\Delta\%P$, the second contains $\Delta\%I$, and the third contains $-X$. Below each oval is a rectangular box with a label: 'Allowed price adjustment' under $\Delta\%P$, 'Inflation' under $\Delta\%I$, and 'Efficiency measure' under $-X$. Lines connect each oval to its corresponding label box.

- Price cap regulation provides incentives for postal operators to improve efficiency
 - Price caps for bundles of postal services (basket) allow pricing flexibility
- Most NRAs apply price caps to a basket of single-piece items for a period of 3 to 5 years

X-factors became negative over time



* Accumulated for three years

** Adjusted for actual volume and CPI developments:

FR: 2017, 2018: -3.3%

PT: 2016: -0.6%, 2017: -1.2%

*** Initial price adjustment in the first year of the PCR to ensure cost coverage

Regulators consider effects of volume decline on average cost in the X-factor



- Volume forecasts of Deutsche Post
- Since 2013, Deutsche Post may apply for a review of the price cap parameters if volume decline accelerates significantly



- Volume and cost forecasts of La Poste and plausibility checks by ARCEP
- Mid-term review. If projected and actual volume developments differ, La Poste may request the application of an adjustment factor in each year



- Volume forecasts of An Post and assumptions on An Post's cost elasticity
- Review after three years to adjust X-factor in case of significant differences between projected and actual volume developments

Repealed in 2017!



- Volume forecasts and assumptions on CTT Correios' cost elasticity
- "Traffic correction factor" adjusts the X-factor each year for differences between projected and actual volume developments

Crew & Brennan proposed an approach for linking price caps to volume decline

- Introduction of an adjustment factor into the price cap formula

$$\Delta\%P = \Delta\%I - X + Z * \Delta\%Q$$

improves transparency by explicitly separating

- price adjustments due to projected productivity gains (X-factor) and
 - price adjustments to compensate effect of volume decline on average cost (Z-factor)
- Promising theoretical approach ...but how to implement this in regulatory practice?
 - Key issues for implementation in practice:
 1. Determination of the volume development $\Delta\% Q$
 2. Determination of the Z-factor

Determine relevant volumes

$$\Delta\%P = \Delta\%I - X + Z + \Delta\%Q$$

- Forecasts vs. actual volume development?
Consideration of actual figures does not require ex post adjustments if actual developments deviate from projections
- Regulated services vs. total volume?
Consideration of all (letter) services within the postal value chain to take into account economies of scale and scope of joint production

Determining the Z-factor requires information on cost and demand functions

$$\Delta\%P = \Delta\%I - X + \underbrace{Z}_{\text{Z-factor}} \Delta\%Q$$

$$Z = \underbrace{e_{AC}}_{\text{First order effect}} + \underbrace{e_{AC} * e_D * Z}_{\text{Second order effect}} \Leftrightarrow Z = \frac{e_{AC}}{1 - e_{AC}e_D}$$

