Danish Competition and Consumer Authority

COMPETITIVE MARKETS AND CONSUMER WELFARE

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ECONOMIC REGULATION RESULTS IN **LOWER WATER PRICES**

Economic regulation of Danish water companies has ensured lower water prices for consumers. This is shown by an analysis of the development of prices in over 300 water companies.

Water companies are natural monopolies and are therefore regulated by means of efficiency requirements. The article shows that there is a clear correlation between the efficiency requirements made and the price consumers pay for their drinking water. Without economic regulation, the water price charged by large regulated water companies would probably have been around 13-17 per cent higher than today. At the same time, water quality and security of supply are not adversely affected by economic regulation, perhaps rather the opposite.

Systematic comparisons of companies' costs through economic benchmarking in themselves result in lower water prices.

Read the article ↓

1. Introduction

Since 2011, all major Danish water companies have been subject to economic regulation aimed at ensuring efficient operations to keep water prices from being higher than necessary.

The background is that water companies are so-called natural monopolies which are not exposed to competition. Consumers thus cannot switch to another water company if, for example, they think that the price is too high. This means that inefficient companies are not ousted from the market.

In practice, the regulation takes the form of efficiency requirements for the water companies. To meet these requirements, the companies must, for example, keep up with the development in productivity and thus reduce their costs and prices on an ongoing basis in the same way as companies that are exposed to natural competition. The efficiency requirements are implemented through reductions in the companies' revenue caps. The revenue caps state the revenues that the companies may generate through the price that households and companies pay for water.

For some companies, parts of the efficiency requirement are determined on the basis of economic benchmarking of the companies' costs. The benchmarking is used to assess whether some companies have higher costs than other similar companies and is used to establish so-called individual efficiency requirements.

This article examines empirically whether the efficiency requirements have led to the water companies charging lower prices. The conclusion is that there is a significant correlation between the efficiency requirements made and water prices. For the large, regulated water companies, the results indicate that the price (exclusive of water tax) would have been 13-17 per cent higher in the absence of such regulation.[1]

For small regulated water companies, the analysis finds that the water price would have been 7-10 per cent higher in the absence of such regulation. The reason for the lower effect is that the economic regulation of these companies is more lenient (no benchmarking).

The analysis thus finds that the economic regulation has led to significantly lower water prices. At the same time, efficiency requirements and benchmarking have not resulted in poorer security of supply in the regulated water companies, perhaps rather the opposite, see Bjørner et al. (2021) and the Danish Competition and Consumer Authority (2021).

As from 2016, there is no longer benchmarking of small regulated companies. The discontinuation of benchmarking has in itself led to a significant increase in the water price charged by these companies. This may reflect that these companies do not make the same efforts to reduce their costs when they are no longer benchmarked and measured against other companies.

Many water companies are owned by consumers. The analysis finds that the effect of efficiency requirements and benchmarking on prices is just as great or perhaps even greater in the consumer-owned companies than in the other municipally-owned companies.

The next section provides a brief overview of the regulation of the water companies. Sections 3 and 4 describe the data used and the development in water prices. The correlation between efficiency requirements, benchmarking and water prices is assessed in sections 5 and 6.

2. Regulation of the water companies

There are around a few thousand non-profit water utilities of varying sizes in Denmark. There are many small water utilities, but, especially in larger cities, the water supply is handled by large water companies. Most of the water companies are consumer-owned, but especially the largest water companies are municipally-owned.

From 2011, revenue caps and efficiency requirements were introduced for all water companies with an annual charged (sold) water volume of over 200,000 m^3.[2] In 2020, the 225 largest water companies were subject to this regulation. These water companies supply drinking water to about 87 per cent of Danish consumers.

Two different types of efficiency requirements are imposed on the regulated water companies. They consist of *general* efficiency requirements, which are imposed on all regulated companies, and *individual* efficiency requirements, which are only imposed on companies that have relatively high costs compared to other companies, see Box 1.

