



**Politecnico
di Torino**

ESCP Business School – Politecnico di Torino

Master's Thesis

Master in Management – Corso di Laurea Magistrale

In ingegneria Gestionale (Engineering and Management)

A.Y. 2024/2025

Capital structure of Regulated Firms in the utilities sector

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ABSTRACT

This thesis explores how capital structure decisions in regulated utilities are shaped by financial incentives, institutional frameworks, and interactions with regulators. While traditional financial theory provides useful insights into capital choices, it doesn't fully account for how utilities firms behave in environments of strong regulation.

In sectors like water and energy transport, debt isn't just a tool for financing, it's also used strategically to influence regulatory outcomes. To investigate this, the study combines theoretical insights with institutional analysis and real-world data from selected utilities in the UK and Italy. The findings reveal that UK utilities tend to maintain higher and more stable levels of debt. This is largely due to liberalisation, pressure from investors, and a regulatory approach that has historically been more permissive.

However, in recent years, UK regulators such as Ofwat and Ofgem have taken steps to strengthen financial oversight, introducing measures like gearing limits, cash lock-up provisions, and capital requirements tied to licences. In contrast, Italian utilities generally show lower and more varied debt ratios. These are influenced by a mix of public and private ownership, less regulatory emphasis on capital structure, and a focus on long-term growth and service quality improvements.

The research highlights how deeply capital structure is tied with institutional and political dynamics. It illustrates feedback loops where firms make leverage decisions not just based on market conditions, but in anticipation of how regulators might respond. This creates risks of moral hazard and financial instability, and challenges in aligning private incentives with the public good. Based on these insights, the thesis offers policy recommendations aimed at improving regulation of capital structure, limiting strategic use of debt, and strengthening resilience in essential service sectors. Ultimately, it argues that regulators should treat capital structure not as a side issue, but as a central part of financial oversight and public interest protection.

INTRODUCTION – Historical Evolution and Ownership Dynamics in Regulated Utilities

In the decades after World War II, utility sectors across Europe were mostly controlled by vertically integrated, state-owned monopolies. These companies were the only providers of essential services like electricity, gas, water, and transport. They also acted as extensions of national governments. Utilities had two main tasks: to offer broad access to public services at low, politically acceptable prices, and to help stabilize the economy, for example by absorbing unemployment during recessions. In this setup, the state was owner, operator, price setter, and regulator all at once. Political processes influence tariffs, quality standards, and investment decisions instead of being driven by market signals or efficiency goals. While this system met some social and economic needs after the war as time went by it became inefficient, weighting heavily on public finances.

The liberalisation wave of the 1990s, promoted by the European Commission, marked a big change in the landscape. To improve transparency, competition and efficiency the Commission introduced common regulatory. However, it left member states free to decide how to structure their own ownership of utilities. This led to different results in the EU landscape: in places like the United Kingdom, large privatizations were combined with early creation of strong independent regulatory authorities with the Thatcher reforms (Rhodes & Hough & Butcher, 2014)¹(Public Impact Fundamentals, 2016)²; in others, like Italy, liberalisation happened more slowly and with discernment, with firms like ENEL, Edison, and Autostrade going through partial or full privatization; common quality of Italian liberalisation (Baldassarri & Macchiati & Piacentino, 1997)³.

One clear effect of these reforms was an abnormal increase in debt's use of regulated utilities. For example, Autostrade raised its leverage from 32% in 1999 to 88% in 2003. This rapid debt growth, often called a “dash for debt,” became common in the sector and raised concerns about the long-term financial health of utility companies. The shift was driven by a lot of factors such as: new private owners demanding high returns, doubts about regulators' ability to commit to stable prices long-term, and regulatory systems that rewarded more leverage due to its characteristics.

¹ 'Privatisation.' Chris Rhodes, David Hough, Luise Butcher. Research paper 14/61, House of Commons Library (2014)

² 'Privatising the UK's nationalised industries in the 1980s.' Public Impact Fundamentals (2016)

³ 'The Privatization of Public Utilities.' Mario Baldassarri, Alfredo Macchiati, Diego Piacentino (1997)

The institutional setup after liberalisation separated ownership from regulation. Member states had to create independent regulatory agencies (IRAs) to oversee pricing, performance, and financial strength of utilities firms. But outside the UK, Regulatory agencies arrived late and lacked power or independence to balance completely investors' incentives. As a result, regulated firms operated in a mixed environment where public service duties coexisted with financial strategies (Cambini & Rondi, 2010)⁴.

Studies show that utilities tend to have higher leverage when privately owned and regulated by an IRA and this condition seems to encourage more debt. The link between capital structure and regulatory pricing also supports this trend, in fact in many European countries, regulators use revenue-cap models or RPI-X systems to set prices (Weyman & Jones, 1990)⁵. These methods aim to cover operating costs and allow firms to earn enough return to maintain and improve infrastructure to guarantee future service improvement. Returns are usually calculated using a notional weighted average cost of capital. In this system, as long as the return on equity is higher than the cost of debt, increasing leverage can raise the firm's residual returns.

High leverage may also protect firms from "regulatory opportunism." By appearing financially fragile, firms limit regulators' ability to cut prices sharply or refuse revenue increases. Such actions might cause financial trouble or service problems. This suggests firms might use debt strategically to defend themselves from harsh regulation, shifting risks onto customers and public bodies.

Ownership plays a key role in these dynamics. Firms are usually called privately controlled if the state owns less than 50% of control rights. These firms are more likely to take on debt, especially when owned by infrastructure funds or private equity. In contrast, state-controlled or listed firms tend to keep more cautious financial positions, due to political responsibility or market pressure.

Given these factors, the rise in leverage in European utilities can be seen in two ways. It may be a rational response to regulatory uncertainty and a way to meet investor return demands. Or it may be an unintended negative effect of privatization, raising worries about financial risk, less investment, and infrastructure sustainability.

⁴ 'Incentive Regulation and Investment: Evidence from European Energy Utilities.' Carlo Cambini, Laura Rondi. *Journal of Regulatory Economics* (2010)

⁵ 'RPI – X price cap regulation: The price controls used in UK electricity.' Thomas Weyman, G. Jones. *Utilities Policy* (1990); pages 65-77.

This history shows that capital structure in regulated firms is not just about isolated corporate choices. It results from a complex mix of ownership, regulation, and market incentives. Understanding this development is key to analysing financial policy in regulated sectors, as it reveals when leverage acts not only as a financing tool but also as a strategic signal and regulatory limit.

Chapter 1 – Theoretical Foundations of Capital Structure in Regulated Firms

In corporate finance, many models try to explain how firms choose between debt and equity. The most known are the Trade-off Theory, the Pecking Order Theory, and Agency Theory. These theories focus on the costs and benefits of different financing tools. They usually assume that firms try to find the best mix of debt and equity to increase their value.

However, these theories are often based on markets with strong competition and active investors. In that view, capital structure is an internal decision, with little outside influence. Regulators are rarely considered. This way of thinking is easier to use in theory, but it doesn't always work well in sectors like energy or water. In these cases, prices and profits are not only shaped by markets, but also by rules and oversight.

In regulated sectors, financial decisions are often shaped by the presence of a regulator. A firm's capital structure can influence how strong or fragile it appears and how it is treated under specific rules. For this reason, firms may adjust their financial setup with strategic goals in mind, not just financial ones. For example, using more debt might help them appear weaker or gain leverage in talks with the regulator, moves that traditional theories do not fully explain.

This chapter aims to give a short summary of each theory and how it works when applied to regulated firms. Moreover, it focuses on how these standard theories match with what happens in real firms, mainly in the water and energy sectors in the UK.

It will be suggested a wider view Instead of thinking of capital structure as just a balance of costs and benefits. In regulated sectors, financial decisions may serve other purposes. This opens the door to forms of strategic behaviour that go beyond what classic models consider.

1.1 Capital Structure Theories and Their Limits in Regulated Sectors

Over the past decades several capital structure theories have tried to explain how firms choose between debt and equity. The most known are the Trade-off Theory the Pecking Order Theory and Agency Theory. These models usually assume firms work in competitive markets and aim to maximise shareholder value by optimising their financial mix. However when applied to regulated firms especially in infrastructure these theories often fail to fully explain strategic financial behaviour.

Trade-off theory

The Trade-off theory explains that firms find their best leverage by balancing tax benefits of debt against expected costs of financial distress (Fama & French, 2002)⁶. Interest payments lower taxable income creating a tax shield. This is more valuable in places with high corporate taxes and for firms with steady cash flows. Nonetheless as debt rises so do the risk of default and distress costs both direct and indirect. The theory says the best capital structure is where the tax benefit equals the distress cost.

Pecking order theory

The Pecking order theory looks at information asymmetry. It argues firms prefer internal funds to external debt and only issue equity last. This is because outside investors may see equity issuance as a sign that managers think the firm is overvalued which raises capital cost (Myers, 1984)⁷; so, firms usually use retained earnings and debt before equity even when equity would be possible.

Agency theory

Agency theory or market timing theory focuses on conflicts between stakeholders. Debt can control managers by limiting free cash flow, wasteful spending, or the pursuit of personal goals (Baker & Wurgler, 2002)⁸; but high debt may push shareholders to take risks to raise equity value while debt holders face losses. Capital structure is then a governance tool that can improve or harm stakeholder alignment.

⁶ 'Testing trade-off and pecking order predictions about dividends and debt.' Fama E., French K. The Review of Financial Studies, 15(1), (2002); pages 1-33.

⁷ 'The capital structure puzzle.' Myers S. The Journal of Finance, 39(3), (1984); pages 574-592.

⁸ 'Market Timing and Capital Structure.' Malcolm Baker and Jeffrey Wurgler. Journal of Finance (2002).

Signalling theory

Signalling theory is based on the idea that firms use gearing as a positive signal to the market (Ross,1977)⁹. Debt contracts act as a commitment from companies to pay interest in the future. This shows confidence that the firm will have enough cash flow to cover these payments. Therefore larger firms and those with higher profitability may hold more debt.