First order effect: Increase in average cost due to volume decline

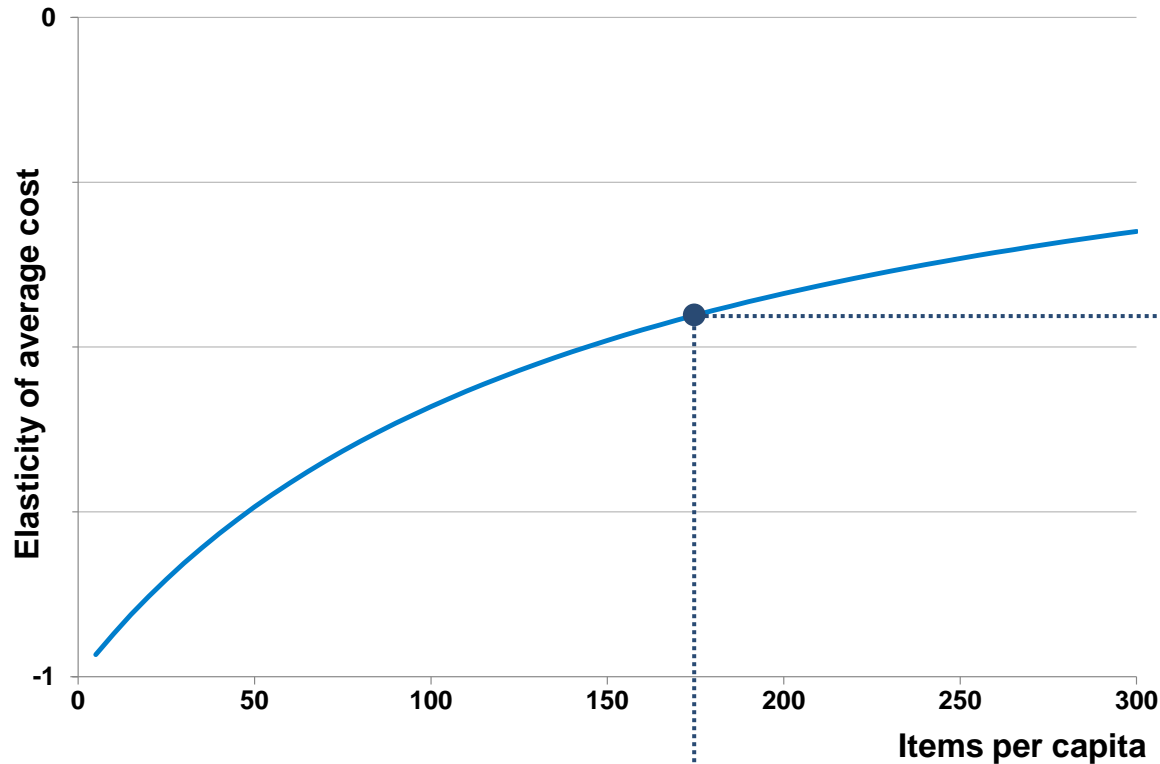
Second order effect: Decline in demand from price increases (to compensate increase in average cost)

- Elasticity of average cost (w.r.t. volume) e_{AC}
- Elasticity of demand (w.r.t. price) e_D

WIK model helps to estimate the elasticity of average cost (1/2)

- WIK model to estimate the financial effects of volume decline
 - Developed as part of the Main Development study for the European Commission in 2013
 - General cost function for a stylized postal operator (Cohen, Pace et al. 2002 & Cohen, Robinson et al. 2004) allows estimation of relative changes in cost
 - Different activities (collection, processing, transport, delivery, other)
 - For each activity consideration of variable and fixed costs
- Model parametrization of the cost share per activity and cost elasticities per activity
 - literature reviews, interviews and discussions with an expert panel of PostEurop
 - for a stylized European postal operator with 150 items per capita

WIK model helps to estimate the elasticity of average cost (2/2)



For a volume of 175 items per capita, elasticity of average cost is -0.45

Consequently, a marginal volume decline increases average cost by 0.45%

Example:

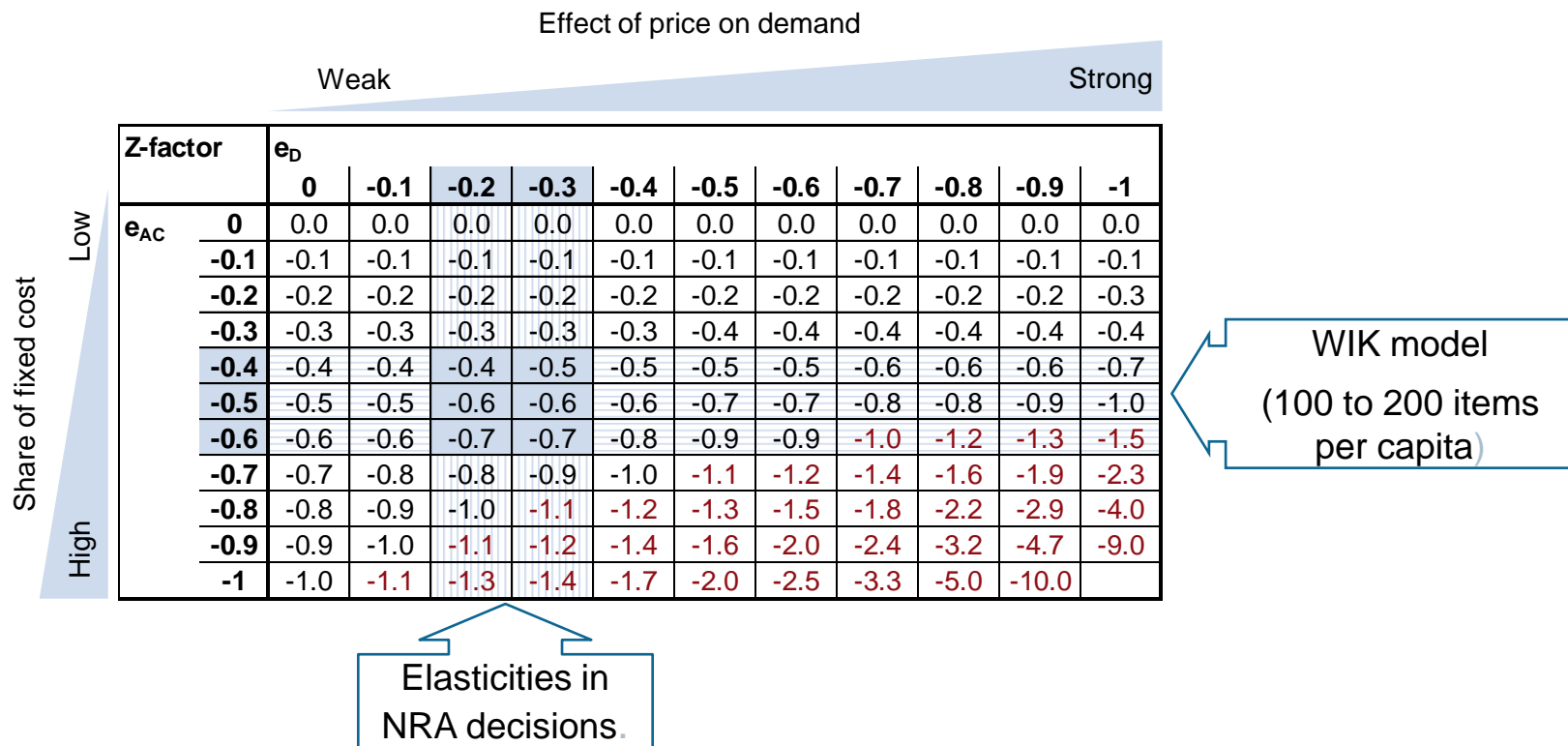
Postal operator with 175 items per capita

Determining demand elasticities: complex issue but questionable merit for price caps

- Elasticity of demand w.r.t. price varies between services, customer groups, etc.
 - Demand elasticity should most usefully be estimated for all services in the basket jointly
 - Estimation of demand elasticity is a challenging task in general
 - Different econometric approaches lead to ambiguous and controversial results

➔ **Costs vs. benefits?**

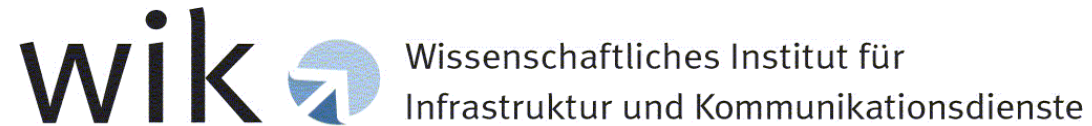
Z-factor is primarily determined by cost elasticity, not demand elasticity



- Effect of elasticity of average cost (e_{AC}) dominates the resulting Z-factor
- Effect of demand elasticity (e_D) on Z-factor is negligible for realistic values

Conclusions and recommendations for the implementation of the Z-factor

- Postal operators face increasing average costs due to volume decline. Postal regulators considering this issue in reviewing their price caps
- Implementing Z-factors helps avoiding commitment problems and ensuring incentive compatibility of price caps
- Some recommendations for setting Z-factors in regulatory practice:
 - Volume development ($\Delta^{\%} Q$) should be based on actual figures to avoid ex post adjustments
 - Determination of the elasticity of average cost (e_{AC}): WIK model provides a sound approach and may be calibrated for individual operators
 - (Second order) demand effect (e_D) could be ignored at present market conditions. Complex issue and little contribution to the Z-factor



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