1 The regulation contains mechanisms that ensure that companies which are to perform new tasks, for example in connection with the green transition, will have the finances to perform these tasks. This may increase the companies' revenue caps and lead to higher prices. These effects on water prices have not been taken into account, as the article focuses on whether there is a correlation between efficiency requirements, benchmarking and water prices.

2 From 2011 to 2016, the regulation was implemented through price caps instead of revenue caps. However, in practice, the price caps largely functioned in the same way as the revenue caps. Therefore, the article does not distinguish between regulation with revenue caps and with price caps.

Box 1 **Individual and general efficiency requirements**

The purpose of the *general* efficiency requirement is that all water companies – including the most efficient companies – must continuously streamline their operations and increase their productivity in the same way that companies that are exposed to competition continuously increase their efficiency to remain competitive.

At the same time, there is a big difference in how efficiently different water companies perform their tasks. This may also be affected by their non-exposure to competition.

The purpose of the *individual* efficiency requirement is that water companies which have higher costs than other comparable companies must reduce their costs. The individual requirement is based on a benchmarking analysis of how efficiently the individual company runs its utility operations relative to the other companies. Thus, not all companies receive an individual efficiency requirement, and there is generally a great difference in the scope of the individual efficiency requirements between different companies (the individual efficiency requirement can be maximum two per cent).

From 2011 to 2016, the individual and general efficiency requirements were set solely for operating costs. From 2017, the efficiency requirements are set for the water companies' total costs.

When the efficiency requirements were introduced with effect from 2011, all water companies with an annual charged water volume above 200,000 m³ were subject to both general and individual efficiency requirements.

The Danish Water Sector Act (*Vandsektorloven*) was amended with effect from 2017, so that companies with an annual charged water volume of between 200,000 and 800,000 m³ are no longer benchmarked or subject to an individual efficiency requirement, see Table 1. The benchmarking of these companies consequently ceased in 2016.[3]

Table 1: **Efficiency requirements for water companies**

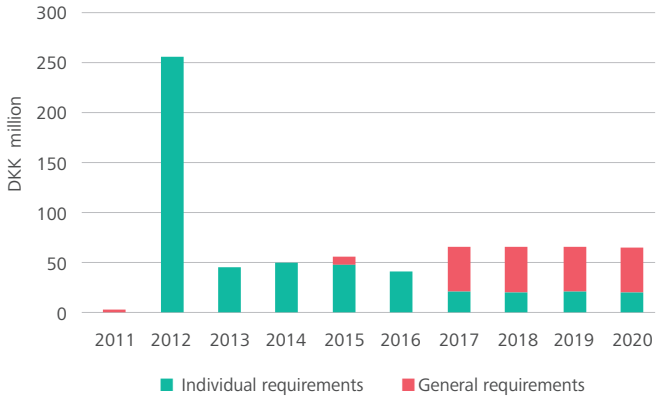
Annual charged water volume (m³)	Before 2011	2011-2016*	2017-2020
Under 200,000	None	None	None
200,000 to 800,000	None	General and individual	General (not individual)
Over 800,000	None	General and individual	General and individual

* The companies were first benchmarked in 2011, and an individual requirement was therefore only imposed on the companies with effect from 2012.

The efficiency requirements were very lenient in the first year of the regulation, but, from 2013, they have been around DKK 50-70 million per year (2020 price level). The distribution between general and individual efficiency requirements has changed over time, see Figure 1.

The efficiency requirements were extraordinarily stringent in 2012. This reflects that, in some companies, the revenue cap was initially set too high relative to the companies' costs. To correct this, more stringent individual efficiency requirements were set for some companies in 2012.

Figure 1: **Efficiency requirements for water companies, DKK million (2020 price level)**



Even though efficiency requirements are set, the water companies' revenue caps may increase because they can apply for an addition to increase their revenue cap if they are to perform new tasks. This may be in connection with investments in brand-new infrastructure (for example in connection with establishment of new residential areas), security of supply or new environmental tasks.