These theories work well for normal firms but less so for regulated ones. Regulated firms have long licences price controls and institutional oversight. Their revenues are stable but limited and investment depends on market signals and regulatory approval. In this context firms may use debt not only to cut costs but also to affect regulators: high debt may signal weakness or support demands for higher prices or fewer obligations. These strategic actions go beyond what traditional theories explain and need a more detailed framework.

1.2 Recent Developments and Theoretical Extensions

Recognising the limits of classical models, recent studies have proposed extensions to better explain the institutional and behavioural factors in regulated firms. These advances aim to close the gap between theory and real observations by including regulatory incentives adjustment costs and bounded rationality.

One key advance is the shift from static to dynamic capital structure models (Fischer, Heinkel, Zechner, 1989)¹⁰. Traditional theories assume firms aim for a fixed debt-equity ratio, but dynamic models see leverage as changing over time. Firms adjust their capital structure due to changes in profits interest rates taxes or regulatory cycles. These models include adjustment costs and strategic timing showing

⁹ 'The Determination of Financial Structure: The Incentive-Signalling Approach.' Ross, S. A. The Bell Journal of Economics, (1977); pages 23-40.

¹⁰ 'Dynamic Capital Structure Choice: Theory and Tests.' Edwin O. Fischer, Robert Heinkel and Josef Zechner. Journal of Finance (1989), page 19-40

that capital structures may differ temporarily from ideal levels because of outside constraints or market flaws. This view fits regulated sectors well due to long investment times and multi-year price reviews.

Another research area is behavioural finance. It moves away from assuming fully rational actors and looks at biases like overconfidence risk aversion and herd behaviour. For example, overconfident managers may downplay risks of high debt or delay equity issues fearing negative market reactions. These behavioural effects can mix with regulation and cause financial choices to stray from optimal (Kahneman Daniel, Tversky Amos, 1979)¹¹.

A further area is institutional factors in capital structure. Different tax rules legal protections bankruptcy laws and regulations cause big leverage differences across countries and sectors. In regulated firms prices are often set by formulas like Weighted Average Cost of Capital (WACC) and firms face limits like notional gearing or financeability tests. These institutional aspects can push leverage up or down regardless of firm traits.

One important concept is regulatory leverage. Firms may use debt strategically not just to cut capital costs but to show urgency or weakness and get better regulatory deals. This shows a deeper link between financial policy and regulation and differs from the usual cost-benefit logic in theory.

In summary, while classical theories give basic insights, their use for regulated firms is limited. Adding dynamic behavioural and institutional views gives a better framework to understand how capital structure is shaped not only by markets but also by regulation governance and strategy.

¹¹ 'Prospect Theory: An Analysis of Decision under Risk.' Kahneman Daniel, Tversky Amos (1979)

Chapter 2 – Institutional Context and Capital Structure in Regulated Industries

Building on the theories from the previous chapter, this section shifts the focus to the institutional setting where regulated firms work. While corporate finance theory gives useful tools to study leverage decisions, these models often ignore the specific rules and incentives created by regulatory systems. Understanding how firms react to these conditions is important to explain why their capital structure and financial behaviour may differ from theory.

This chapter looks especially at the change from public monopolies to private ownership and the rise of independent regulatory authorities. Then, it examines how different regulatory systems shape pricing, investment requirements, and financial incentives: this includes the effects of rate-of-return regulation and price cap models on capital structure choices.

The link between ownership structure and leverage is explored, focusing on how different types of control whether public, private, or mixed influence utility firms' risk attitudes and financial strategies. It is also discussed the common patterns of increasing debt after privatization, often called the "dash for debt," and explains why it happens.

Finally, the idea of regulatory engagement with financial policy is introduced. It previews the specific regulatory responses that will be studied in later chapters. By combining historical, political, and institutional factors, this section prepares the ground for a deeper understanding of how leverage decisions form in an environment where firms are not just economic players, but also active participants in regulatory discussions.

2.1 Characteristics of Regulated Firms

Regulated firms work in industries where competition is limited or does not exist. These firms usually provide essential services like water supply, energy transmission, or transport infrastructure. In these sectors, natural monopoly conditions apply high fixed costs, large economies of scale, and long

investment times make competition inefficient or impossible. Therefore, service delivery is assigned to a small number of firms that hold licenses and are under regulatory control (Vickers & Yarrow, 1991)¹².

To mimic competitive market results and avoid abuse of market power, regulators use tools that limit pricing freedom and tie allowed revenues to efficient operating and financing costs. One common tool is the Regulatory Asset Base (RAB), which measures the value of a firm's capital assets to calculate allowed returns. Regulators apply a notional Weighted Average Cost of Capital (WACC) to the RAB to set maximum revenues or prices. This system aims to balance fair returns for investors and protection for consumers from high prices (Helm, 2009)¹³.

Firms under these rules benefit from stable and predictable revenues, often adjusted for inflation and partly shielded from demand changes. This stability allows them to carry higher debt levels than firms in competitive markets. However, their ability to pass unexpected costs to customers or earn extra profits is limited by regulations. Capital spending must follow long-term plans, and firms are monitored not only by investors but also by regulators, politicians, and the public.

Another key feature of regulated firms is information asymmetry. These firms usually understand their internal costs, risks, and financing needs better than regulators do. This gives them a strategic advantage in negotiations. They may present themselves as financially fragile or unable to invest to influence regulatory decisions, such as asking for higher prices or more flexible financial rules.

The relationship between firms and regulators is not only technical. It also involves institutional history, politics, and influence. Regulatory capture happens when firms use long-term interaction and information power to shape rules in their favour. This can happen subtly or through staff moving between regulators and firms. Even honest regulators may feel pressure to keep large infrastructure companies financially stable, especially if failure would harm the public.

Regulatory commitment is also important. Regulations are meant to be stable, so many regulators stick to fixed methods, like agreed formulas for cost of capital or clear index rules. While this reduces uncertainty and encourages long-term investment, it can make it hard for regulators to respond to

¹² 'Economic Perspectives on Privatization.' Jhon Vickers, George Yarrow. *Journal of economic perspectives* (1991); page 111-132

¹³ 'Infrastructure investment, the cost of capital, and regulation: an assessment' Helm D. Oxford University Press (2009)

unexpected firm behaviour. For example, if a firm raises its debt significantly before a review, it may claim higher financing costs and ask for higher allowed returns (Jenkinson, 2006)¹⁴. This puts regulators in a tough spot, balancing financial health and avoiding rewarding risky choices.

All these factors create an environment where capital structure decisions are financial but also political and strategic. Unlike firms in competitive markets, where leverage reflects tax benefits, risk, or agency costs, regulated firms can use debt to influence regulation. The next section will explore how this behaviour can lead to moral hazard, where firms shift risk from shareholders to regulators or consumers.

2.2 Regulatory Moral Hazard and Strategic Use of Leverage

Regulation is meant to fix market failures, ensure essential services, and align private firms' incentives with the public good. But when rules are imperfect or too rigid, they can create unwanted incentives that change how firms behave. One important problem in regulated industries is regulatory moral hazard. This happens when firms use their position to shift risk to regulators or get better treatment in price or performance reviews (Cambini & Rondi, 2010)¹⁵.

Moral hazard occurs when a party takes on more risk because it will not face all the consequences. For regulated firms, this can happen when they use financial strategies that make them fragile, knowing regulators may step in to avoid service cuts, protect consumers, or keep the firm going. The firm's capital structure, especially its debt, is the main way this risk spreads.

Highly leveraged firms can argue that they cannot keep running or invest properly without regulators allowing higher prices or better financial conditions. These claims become stronger when credit ratings drop, interest costs rise, or rating agencies warn of risks. Regulators may then feel forced to act, especially if service failure, reputation damage, or wider problems could happen. (Jenkinson, 2006)¹⁶. This gives firms a strong reason to use debt not only as finance but also as a bargaining tool.

¹⁴ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

¹⁵ 'Incentive Regulation and Investment: Evidence from European Energy Utilities.' Carlo Cambini, Laura Rondi. Journal of Regulatory Economics (2010)

¹⁶ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

Financial distress threats become a form of leverage in talks. Firms can claim that without regulatory help, they might break debt contracts, lose capital market access, or cut needed investments. Sometimes, they delay new equity or dividend cuts to appear more vulnerable and urgent. Although these claims can be true financially, they often result from planned choices about debt and capital (Ofwat, 2023)¹⁷.

This behaviour is made stronger because many regulators face limits in their commitment and reputation. A regulator who lets a big utility fail or reduce service badly risks political backlash, public anger, or legal challenges. Firms know this and believe regulators will usually help. This weakens regulators' bargaining power and makes firms push limits, confident they will get some support.

Information gaps also make things worse. Regulators often lack up-to-date, detailed data on financial plans, liquidity, or group-level moves. This makes it hard to tell real distress from strategic plays. Also, if a firm is part of a larger group, decisions at the parent level may put pressure on the regulated part while shielding owners from risks. This makes regulators cautious and likely to favour short-term stability over long-term discipline.

Over time, repeated regulatory help creates a cycle. Firms come to expect support, which encourages high debt and delays fixing problems. This weakens regulation's power and harms rules meant to ensure financial strength. It also shifts risk from shareholders to consumers and taxpayers, who may face higher prices or costs when instability must be fixed (Ofgem, 2023)¹⁸.

Regulatory moral hazard challenges usual capital structure theory. When downside risk is socialized, firms have less reason to keep safe financial profiles. They may choose debt levels that would fail in competitive markets. The next section looks more closely at how this use of debt plays out in specific sectors and regulatory settings.

¹⁷ 'Decision under sections 13 and 12A of the Water Industry Act 1991 to modify the ring-fencing license conditions of the largest undertakers.' Ofwat. (2023)

¹⁸ 'Guidance on the Operational Capability and Financial Responsibility Principles.' Ofgem. (2023)

2.3 Leverage as a Strategic Variable in the Regulatory Process

Regulated firms influence the regulatory process not only because they provide essential services or hold more information. They also do this through deliberate financial choices, especially regarding leverage. Here, debt is not just the result of minimizing capital costs, but an active part of the firm's strategic position.

One main reason leverage is strategic is that it affects how the firm's financial strength appears to regulators. Regulators watch financial resilience closely to ensure long-term service. High debt levels, falling interest coverage, or negative free cash flow can raise concerns and trigger regulatory action. While some of these signs come from outside problems, others come from planned capital structure choices, such as complex financing, loans within a corporate group, or dividend policies that cut retained earnings.

By showing financial constraints, firms can gain power in negotiations. They may claim that without regulatory help, they cannot keep services running or meet investment demands. They may ask for higher allowed returns, saying market or credit conditions have raised their costs. They might also try to delay strict financial rules, like forced equity injections or dividend limits, arguing these would cause problems under current finances (Tapia, 2009)¹⁹.

Though these claims sound technical, they are not neutral. They show the firm's strategy to shape regulator views and outcomes. Leverage acts as a signal, aimed not just at markets but also regulators. It sends a message about the firm's financial state that supports calls for flexibility, urgency, or changes.

This strategic use of leverage is important where regulators have limited discretion due to rules, politics, or the need to keep investor trust. If regulators must follow fixed methods or past decisions, firms may decide that looking weaker financially increases chances of favourable treatment. This means firms design capital structures not only to cut costs but also to influence regulatory assumptions.

At the same time, firms plan financial moves carefully around regulatory events. Changes in debt levels, dividend policies, or equity contributions often coincide with price reviews or performance checks. At

¹⁹ 'Is the regulatory control of utilities' capital structures always justified?' Javier Tapia. Second annual conference on competition and regulation in network industries (2009)

these times, financial numbers matter more, as regulators use them to decide on future prices or corrective steps.

This behaviour is not always poor management or opportunism. Instead, it is a rational response to institutional rules that do not always align financial incentives with regulatory goals. As long as regulators leave room for interpretation or react to crises, firms will use financial structure strategically.

In short, leverage in regulated firms is more than tax savings, risk preferences, or agency issues. It is also a tool to influence regulatory negotiations. This challenges traditional capital structure theories and shows that regulators need to understand the strategic side of financial decisions when assessing firm resilience and making policy.

2.4 Implications for Capital Structure Theory and Regulation

Regulated firms face a unique set of incentives and limits that change the usual logic of capital structure decisions. While basic theories like the Trade-off Theory, Pecking Order Theory, and Agency Theory offer useful tools, they lose accuracy when applied to firms that do not face normal market pressures and deal directly with regulators to set their financial terms.

The evidence shows that leverage in regulated firms often acts not just as a way to raise money, but as a strategic tool in regulation. By managing their finances to look weaker or more limited, firms can influence the information available to regulators. This behaviour may not always be explicit or opportunistic but reflects a system where financial policy and regulation interact. In this context, signs of financial trouble or low capital are not always due to poor management, instead can be intentional moves to affect regulatory decisions (Tapia, 2009)²⁰.

From a theory standpoint, this challenges the idea of an optimal capital structure as a stable balance of costs and benefits within the firm. Instead, capital structure becomes dynamic and depends on the

²⁰ 'Is the regulatory control of utilities' capital structures always justified?' Javier Tapia. Second annual conference on competition and regulation in network industries (2009)

firm's expectations of how regulators will react. This adds an external feedback loop, where expected regulatory responses shape leverage decisions.

Regulators face important challenges too. If firms can use high debt strategically to get concessions or delay fixes, regulations need to change. Rules should be less reactive and more preventive. This might mean setting future-looking financial resilience limits, requiring earlier disclosure of financing plans, or linking allowed returns to capital structure choices.

Also, the idea of financial resilience, used more and more by regulators, must be clear and practical. It should go beyond past measures like debt ratios or interest coverage. It needs to include the wider context of financial decisions, including group policies, dividend payments, and firm strategies around regulatory reviews (Jenkinson, 2006)²¹.

Finally, this analysis highlights the need for regulators to stay independent and technically skilled. When information gaps remain, or when political pressure or weak institutions reduce commitment, the risks of moral hazard and regulatory capture rise. In these cases, capital structure may stray further from efficiency and closer to opportunism, causing harm not just to consumers but also to the regulatory system itself.

This ends the theoretical and institutional review of how regulated firms behave differently in their capital structure choices.

2.5 The strategic role of Leverage under regulation

The interaction between regulation and capital structure has been studied by a relatively small but important strand of the literature. The first contributions are from the US context, where utilities have always been privately owned and subject to regulation by state or federal commissions. In these markets, leverage was shown to respond directly to the regulatory framework. Taggart demonstrated that the introduction of rate-of-return regulation induced electric utilities to increase their debt-to-equity ratios, while Hagerman and Ratchford found that the allowed return on equity was positively

²¹ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

related to the level of leverage. These results suggest that the regulator, in defining the “fair return”, implicitly considers the capital structure of the firm, and firms can adapt their financing decisions to this mechanism (Taggart, 1981; Taggart, 1985; Hagerman and Ratchford, 1978)^{22 23 24}.

Later theoretical models formalised this intuition. Spiegel and Spiegel with Spulber showed that leverage can be used as a strategic device in the regulatory game. In their framework, the regulated price p is set taking into account the cost of capital, which depends on the weights of debt and equity. The regulator wants to avoid situations of financial distress, so when the firm increases its debt ratio, the regulator reacts by setting a higher price in order to reduce the probability of bankruptcy. Mathematically, the regulated price becomes an increasing function of the debt-equity ratio, and leverage acts as a commitment device. In this way the firm can use its capital structure strategically to influence the outcome of regulation (Spiegel and Spulber, 1994; Spiegel and Spulber, 1997)^{25 26}.

This theory departs from the traditional Modigliani and Miller irrelevance proposition, according to which leverage does not affect the value of the firm in perfect markets. In regulated industries, instead, the relationship between prices and leverage introduces a new channel: financing decisions change the bargaining power of the firm with the regulator. The result is that leverage can be chosen not only for tax shield or agency reasons, but also to extract higher allowed returns through the regulatory process (Modigliani and Miller, 1958)²⁷.

More recent studies have analysed this mechanism in the European context, where the institutional framework is very different from the US. In Europe, large utilities were traditionally state-owned and only in the 1990s did a wave of privatizations and liberalizations changed the landscape. Together with privatization, Independent Regulatory Agencies (IRAs) were created, for example Ofwat, Ofgem and CAA

²² ‘Rate-of-Return Regulation and Utility Capital Structure Decision’ R. Taggart. The Journal of Finance (1981)

²³ ‘Effects of Regulation and Utility Financing: Theory and Evidence’ R. Taggart. The Journal of Finance (1985)

²⁴ ‘Some Determinants of Allowed Rates of Return on Equity to Electric Utilities’ L. Hagerman and T. Ratchford. Bell Journal of Economics (1978)

²⁵ ‘The Capital structure and Investment of Regulated firms’ Y. Spiegel and D. Spulber. Journal of Regulatory Economics (1994)

²⁶ ‘The Choice of Technology and Capital Structure under Rate Regulation’ Y. Spiegel and D. Spulber. International Journal of Industrial Organization (1996)

²⁷ ‘The cost of capital, corporation finance and the theory of investment.’ Franco Modigliani, Merton Miller. American Economic Review (1958)

in the UK. These two institutional changes — ownership structure and regulatory independence — have important consequences for capital structure choices.

Bortolotti, Cambini, Rondi and Spiegel provide the first systematic empirical study of this issue. They collect a panel of 92 publicly traded utilities in the EU-15 for the period 1994–2005, across sectors like energy, telecommunications, water and transport infrastructure. They measure leverage both in book value and in market value, with the usual formulas:

$$\textit{Book Leverage} = \frac{D}{D + E}$$

$$\textit{Market Leverage} = \frac{D}{D + ME}$$

Where **D** is the total financial debt, **E** is book value of equity, and **ME** is the market value of equity.

In this thesis I always refer to book leverage, measured as Debt over Debt plus Equity. While some studies report both book and market measures, the market value of equity is not consistently available for many Italian utilities, especially local multi-utilities and airports. For this reason, book leverage is the only consistent measure that allows to compare Italian firms, based on balance sheet data, with UK utilities, where gearing is defined on the Regulatory Asset Base.

Their results show two important points. First, leverage is significantly higher when utilities are privately controlled and subject to an IRA, compared to state-controlled firms or those regulated directly by ministries. Second, using panel regressions and Granger causality tests, they demonstrate that leverage Granger-causes regulated prices, but not the opposite, when firms are private and under independent regulators. This means that an increase in leverage today leads to higher regulated prices tomorrow, but changes in prices do not predict leverage. The evidence is consistent with the strategic use of debt predicted by Spiegel and Spulber (Bortolotti, Cambini, Rondi and Spiegel, 2011)²⁸.

Another important extension is the theoretical model of Cambini and Spiegel. They consider the case of partially state-owned regulated firms and formalise the interaction between capital structure,

²⁸ ‘Capital structure and regulation: do ownership and regulatory independence matter?’ B. Bortolotti, C. Cambini, L. Rondi, and Y. Spiegel. *Journal of Economic & Management Strategy* (2011)

ownership, and the degree of independence of the regulator. In their model the regulated price P is an increasing function of leverage L :

$$P = f(L), \quad f'(L) > 0$$

but the slope of this function is higher when the firm is privately controlled and the regulator is independent. This is because independent regulators are able to commit to long-term policies, and private owners have stronger incentives to exploit leverage as a strategic device. The model also shows that higher leverage increases investment incentives, so that welfare can actually be higher under independent regulation despite the risk of financial distress (Cambini and Spiegel, 2016)²⁹.