3 The analysis focuses on the effect of the regulation on water prices up to and including 2020. The reason for this is that, as from 2021, consumer-owned companies with an annual charged water volume of between 200,000 and 800,000 m³ may opt out of the regulation. This makes it more complex to examine the effect of the regulation, because it may be necessary to take into account that there may be differences between the companies that choose to opt out of or remain under the revenue cap regulation (self-selection).

3. Data

The analysis is based on information about water prices in more than 300 water companies. Information has been collected about water prices both before and after 2011, when efficiency requirements were introduced. Information has also been collected about the development in prices for a number of water companies which have not been subject to revenue cap regulation. This comprises companies that are (slightly) smaller than what is required to be subject to economic regulation.[4]

The water prices have been collected from various sources. Since 2011, the Danish Water Regulatory Authority[5] has continuously collected information about prices in the regulated water companies. This information has been supplemented by data from the Danish Water and Wastewater Association (DANVA)[6], Internet archives, separate reports from companies, etc. In addition to the regulated water companies, information has been collected about water prices for 111 non-regulated water companies.[7]

In the following, a water price definition has been used that does not include taxes and VAT. In addition, the water price has been calculated at the 2020 price level, see Box 2. In the following, all analyses are based on the water price as described in the box.

Box 2 **Calculation of the water price in the analyses**

Water prices are often divided into two parts in the different companies. There is a variable price, which depends on the consumption of drinking water. In addition, there is also typically a fixed annual price (independent of water consumption). In the following, an average price is used at a typical water consumption of 80 m³ per year, so that the contribution from the fixed annual price is also included in the price.

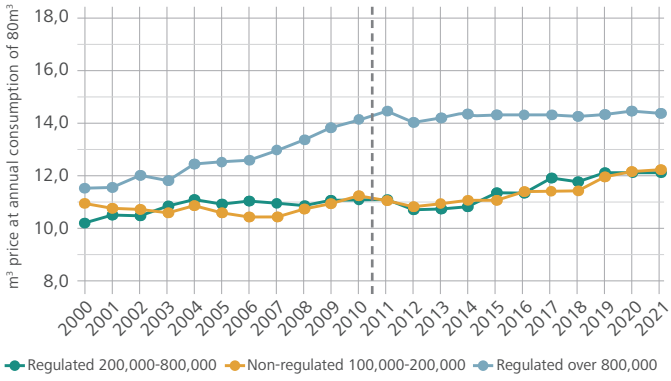
So-called base prices, i.e. exclusive of VAT and water taxes (and exclusive of contributions to waste water companies), are used to arrive at an expression of the net water price. Water prices have been calculated at the 2020 price level by deflating with the consumer price index.

4. Rising prices before regulation

Before the regulation was introduced, there was a significant increase in the average water price for the group of the largest regulated water companies (i.e. companies with an annual charged water volume of over 800,000 m³). After the economic regulation was introduced with effect from 2011, the average price has instead remained fairly constant for these companies, see Figure 3.

On the face of it, there are thus signs that the regulation may have kinked the curve of rising water prices (measured in relation to consumer prices) in the largest water companies.[8]

Figure 2 **Development in real water prices**



Note: Average of water prices calculated for companies where data for prices exist at least one year before and one year after 2011 (2020 price level). The dotted vertical line indicates the year of introduction of efficiency requirements.

From 2016, economic benchmarking was no longer done for regulated companies with an annual charged water volume of between 200,000 and 800,000 m³, and, from 2017, the individual efficiency requirements were discontinued for this group of companies, see Table 1 in section 2.

This seems to have led to a water price increase in 2016 and 2017 relative to the water companies which are still subject to economic benchmarking (companies with an annual charged water volume of above 800,000 m³), see Figure 3.[9] The increase is of just under 10 per cent, which is equal to approx. DKK 1 per m³.

4 These non-regulated water companies all have an annual recovered water volume of over 100,000 m³. Thus, relatively large non-regulated water companies can be expected to be comparable to regulated water companies. The analysis focuses on water companies because it is possible to compare the development in prices for regulated companies with the development in prices for non-regulated water companies that are not subject to efficiency requirements. This is, for example, not possible for waste water companies, which are all subject to economic regulation.