The paradoxical implication is that financial distress becomes possible only under independent regulators, because firms trust the credibility of the regulator and therefore issue more debt. In contrast, when firms are state-owned or when regulation is carried out by ministries, the incentives to use leverage strategically are much weaker.

Taken together, these studies show that the capital structure of regulated utilities cannot be analysed separately from the regulatory and institutional environment. Ownership, the degree of independence of the regulator, and the credibility of regulatory commitments all affect leverage choices. In particular, privately controlled utilities subject to independent regulators tend to exhibit higher gearing and to use debt strategically to obtain more favourable regulatory outcomes.

²⁹ 'Investment and capital structure of partially private regulated firms' C.Cambini and Y. Spiegel. Journal of Economic & Management Strategy (2016)

Chapter 3 – Independent Regulatory Agencies: Origins, Structure and Scope

In liberalised infrastructure sectors where market competition is limited or does not exist, the regulation of prices, investments, and service quality is given to special bodies called independent regulatory agencies or IRAs. These agencies appeared mainly during the wave of privatisations and market reforms that changed many network industries in Europe from the 1980s on (Vickers & Yarrow, 1988)³⁰. Their main role is to act as neutral referees between private companies and the public interest. They replace direct state control with rules designed to ensure fair access, efficiency, and long-term investment.

IRAs are usually set up to work independently from governments and market players. This independence is important to provide regulatory certainty, protect consumers, and encourage private investment in sectors with high fixed costs and long-lasting assets. At the same time, these agencies must have strong technical skills, legal power, and clear operations to do their job well.

This section gives an overview of why IRAs were created and what their main functions are in regulated sectors. It also briefly describes some key agencies in the UK and Italy, focusing on their history, areas of regulation, and structure. Without going into technical or national comparisons, this overview shows the institutional setup where capital structure decisions happen and sets the stage for the case studies in the next chapters.

3.1 Historical Origins and Purpose of IRAs

Independent regulatory agencies, or IRAs, were created during the liberalisation and privatisation of utilities and infrastructure in many European countries from the late 20th century. Before these reforms, services like water, electricity, gas, and transport were mostly provided by state-owned monopolies. These companies owned the assets, managed operations, and were overseen politically. They had goals beyond efficiency, such as supporting employment and setting social prices.

³⁰ 'Economic Perspectives on Privatization.' Jhon Vickers, George Yarrow. *Journal of economic perspectives* (1991); page 111-132

The move to liberalise markets came from political, financial, and practical reasons. Governments wanted to lower public debt, improve services, and attract private investment in sectors needing large capital. However, many network industries are natural monopolies, so full competition was impossible or not ideal. Private ownership created a need for new institutions to regulate prices and performance independently from politics and the companies themselves.

IRAs emerged to solve this governance problem. Their goal is to provide clear, transparent, and skilled oversight that balances private incentives with the public good. By working outside daily politics, IRAs offer long-term regulatory certainty, which is vital in sectors with long-lived assets and delayed returns (OECD, 2016)³¹.

IRAs mainly ensure that firms do not abuse their market power by charging too much or underinvesting in essential infrastructure. They set tariffs, service standards, and investment rules based on established methods and monitor performance. Their role is twofold: protect consumers from abuse and give firms clear rules and fair returns to encourage efficiency and investment.

The design and role of IRAs differ by country and sector but share some features. They are legally independent from government ministries, accountable through reports or parliament, consult stakeholders, and balance consumer protection with investment promotion. In the UK, IRAs have strong authority and are key to sector governance. In other places, like Southern Europe, IRAs developed more slowly and vary in strength and independence.

As capital structure became more important after financial crises and sector problems, IRAs had to widen their focus. They do not decide how firms finance themselves but influence financial choices through price controls, allowed returns, and financial disclosure. The next section introduces some key agencies, showing their sector coverage and institutional roles.

³¹ 'Being an Independent Regulator, The Governance of Regulators.' OECD Publishing (2016)

3.2 Sectoral Agencies: An Institutional Overview

The analysis of capital structure and regulatory interaction in the next chapters will focus on key regulatory bodies in the UK and Italy. These include Ofwat Ofgem and the Civil Aviation Authority (CAA) in the UK as well as ARERA and ART in Italy. Each agency plays a vital role in shaping the financial and operational behaviour of the firms they oversee. This section gives a brief profile of these regulators, highlighting their origins mandates and main responsibilities in their sectors.

Ofwat (Water Services Regulation Authority – UK)

Established in 1989 during the privatisation of the water industry in England and Wales Ofwat regulates private water and wastewater companies. It sets price limits monitors service quality and ensures long-term investment in water infrastructure. Independent from government Ofwat carries out price reviews every five years and uses performance-based models to encourage efficiency and innovation. Recently the agency has taken a more active role in monitoring financial resilience including oversight of dividend policies and corporate governance.

Ofgem (Office of Gas and Electricity Markets – UK)

Ofgem was created in its current form in 2000 by merging two earlier regulators. It oversees electricity and gas markets in UK making sure consumers are protected and energy systems stay secure and sustainable. Ofgem's responsibilities include supervising wholesale and retail markets setting price controls for monopoly networks and supporting the energy transition. Like Ofwat Ofgem has recently expanded financial oversight requiring minimum capital standards and better risk reporting from suppliers and distributors.

CAA (Civil Aviation Authority – UK)

The CAA is the UK regulator for the aviation sector. It has a broad role that includes safety airspace policy and economic regulation of airports with strong market power. The CAA sets price caps for Heathrow and other airports based on fair cost recovery and returns. The agency works independently but coordinates with government departments on aviation strategy. During the COVID-19 pandemic the CAA evaluated requests for tariff changes linked to financial distress.

ARERA (Autorità di Regolazione per Energia, Reti e Ambiente – Italy)

ARERA is the Italian regulator for electricity gas water services and waste management. It was founded in 1995 as the energy regulator (AEEG) and later expanded to include water in 2011 and waste in 2018. ARERA sets tariff methods monitors service quality and supports investment in networks. It also works to ensure transparency sustainability and user protection. Although formally independent ARERA's autonomy and enforcement power have grown more slowly than similar agencies in the UK.

ART (Autorità di Regolazione dei Trasporti – Italy)

ART was created in 2013 and oversees economic regulation for transport services and infrastructure in Italy, including railways, highways, airports and ports. ART sets rules for infrastructure access and tariff systems and monitors if service obligations are met. Compared to other regulators ART is newer and works in a setting where public and private interests often mix, especially in concession models. Its independence and role in long-term investment planning are still developing.

These agencies form the main framework for regulation in their sectors. Their design power and scope vary but each plays an important role between public policy and private operations. Knowing their structure and approach is the key to understanding how capital structure decisions are shaped and influenced in regulated settings.

Chapter 4 – Strategic Leverage and Regulatory Reaction: Evidence from UK Sectors

After setting out the theoretical and institutional background to capital structure in regulated firms, this chapter moves to the empirical side. It looks at how regulated utilities in the UK have used leverage strategically in their dealings with regulators, and how these regulators have responded over time to changing financial behaviour and sector challenges.

Focusing on three key sectors transport, energy, and water each showing different ways in which capital structure choices influence regulatory outcomes. It starts with Heathrow Airport, examining the company's request for a price review after COVID-related financial problems and the regulatory debate over whether this request was justified. The second part covers the energy sector under Ofgem, highlighting reforms to improve financial resilience, such as minimum capital levels and stronger risk reporting. The third section studies the water industry, discussing Ofwat's reforms including cash lock-up rules and the requirement for two credit ratings.

These case studies reveal common trends and sector-specific differences in how firms use financial weakness to gain regulatory leniency, higher prices, or delay obligations. At the same time, they show how regulatory frameworks have evolved, increasingly recognizing the strategic use of capital structure and responding with more active and precautionary measures. It provides real examples of how financial strategies and regulation interact, and how firms balance financial goals with long-term service responsibilities.

4.1 Heathrow Airport and the COVID-19 Crisis. (CAA, 2021)³²

The case of Heathrow Airport Limited (HAL) during the COVID-19 crisis shows how regulated firms can try to influence regulatory decisions by linking financial weakness to wider investment and service needs. HAL, regulated under a price control model by the UK Civil Aviation Authority (CAA), asked to

³² 'NEED FOR GEARING RECOVERY, A report for Heathrow Airport Limited'. Economic Insight (2014)

reopen its price setting process, proposing the increase of its Regulatory Asset Base (RAB) to reflect financial pressures caused by the pandemic.

In fact, the sharp drop in air traffic and revenue during COVID-19 forced the company to rely heavily on debt to keep operating and this increase raised its gearing ratio well above the notional level set by the regulator; raising the RAB would help it continue investing in infrastructure and improve services, benefiting consumers and lowering gearing.

The CAA recognized the financial stress in aviation caused by the COVID-19 pandemic but doubted that it was the only reason of HAL's high leverage. HAL had kept gearing above the benchmark for years before the crisis and continued paying dividends and managing finances in ways that may have limited resilience.

From the regulator's view, the case raised concerns about high debt during economic stress. The CAA said firms often increase debt in crises but warned that such debt is not sustainable long term. High gearing may solve short-term cash problems but can reduce investment capacity later. This is a serious issue in regulated sectors because less investment can lower service quality and raise costs for both consumers and the regulatory system.

The CAA also questioned whether HAL's request was a fair and proportional regulatory response. It acknowledged the crisis was exceptional but said HAL did not show strong evidence that its financial troubles were mostly outside its control. Instead, the problems may have been made worse by decisions to keep gearing above efficient levels even before COVID-19.

This case shows how leverage is used not just for finance but to shape regulatory arguments. HAL framed high debt as a problem caused by external shocks while downplaying the role of earlier financial choices. It presented financial weakness as a constraint that regulators must fix, pushing the responsibility for fixing the balance sheet onto the regulator.

In the end, the CAA took a balanced approach. It did not approve the full RAB increase but introduced short-term smoothing and delayed the full decision to future reviews. This shows the regulator's challenge between being realistic financially and avoiding setting precedents that encourage strategic use of debt.

Overall, the HAL case highlights the problem of time inconsistency in crisis regulation. Firms may expect regulators to help during downturns and arrange their capital accordingly. High debt strengthens their position in future talks. Thus, capital structure becomes a strategic tool, not just a financial outcome, especially in sectors where service must continue for social and political reasons.

4.2 Ofgem and the Regulation of Financial Resilience in the UK Energy Sector. (Ofgem, 2023)^{33 34}

The UK energy retail market has faced exceptional stress in recent years, revealing serious weaknesses in the financial structure of many suppliers. A mix of external shocks, including sharp rises in wholesale energy prices and geopolitical uncertainty, exposed business models that were undercapitalized and depended on narrow profit margins. In response, Ofgem, the national energy regulator, introduced a much stricter framework to ensure the long-term financial resilience of energy suppliers. This change reflects a broader understanding that capital structure is not just a firm's choice but a regulatory issue with consequences for consumer protection and market stability.

At the heart of this reform is the Financial Responsibility Principle, part of suppliers' license requirements. It demands that firms keep enough capital and liquidity to meet their obligations and continue operating under likely stress scenarios. Ofgem put this into practice by setting two key levels: a Capital Floor, the absolute minimum capital a supplier must hold to avoid breaking rules, and a Capital Target, a higher, forward-looking goal linked to the size of the firm's operations. These levels are adjusted based on the number of domestic customers served and are designed to help firms absorb market shocks without risking service disruptions.

The regulatory framework goes beyond fixed capital levels. Firms must perform yearly self-assessments of their financial health, supported by scenario analysis and planning for the future. They must send these reports to Ofgem, showing they have and expect to keep enough capital to handle risks like

³³ 'Guidance on the Operational Capability and Financial Responsibility Principles.' Ofgem. (2023)

³⁴ 'Decision on Strengthening Financial Resilience.' Ofgem (2023)

customer loss, volatile wholesale markets, failed hedging, and operational problems. This shifts supervision from looking at past financial data to a proactive, risk-based approach.

At the same time, Ofgem strengthened governance and reporting rules. Suppliers must prove full legal and operational control over key assets that support their business, including physical infrastructure and cash flows. They must ensure that critical functions and contracts are not split across companies or exposed to third-party risks. Annual reports must show that capital and liquidity are not only enough but also protected and accessible during stress.

One notable feature of the new rules is the focus on asset ring-fencing, especially for customer credit balances and Renewables Obligation payments. Ofgem found that misuse of these funds contributed to supplier failures during recent crises. By requiring suppliers to separate and protect these balances, the regulator aims to reduce the financial impact on other market players and limit failure costs passed to consumers. These changes mark a shift in regulation, from tolerating risky financial strategies to actively preventing systemic risks.

The reforms have been widely welcomed by consumer groups and financial experts, but some suppliers have raised concerns. They say higher capital demands and tighter governance may raise entry barriers and make the market less attractive to investors. Smaller firms might struggle to meet new rules without raising prices or cutting services. Ofgem recognizes these concerns but argues that a stable and resilient retail market justifies the short-term costs.

From a capital structure theory view, Ofgem's actions mark a move away from the idea that firms freely optimize debt and equity based on costs and taxes. Suppliers now face external limits that change what capital choices are possible. The need to keep capital above regulatory floors reduces the chance to use high leverage and links financial compliance directly to capital structure. This changes the incentives for regulated firms, especially those that once used high debt to gain regulatory advantages or short-term benefits.

Overall, the UK energy case shows how financial weakness in a liberalized but essential sector can lead to major changes in regulation. Ofgem's framework not only sets limits but also reshapes the role of capital structure in regulated industries. It stresses the need for firms to maintain financial discipline for internal strength and to ensure public trust and system stability.

4.3 Ofwat and Financial Resilience in the Water Sector (Ofwat, 2023,2022)^{35 36}

The financial rules for the water sector in England and Wales have changed a lot recently. These changes respond to worries about the sector's ability to keep investing and maintain service quality despite high debt levels and economic stress. Ofwat, the independent regulator, introduced policies to strengthen the financial resilience of water companies while keeping incentives for efficiency and innovation.

At the core of these policies is the idea that capital structure decisions affect consumers, investors, and the long-term quality of service. In regulated monopolies, financial trouble can hurt customers and disrupt regulation. To tackle this, Ofwat updated licenses and set new expectations for managing capital, addressing both current problems and wider risks.

A major change is the cash lock-up rule. Companies cannot pay dividends if their credit rating falls to the lowest investment grade—currently BBB- or Baa3 with a negative outlook. From April 2025, this threshold will rise to BBB or Baa2 with a negative outlook, tightening conditions for dividend payments. Companies can ask for an exemption but must prove strong financial resilience despite the downgrade. This rule aims to match shareholder returns with company performance, especially in tough times.

Companies must also keep credit ratings from at least two agencies. This improves transparency and reduces risks from rating disagreements. Firms must quickly report any credit changes to Ofwat. New dividend rules require boards to consider finances, current and future investments, and service outcomes before approving payments.

These rules affect capital structure decisions. Although companies still have some freedom in financing, stricter dividend, credit, and reporting rules narrow leverage choices. Keeping an investment-grade rating encourages more cautious balance sheets. Firms close to these limits face higher capital costs and payout limits, pushing them to raise equity and simplify finances.

Ofwat's 2022–23 Monitoring Financial Resilience Report shows that, despite efforts, sector-wide gearing remains high. As of March 2023, average gearing was 68.2%, up from 66.2% the year before.

³⁵ 'Decision under sections 13 and 12A of the Water Industry Act 1991 to modify the ring-fencing licence conditions of the largest undertakers.' Ofwat. (2023)

³⁶ 'Monitoring financial resilience report.' Ofwat (2022)

Some companies, including Thames Water, Affinity Water, and South East Water, reported gearing above 75%. Although firms like Thames and Southern Water have received large equity injections recently, these moves have often been reactive, aimed at fixing problems rather than building lasting resilience.

High gearing during inflation periods creates mixed effects. Equity investors gain from inflation-linked increases in Regulatory Capital Value (RCV), especially with fixed-rate debt. But inflation also raises operational costs, index-linked debt servicing, and short-term pressures. Ofwat stresses the need for companies to keep enough financial buffer and avoid pushing risks to future periods or customers.

Ofwat has also increased focus on dividend accountability. Companies must explain how dividends relate to performance, customer outcomes, and environmental compliance. In 2022–23, firms paid £1.4 billion in dividends, but some failed to clearly connect payments to company results. Ofwat said it is ready to use licence enforcement powers where this disconnect remains.

Thames Water’s case shows these challenges. Despite £500 million in new equity in 2022–23 and shareholder promises for another £750 million by 2025, it still operates with high debt and falling credit ratings. Concerns over finances and operations led Ofwat to place it in the Action Required category. This means closer monitoring and limits on financial decisions until clear improvements happen. Similar steps apply to Southern Water, SES Water, and South East Water, which also face financial and service pressures.

Ofwat’s approach has two goals. First, to link corporate finance and regulatory accountability, making sure capital decisions serve consumers and the environment long term. Second, to reduce moral hazard from firms using high debt to gain regulatory favours or shift risk. Ofwat monitors financial resilience through indicators like adjusted interest cover, funds from operations to net debt, and return on notional equity, all part of a broader resilience framework.

KPMG’s Financial Resilience Impact Assessment supports these steps. It notes that while high debt can be a rational response to regulation or capital needs, it raises risks in crises. Weak finances reduce flexibility, increase underinvestment chances, and create governance issues when ownership is highly financial or foreign. KPMG also points out that regulatory incentives, like RCV inflation indexing and short price control periods, may encourage short-term gains over resilience.

In summary, Ofwat's evolving rules mark a big step in making capital structure discipline central to utility regulation. The water sector, once seen as low-risk and stable, now faces tougher rules that link financial strength to service legitimacy. By including dividend limits, credit quality, and gearing caps in licences, Ofwat has made capital structure a public interest issue, strengthening private companies' accountability for long-term investment, stability, and consumer protection.

Chapter 5 - British CASE & Italian CASE

This section aims to compare how capital structure has changed in regulated utilities in two key European countries the UK and Italy. Building on theory and institutional insights from earlier chapters it looks at how different paths of privatisation ownership and regulatory strength shaped firms' financial strategies especially leverage and how regulators reacted to new risks.

The UK is an example of early and deep liberalisation with strong independent regulators. After privatisation firms mostly used equity. Over time they shifted to higher debt levels known as the “dash for debt”. This section analyses this change and shows how regulators like Ofwat Ofgem and the CAA responded with measures to boost financial resilience and changes in rules like notional gearing and WACC models.

A different case is shown in Italy where liberalisation was slower and partial. Mixed ownership is still common and regulatory power is more divided. While some sectors saw more debt Italian regulators like ARERA and ART have different tools and frameworks compared to the UK. This section examines Italy's experience focusing on ownership types financial risks and the limits of current regulation in shaping capital structure.

Methodology

The empirical analysis in this thesis looks at the capital structure of a selected group of regulated utility companies in the UK and Italy, focusing on leverage levels and how national regulatory and institutional frameworks affect them.

Data Sources

For Italian firms, financial data were taken from the PitchBook platform, mainly from the balance sheet section. The primary measure used to assess leverage was the gearing ratio, defined as:

$$\text{Gearing} = \frac{\text{Net Debt}}{\text{Net Debt} + \text{Total Equity}}$$

Net debt was calculated by subtracting cash and short-term investments from total debt, giving a clearer view of financial exposure.