5 The Danish Water Regulatory Authority is the unit in the Danish Competition and Consumer Authority that handles the economic regulation of water and waste water companies.

6 DANVA is an industry association for water companies and waste water companies.

7 A more detailed description of the collected data is available in a short supplementary documentation appendix, which is accessible on www.kfst.dk.

8 A statistical analysis confirms that there is a statistically significant kink in the curve of rising water prices in connection with the introduction of the regulation for the largest water companies in 2011. This has been described in further detail in the supplementary documentation appendix (available on www.kfst.dk).

9 As the prices are generally higher in the largest regulated companies, the prices have been indexed to provide a better basis for comparison of the development (2011 = 100).

Figure 3 **Development in average real water prices for the two groups of regulated companies**

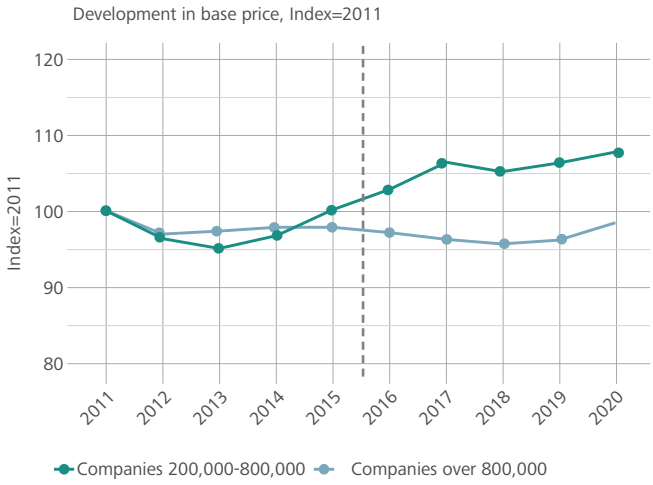
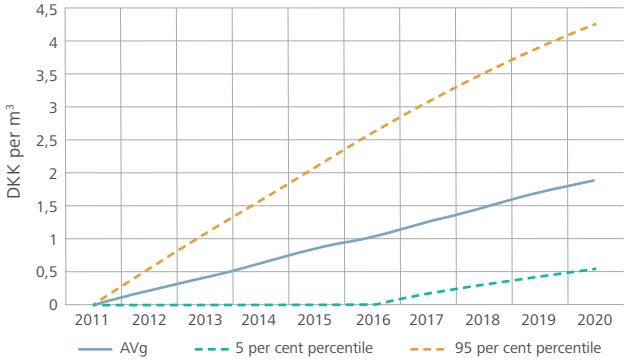


Figure 4 **Development in accumulated efficiency requirements, DKK per m³ (2020 price level)**



Note: The figure shows 5th and 95th percentiles for the distribution of efficiency requirements and the average accumulated efficiency requirement per m³ of charged water volume in the individual years.

5. Correlation between water prices, efficiency requirements and benchmarking

In this section, it is examined in greater detail based on statistical analyses whether there is a significant correlation over time between the development in prices and the efficiency requirements set for the individual companies. One question is whether the graphic patterns described in section 4 are still applicable when other conditions are checked. It is also examined whether economic benchmarking has an independent impact on price.

The efficiency requirements set for the various companies differ greatly. This reflects that there may be considerable variation between the companies in the individual efficiency requirements set.[10]

This is illustrated in Figure 4. Here, the middle (blue) curve shows the development in the average efficiency requirement per m³ charged water volume for the regulated companies. The curve is increasing because it shows the accumulated efficiency requirement of the individual companies.

The other two lines show the 5th and 95th percentiles in the distribution of the accumulated efficiency requirements per m³ of charged water in the companies. In 2020, these percentiles amount to DKK 0.5 and 4.2 per m³. This illustrates that there is considerable variation in the efficiency requirements set for different companies.

The analysis also takes into account the development of the charged (or alternatively the recovered) water volume in the individual companies. If the water consumption increases, it must therefore be expected to lead to a decrease in the price per m³, as, in such a situation, the often large overheads in the water companies can be distributed on a larger water volume sold.[11]

The regression model and the included variables are briefly described in Box 3. In specific terms, the price of water in each individual company is explained as a function of the development of the company's efficiency requirement, the development of the charged water volume and whether the company is benchmarked.