For UK firms, financial data were collected from various annual reports published by the companies over different years. In all cases, leverage was calculated using the Regulatory Asset Value (RAV) as the denominator, in line with UK regulatory practices. The gearing ratio was calculated as:

$$\text{Gearing} = \frac{\text{Net Debt}}{\text{Regulatory Asset Value (RAV)}}$$

This approach reflects the methodology used by UK regulators like Ofwat, Ofgem, and the Civil Aviation Authority when assessing financial resilience and price control compliance.

Statistical Analysis

In addition to the calculation of gearing ratios, I apply a simple statistical test to verify whether the observed differences in average leverage across groups are significant. For this purpose, I use the Welch's t-test, which is suitable when the two samples may have different variances and different sizes. The formula of the test is:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

where $\bar{x}_i$ are the sample means, s_i^2 the sample variances, and n_i the number of observations in each group. This test is applied to compare ownership categories (private vs partially privatized) and to compare country-level averages (UK vs Italy) within each sector.

Trend Analysis

To analyse the dynamics, I estimate simple linear regression of gearing on year for each sector and country:

$$\text{Gearing}_{it} = \alpha + \beta * \text{Year}_t + \varepsilon_{it}$$

In this model, Gearing_{it} is the leverage of firm i in year t . The intercept α represents the baseline level of gearing, while the slope coefficient β measures the average yearly change. Year_t is the time variable

and ε_{it} is the error term that captures all the unexplained variation. A positive β indicates that leverage is increasing over time, a negative β suggests a decline, and a non-significant coefficient implies that no clear trend can be detected.

Scope and Consistency

Although the formulas for gearing differ between countries, RAV-based for UK firms and balance sheet-based for Italian firms, the methodology is consistent with the regulatory standards in each country. The selection of firms includes major companies from the water, energy, and transport sectors, both publicly listed and privately held.

This dual approach allows for meaningful comparison between countries while showing how regulatory models influence financial strategies and capital structure decisions.

5.1.1 British Historical Background

In the 1980s, a large privatisation program took place in the UK, leading to a transformation of the utility sector. This changed both ownership and regulation: water, energy, and transport companies, once state-owned monopolies, were sold to private owners. The move was only partly based on economics: in fact, the government also wanted to increase public share ownership and reduce the power of trade unions and state control. To help this, firms were first privatised with little debt and strong incentives for small investors, such as cheap shares and bonus schemes. The goal was to create many small shareholders and make equity the main financing method for new private utilities (Rhodes & Hough & Butcher, 2014)³⁷.

At first, this worked well. Regulators allowed high returns and approved big investments. Private utilities had a clear focus on equity and low debt. For example, when the water sector was privatised in 1989, debts were wiped clean before sale, so companies started with little or no debt. Electricity distribution saw similar cuts, with gearing ratios around 25% (Public Impact Fundamentals, 2016)³⁸.

³⁷ 'Privatisation.' Chris Rhodes, David Hough, Luise Butcher. Research paper 14/61, House of Commons Library (2014)

³⁸ 'Privatising the UK's nationalised industries in the 1980s' Public Impact Fundamentals (2016)

However, this phase did not last long. By the mid-1990s, utilities started increasing their debt levels, replacing equity with debt as the main way to finance. This period, called the “dash for debt”, matched the interests of infrastructure funds and leveraged buyouts rather than long-term ownership. By the early 2000s, many companies had gearing ratios between 50% and 70% with some energy and gas firms going even higher. Electricity distribution showed average gearing from 44% to 51% between 2004 and 2008, while gas distribution averaged close to 60%.

The water sector followed a similar but more varied path. Research by DEFRA and Ofwat found three main corporate types in the water sector: traditional equity-debt models, thin equity firms, and complex finance structures with holding companies backed by debt. Differences also appeared within sectors. In 2008, the most leveraged electricity distributor had 61% gearing, while the least had 17%. Even under the same rules, capital structures varied widely due to ownership, finance strategy, and group decisions.

One extreme case is Network Rail. It runs a 100% debt-financed model for the UK’s rail system. Despite such outliers, most regulated utilities moved toward high leverage with thin equity and heavy debt, but not full debt dependence. This change is very different from the early privatisation days and it raises important questions about how financial strategy and regulation work together, especially in essential services with long-term licences.

5.1.2 UK Companies under scope

Water utilities sector:

Thames Water:

Thames Water is the largest provider of water and wastewater services in the UK. It serves about 15 million customers in London and the Thames Valley. The company was created during the 1989 privatization of the water industry. It handles the extraction treatment and distribution of clean water as well as sewage collection and treatment. With around 8,000 employees Thames Water manages important infrastructure and works on energy recovery and biosolid reuse. Recently the company has been at the center of debates about regulation and financial resilience because of its high debt dividend

policies and worries about underinvestment. This raises questions about the long-term sustainability of capital structures in the UK water sector. (Thames Water, Pitchbook. 2025)³⁹

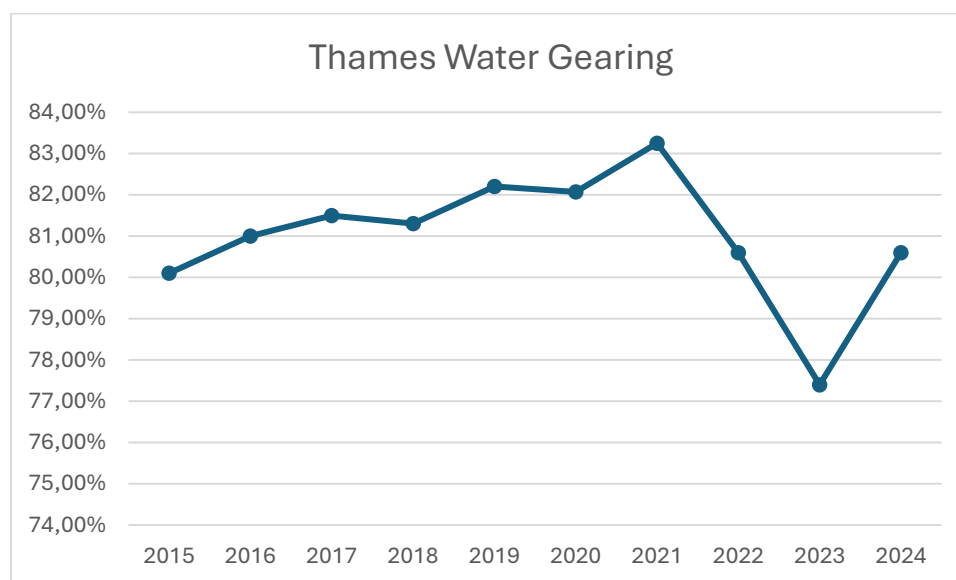


Figure 1. Average gearing ratio trend for Thames Water from 2016 to 2024

United Utilities Group:

United Utilities Group is the holding company for United Utilities Water. This company provides water and wastewater services in northwest England, including major cities like Manchester and Liverpool. It is based in Warrington and was formed during the 1989 privatization wave. United Utilities remains one of the UK's top regulated water utilities. It serves over seven million people and manages large infrastructure assets in the area. As a fully regulated business under Ofwat, United Utilities follows relatively cautious financial policies compared to some peers. This makes it a good example for studying capital structure choices, credit measures, and financeability under the UK price cap system (Pitchbook 2025)⁴⁰.

³⁹ Pitchbook, Thames Water Company Description 2025

⁴⁰ Pitchbook, United Utilities Group Company Description. 2025

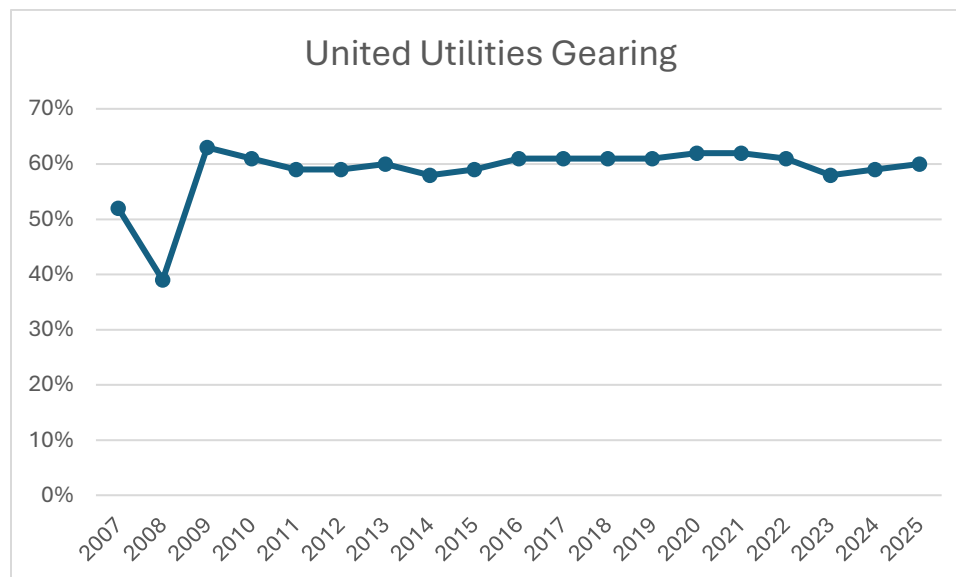


Figure 2. Average gearing ratio trend for United Utilities from 2007 to 2025

Severn Trent:

Severn Trent is one of the UK's major regulated water and wastewater companies. It is based in Coventry and started from the 1974 reorganisation of the British water industry. Listed on the London Stock Exchange it mainly serves the Midlands and parts of Wales with millions of residential and business customers. Besides its core regulated work under Ofwat, Severn Trent is involved in renewable energy and infrastructure projects through public-private partnerships. Its diverse activities and clear financial strategy make it a key example of how capital structure relates to regulatory demands environmental goals and service duties in a sector under close watch (Pitchbook 2025)⁴¹.

⁴¹ Pitchbook, Severn Trent Company Description 2025

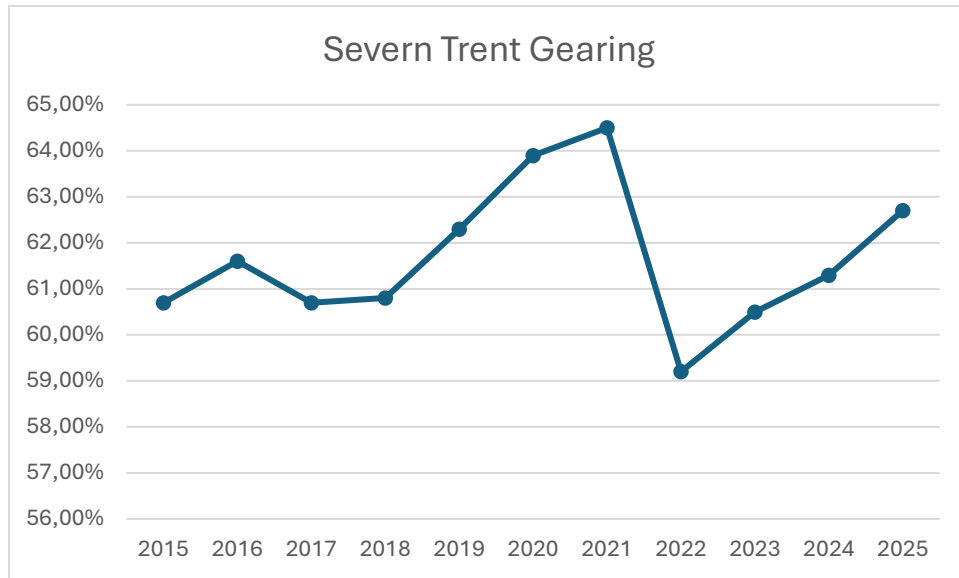


Figure 3. Average gearing ratio trend for Severn Trent from 2015 to 2025

Yorkshire Water Services:

Yorkshire Water Services is a privately owned regulated utility based in Bradford. It operates under Ofwat's rules to provide water and wastewater services across the Yorkshire region. The company was created during the 1989 privatization of the UK water sector. It serves both homes and businesses and manages large infrastructure for water extraction treatment distribution and sewage. Yorkshire Water's high debt and complex ownership make it a key case for studying how capital structure is used strategically and how the regulator's role is changing to ensure financial and service resilience (Pitchbook 2025)⁴².

⁴² Pitchbook, Yorkshire Water Services Company Description 2025

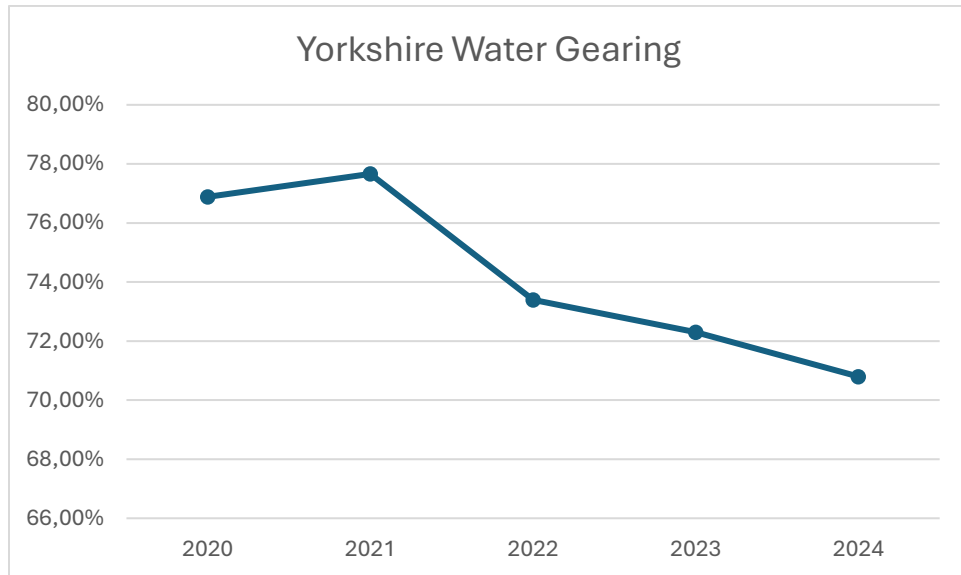


Figure 4. Average gearing ratio trend for Yorkshire Water from 2020 to 2024

South West Water:

South West Water was founded in 1989 and is based in Exeter Devon. It is a regulated utility that provides essential drinking water and wastewater services across the South West of England. The company employs over 2,700 people and manages water collection treatment and distribution along with sewerage for homes and businesses. Under Ofwat's supervision South West Water plays a key role in service quality environmental protection and long-term infrastructure investments.

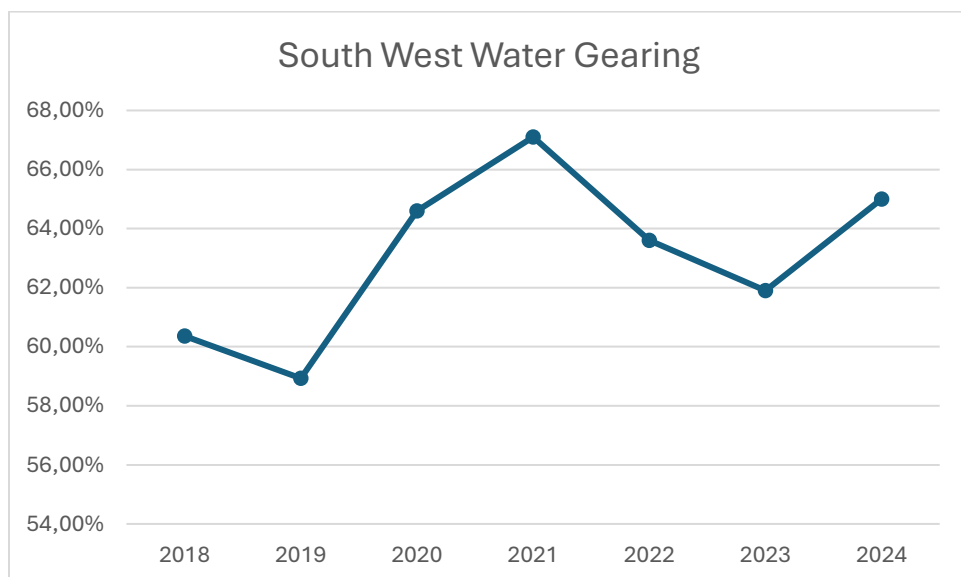


Figure 5. Average gearing ratio trend for South West Water from 2018 to 2024

Northumbrian Water:

Northumbrian Water Ltd provides water and wastewater services to approximately 4.4 million people across North East England and parts of Essex and Suffolk. The company is entirely owned by CK Hutchison Holdings, a multinational conglomerate based in Hong Kong. Although it operates under the economic regulation of Ofwat, Northumbrian Water has adopted a holding structure and dividend distribution policy that have attracted regulatory scrutiny. Its capital structure features significant debt, including group-level liabilities, and its gearing has often surpassed Ofwat's notional benchmarks. As such, it serves as a key example for analysing the impact of foreign ownership and the strategic use of leverage within the UK's regulated utility framework (PitchBook 2025)⁴³.

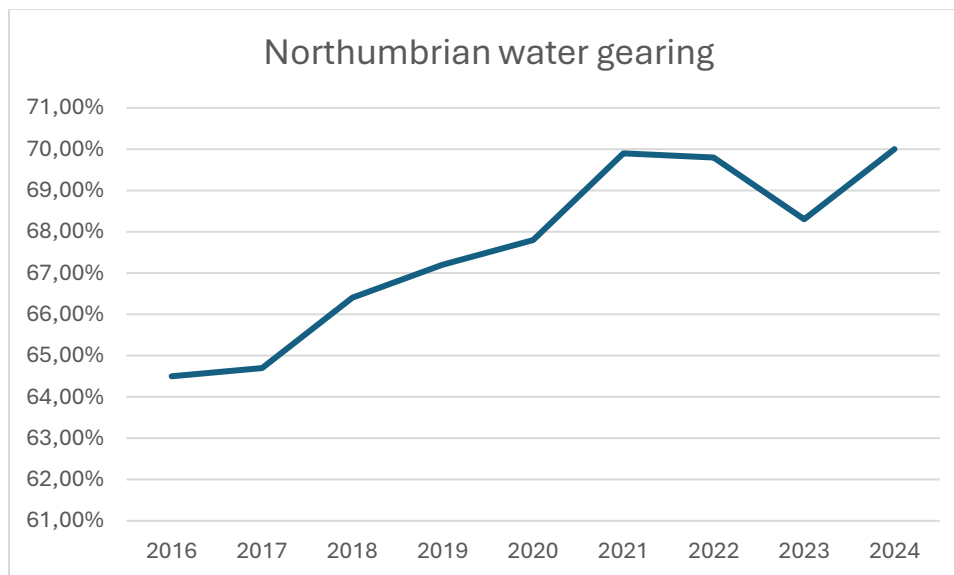


Figure 6. Average gearing ratio trend for Northumbrian Water sector from 2016 to 2024

Anglian Water Services:

Anglian Water Services Ltd is one of the UK's largest water and wastewater companies, serving over 6 million customers across the East of England. It is fully privately owned through Anglian Water Group, backed by long-term infrastructure investors such as IFM Investors, CPPIB, and others. The company has been known for its highly leveraged structure, with gearing often above 80%, supported by inflation-

⁴³ Pitchbook, Northumbrian Water company description 2025

linked revenues and a complex financial model. Anglian Water operates under Ofwat regulation and has faced increasing scrutiny over resilience, dividend policy, and financial transparency. It remains a key case in the debate over the sustainability of leveraged private ownership in regulated utilities. (PitchBook 2025)⁴⁴