10 However, there are also differences in the method used to determine the general efficiency requirement depending on the size of the company and the type of cost, see the Danish Competition and Consumer Authority (2020). To a certain extent, this also contributes to different efficiency requirements having been imposed on different companies.

11 It can be argued that the causality of water volume may go in the other direction, as the water consumption may be expected to decrease to some extent when the price of water increases due to price sensitivity in consumption. However, as water is a necessity, the price sensitivity is relatively low, see Dalhuisen et al. (2003) and De Økonomiske Råd (Danish Economic Councils) (2017). It has therefore been assumed that water volume is an exogenous variable. However, estimations are also done exclusive of the water volume as an explanatory variable to assess whether there is a statistically significant correlation between efficiency requirement and price, even when the water volume is not included in the estimation.

Box 3 **Model and variables**

A linear model is estimated which takes into account that there are company-level data over several years (panel data):

$$P_{it} = \beta_1 E_{it} + \beta_2 log(V_{it}) + \beta_3 DV_{it} + \beta_4 DB_{it} + \alpha_i + \gamma_t + \varepsilon_{it}$$

The following have been used:
P_{it}: Price in water company i in year t (DKK per m³).

E_{it}: Accumulated efficiency requirement for company i up to year t (DKK per m³). The calculation of E_{it} does not include that part of the extraordinarily high individual efficiency requirement in 2012, which can be attributed to the revenue cap being too high in some companies from the start of the regulation, see section 2.

The variables P_{it}, and E_{it} er opgjort i 2020-prisniveau.

$Log(V_{it})$: The logarithm of charged (sold) water volume when the charged water volume is available. Otherwise, recovered water volume has been used. The variable is available from 2008 (for the non-regulated companies, the variable has been imputed in 2019 and 2020[12]). The logarithm has been applied to the water volume. The reason for this is that it is not plausible that the effect on the water of a given change in the water volume calculated in m³ is the same for a large water company and a small water company.

DV_{it}: Has the value 1, when V_{it} has been calculated as charged (sold) water volume, and 0, when V_{it} is recovered water volume. The variable takes into account that charged water volume is lower than recovered water volume and that the two measures of water volume are from different sources.

DB_{it}: Has the value 1, when i is benchmarked in year t (otherwise 0).

α_i: Individual constants for each company ('fixed effects'). Takes into account that there may be different price levels in the companies due to, for example, geographical conditions or the like.

γ_t: Annual constants which take into account that there may be (unobserved) effects on prices that affect all companies in the same way in a given year.

The estimations include non-regulated water companies as a kind of control group for the development in the prices in the regulated companies, see models 1 and 2 in Table 2. Estimations have also been made which include further information on the prices going back to 2008, i.e. some years before the regulation entered into force (models 3 and 4 in Table 2).[13]

The estimations thus take into account that non-regulated companies may potentially themselves streamline their operations on an ongoing basis.[14]

The estimations show that there is a statistically significant correlation between the efficiency requirements and the prices in the individual companies. This indicates that the efficiency requirements result in lower prices of drinking water in the regulated companies.

As both water prices and efficiency requirements are calculated in the same unit (DKK per m³), the efficiency requirements will make themselves fully felt in lower water prices if the estimated parameter for the efficiency requirements in the companies is exactly -1.

The estimated parameter for the efficiency requirements is approximately -0.7 and -0.5 in model 2 and model 4, respectively, of Table 2 (where other conditions are checked). This corresponds to an increase in the efficiency requirement of DKK 1 per m³ resulting in a decrease in the water price of DKK 0.70 and DKK 0.50, respectively.

The estimations also show that an increase in the water volume appears to lead to a decrease in the water price. As mentioned, this may reflect that the large overheads can be distributed on a larger water volume, which results in a lower price (analogous to a decrease in the water volume pulling towards a higher water price). However, the estimated parameter for the water volume variable is only statistically significant in one of the two models where the water volume has been included.

12 The imputation has been made by estimating a model of the trend in water volume for each of the companies in question based on data from previous years. Sensitivity analyses suggest that the use of the imputed figures for water volume is only of modest significance to the estimation results, see the supplementary documentation note.

13 The collected data do not provide information about water volumes recovered in the companies before 2008.

14 These estimations thus have the character of 'difference-in-difference' estimations which can show the effect of the efficiency requirements on the price development in the regulated companies in relation to the price development in companies which are not subject to efficiency requirements.

Table 2 **Effect on water prices of efficiency requirements (both regulated and non-regulated companies)**

Model	**(1)**	**(2)**	**(3)**	**(4)**
Data period	**2011 - 2020**		**2008 - 2020**	
Efficiency requirements (DKK/m³)	**-0.58*** **	**-0.68*** **	**-0,42*** **	**-0.52*** **
	(0.8)	(0.8)	(0.7)	(0.8)
Log (water volume)		-0.07		-0.92***
		(0.40)		(0.12)
Measure of water volume from charged to recovered		•		-1.03***
				(0.26)
Economic benchmarking		**-0.85*** **		**-0.66*** **
		(0.13)		(0.14)
Annual effects (annual dummies)	Yes	Yes	Yes	Yes
Company effects (fixed effects)	Yes	Yes	Yes	Yes
Number of companies	332	331	332	331
Observations	2,760	2,747	3,239	3,181
R^2 within	0.070	0.087	0.058	0.086
R^2	0.853	0.857	0.814	0.822
		*p<0.1;	**p<0.05;	***p<0.01

Note: Standard errors in brackets are clustered at company level.

Finally, models 2 and 4 include a variable for whether there is economic benchmarking of the regulated company in a given year.

The estimated parameter is negative and statistically significant in both cases. This indicates that benchmarking has an independent dampening effect on the water price.

One obvious explanation for this is that the water companies do more to reduce their costs when they know that they are being compared with other water companies.

The estimated parameter of -0.85 in model 2 can be interpreted as a reduction in the water price of DKK 0.85 per m³ as a result of benchmarking. This is almost on a par with the development illustrated in Figure 3 in section 4. It shows that the discontinuation of benchmarking for a group of the regulated companies from 2016 was accompanied by a price increase of just under 10 per cent (equal to approximately DKK 1 per m³) relative to the regulated companies, which are still benchmarked.

The estimated parameter for the effect of benchmarking in model 4 is of -0.66, i.e. lower (numerically) relative to model 2.

The difference between the estimated parameters presumably reflects that it is the effect of different types of benchmarking that is 'captured' in the two models, see Box 4.

Box 4 **Effect of benchmarking**

Model 2 has been estimated on data for the period 2011-2020. The benchmarking parameter in this model only reflects the effect of some of the regulated companies no longer being benchmarked from 2016.

Model 4 has been estimated on data for the period 2008-2020. This entails that the benchmarking parameter in this model also captures the effect of all the regulated companies becoming subject to benchmarking from 2011.

However, when the regulation was introduced in 2011, only the companies' operating costs were subject to efficiency requirements and included in the benchmarking, see Box 1 in section 2.

It is therefore plausible that the effect of benchmarking is lower when estimated for data that comprise benchmarking of operating costs only, relative to estimation for a data period which shows the effect of benchmarking of both operating costs and investment costs.

Today, there is benchmarking of both operating costs and investment costs. This suggests that the benchmarking parameter in model 2 (-0.85) is more accurate in terms of the effect of the current benchmarking.

Potentially, however, the higher estimated effect of the benchmarking in this case may also reflect that the discontinuation of the benchmarking in 2016 also resulted in a discontinuation of individual efficiency requirements (from 2017).

Sensitivity analysis

As a sensitivity analysis, estimations have been performed which only include data for the regulated companies from 2011 to 2020, see Table 3. These estimations may show more directly the effect of the regulation, seeing that the companies are regulated (i.e. no control group of non-regulated companies).

This analysis indicates that there is a pass-through of the efficiency requirements on the price of between just under 0.7 and 0.8. Furthermore, it shows that, also in this case, a significant negative parameter (-0.98) has been estimated for the variable of whether there is benchmarking of a company.

A sensitivity analysis based solely on the regulated companies thus supports the results from Table 2, where non-regulated companies also form part of the data base.

Table 3 **Effect on water prices of efficiency requirements (regulated companies from 2011-2020)**

Model	**(1)**	**(2)**	**(3)**
Data period	---------- **2011-2020** ----------		
Efficiency requirements (DKK/m³)	**-0.74*** **	**-0.77*** **	**-0.68*** **
	(0.10)	(0.11)	(0.10)
Log (water volume)		-0.89	-0.87
		(0.57)	(0.58)
Economic benchmarking			**-0.98*** **
			(0.16)
Annual effects (annual dummies)	Yes	Yes	Yes
Company effects (fixed effects)	Yes	Yes	Yes
Number of companies	221	221	221
Observations	2,088	2,088	2,088
R^2 within	0.062	0.064	0.081
R^2	0.829	0.829	0.833
	*p<0.1	**p<0.05	***p<0.01

Note: Standard errors in brackets are clustered at company level.

6. Efficiency requirements and consumer-owned companies

The water companies are either publicly-owned or consumer-owned. Especially for consumer-owned companies, a question is sometimes raised about whether the economic regulation with efficiency requirements and economic benchmarking has led to lower prices.

The argument is that consumer-owned companies may have increased focus on safeguarding the interests of consumers. In such case, it must be expected that the consumer-owned companies will themselves ensure that their costs are not higher than necessary (for a given level of quality and security of supply) so that the consumers do not pay an unnecessarily high price for the service provided.

Against this argument, it can be argued that municipally-owned water companies also have an interest in achieving reasonable water prices, but that there is both theoretically and empirical evidence that natural monopoly companies and industries with poor competition do not do enough to ensure efficient operations and have low productivity regardless of their type of ownership, see Leibenstein (1966), Motta (2004) and OECD (2014).

There is nothing to indicate that efficiency requirements and benchmarking have less effect on prices in consumer-owned companies than in other companies, see Table 4. The estimated parameter for the effect of efficiency requirements is actually somewhat higher (numerically) for the consumer-owned companies.

It has also been examined whether efficiency requirements have a different effect on the smaller of the regulated companies (annual charged water volume below 800,000 m³). Here, the estimated parameter for the efficiency requirements is on a par with the corresponding parameter for all companies. There is thus no indication that there is a difference in the effect on the price for the large regulated and the small regulated companies.

Table 4 **Effect on water prices of efficiency requirements (both regulated and non-regulated companies)**

Model	**(1)**	**(2)**	**(3)**
	Only consumer-owned	**Only under 800,000 m³**	**All**
Efficiency requirements (kr/m³)	**-0.75*** **	**-0.50*** **	**-0.52*** **
	(0.10)	(0.09)	(0.08)
Log (Water volume)	-0.22	0.07	-0.92***
	(0.16)	(0.16)	(0.12)
Measure of water volume from recovered to charged	-0.67**	-0.52*	-1.03***
	(0.28)	(0.29)	(0.26)
Economic benchmarking	**-0.57*** **	**-0.53*** **	**-0.66*** **
	(0.18)	(0.20)	(0.14)
Annual effects (annual dummies)	Yes	Yes	Yes
Company effects (fixed effects)	Yes	Yes	Yes
Number of companies	248	258	331
Observations	2,212	2,307	3,181
R^2 within	0.111	0.094	0.086
R^2	0.823	0.835	0.82
	*p<0.1;**p<0.05;***p<0.01		

Note: Based on data for 2008-2020. Standard errors in brackets are clustered at company level.

7. Summary and discussion

The analyses show that there is a major and statistically significant correlation between efficiency requirements and prices in the regulated water companies.

However, regulation with efficiency requirements and benchmarking could theoretically lead to a reduction in the quality of the regulated service, which would then reduce the benefits of the regulation. However, recent analyses suggest that various indicators of quality and security of supply in the water companies have not deteriorated as a result of the regulation and the accompanying economic benchmarking, see Bjørner et al. (2021) and the Danish Competition and Consumer Authority (2021).

Based on the analyses performed, it is assessed that an efficiency requirement corresponding to DKK 1 per m³ of water has reduced the price of water by around DKK 0.5-0.8 per m³. This corresponds to a pass-through of the efficiency requirements of 50-80 per cent on the water price.[15]

15 An analysis performed by Deloitte (2013) also finds that the economic regulation has contributed to reducing prices of drinking water.

There may be various reasons why the efficiency requirements have not had a one-on-one effect in terms of lower water prices. One possible reason is that non-regulated water companies may reduce their costs and prices to a certain extent also in the absence of regulation. Another possible reason is that there are a number of water companies that do not collect all the revenues that they are allowed to under their set revenue cap.[16] Such 'leeway' in the revenue cap may indicate that the revenue cap is too high in some companies. In such case, efficiency requirements will not necessarily make themselves fully felt in lower prices for consumers.

There are also indications that benchmarking has an independent effect on the prices. This may indicate that systematic comparisons of costs increase companies' awareness of the need to lower their costs and, ultimately, prices. Economic benchmarking is thus an effective tool in the regulation of natural monopolies.

After 2016, there is no longer benchmarking of companies with an annual charged water volume of between 200,000 and 800,000 m³. The analyses indicate that this has led to an increase in the water price of between DKK 0.7 and 1 per m³ in the water companies in question.

All in all, the analyses indicate that the water prices (exclusive of water tax) charged by the large regulated water companies (annual charged water volume above 800,000 m³) would, on average, have been 13-17 per cent higher without the use of efficiency requirements and benchmarking, see Box 5.[17]

For the smaller of the regulated water companies (annual charged water volume from 200,000 to 800,000 m³), prices (exclusive of water tax) would, on average, have been approx. 7-10 per cent higher in the absence of the economic regulation.

The lower effect reflects that these companies were not benchmarked in the period 2016-2020. If the benchmarking for this group of companies had not been discontinued in 2016, the analysis suggests that the effect of the regulation would probably have been of the same magnitude as for the large companies.

As from 2021, small regulated consumer-owned water companies have been entitled to opt out of the economic regulation. So far, more than ⅔ of these companies have chosen to do so. Based on the analyses in the article, there is a significant risk that this will lead to price increases in these companies.

Box 5 **Effect on water price of regulation**

For an average water company with an annual charged water volume above 800,000 m³, the calculated effect of efficiency requirements and benchmarking has been based on the estimated parameters in Table 2 (model 2 and model 4). In 2020, the average (accumulated) efficiency requirement and the average water price for this group of companies were DKK 2.26 and DKK 14.31, respectively, per m³. The calculation of the effect of the regulation on the price in the large regulated water companies is outlined in the table.

Calculated effect on water price for large regulated companies in 2020

	Model 2	Model 4
A Parameter for effect of eff. requirements	-0.68	-0.52
B Parameter for effect of benchmarking	-0.85	-0.66
C Avg. eff. requirements set in 2020 (DKK/m³)	2.26	
D Calculated price effect of eff. requirements (DKK/m³) (A×C)	-1.53	-1.17
E Calculated total price effect (DKK/m³) (B+D)	-2.38	-1.83
F Avg. water price in 2020 (DKK/m³)	14.31	
G Calculated water price without regulation (F-E)	16.69	16.14
Forskel i pct	**17**	**13**

The effect of the regulation on the price in companies with a charged water volume of between 200,000 and 800,000 m³ has been calculated in the same way. However, an effect of the benchmarking has not been included for this group, as they were no longer benchmarked from 2016-2020.

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16 As an example, 8 per cent of the largest regulated water companies have a leeway of more than 5 per cent in their revenue cap.

17 The effect of the regulation corresponds to 9-12 per cent when the price is calculated inclusive of water tax (i.e. the tax on transported water).

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