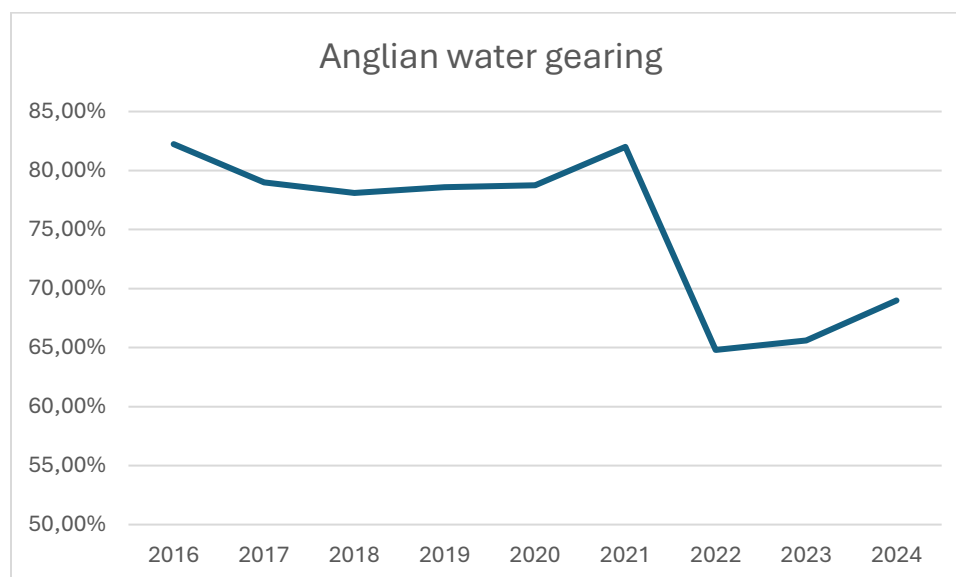


Figure 7. Average gearing ratio trend for Anglian Water sector from 2016 to 2024

Southern Water Services:

Southern Water Services Ltd supplies water and wastewater services to more than 2.5 million customers across the South East of England. Historically, the company faced both operational shortcomings and financial strain, leading to regulatory penalties and reputational damage. In 2021, it was acquired by Macquarie Asset Management, which committed to a substantial equity injection and corporate governance improvements aimed at restoring long-term stability. Before the acquisition, Southern Water had one of the highest gearing ratios in the UK water sector, frequently exceeding 80%, raising concerns about financial resilience and regulatory compliance. The company's ongoing restructuring makes it a pivotal case for examining how capital structure decisions can affect regulatory trust, investor behaviour, and public accountability in essential service provision (PitchBook 2025)⁴⁵.

⁴⁴ Pitchbook, Anglian Water company description 2025

⁴⁵ Pitchbook, Southern Water company description 2025

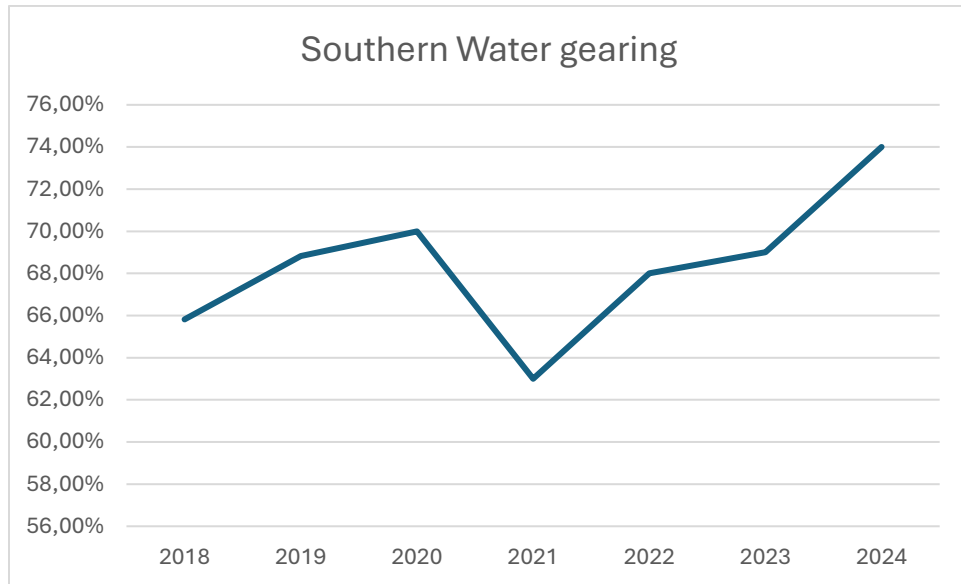


Figure 8. Average gearing ratio trend for Southern West water from 2018 to 2024

AVG Water Sector:

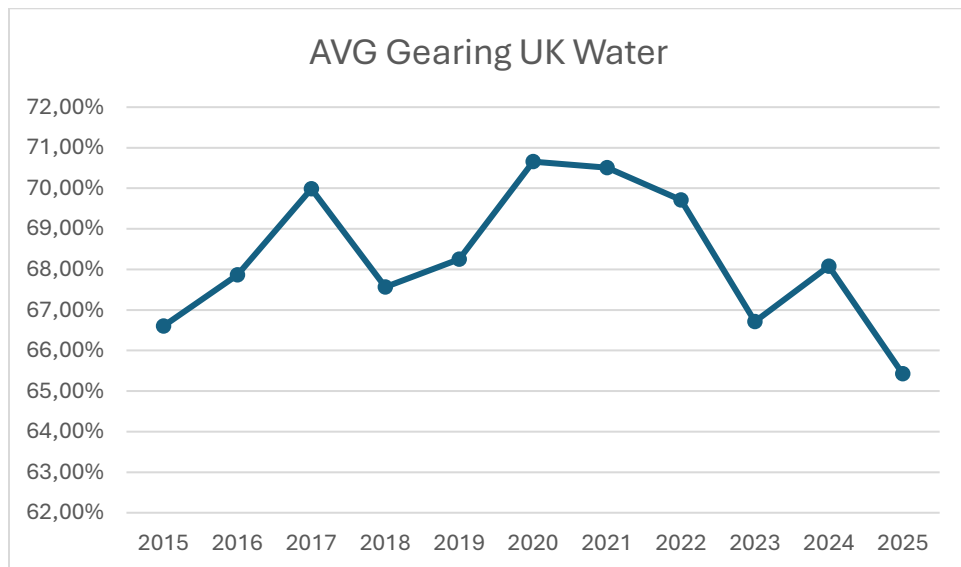


Figure 9. Average gearing ratio trend for UK Water sector from 2015 to 2024

The data on average gearing in the UK water sector from 2015 to 2025 show a clear change in financial leverage. Starting at 66.6% in 2015 the average gearing rose steadily to a peak of 70.9% in 2021. This rise reflects a period of aggressive capital structures where firms used debt strategically to influence

regulation and support dividend payments. After 2021 gearing fell to 66.02% in 2023 and is expected to drop further to 61.3% by 2025. This recent drop matches regulatory actions by Ofwat including stricter credit rating rules dividend limits and closer checks on financial resilience. These figures support the thesis that regulation is reacting more to high leverage and linking capital structure more closely to licences and long-term service goals.

Energy utilities sector:

SSE:

SSE plc was founded in 1943 and is based in Perth United Kingdom. It is a vertically integrated energy utility working mainly in electricity generation transmission and distribution. SSE plays an important role in the UK energy system with growing focus on renewables like wind and hydro alongside older thermal power. The company employs almost 15,000 people and earns most of its income from regulated electricity networks and low-carbon generation. SSE is regulated by Ofgem especially on network investments system resilience and energy transition (Pitchbook 2025)⁴⁶.

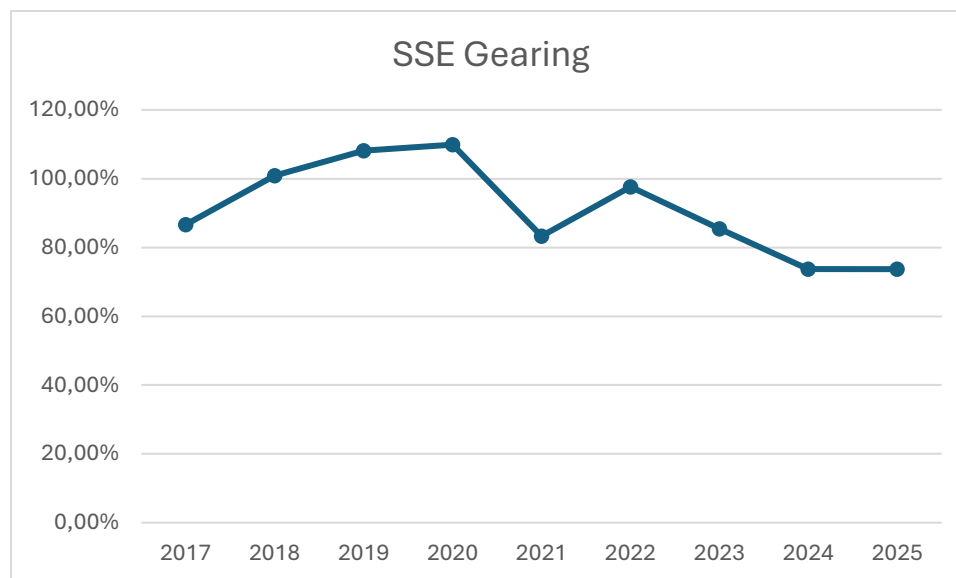


Figure 10. Average gearing ratio trend for SSE from 2017 to 2025

⁴⁶ Pitchbook, SSE Company Description 2025

National Grid:

National Grid plc was founded in 1935 and is based in London United Kingdom. It is one of the largest investor-owned utilities in the UK and US focusing on electricity and gas transmission and distribution. In Great Britain the company owns and runs the high-voltage electricity transmission network in England and Wales. It plays a key role in national energy security and infrastructure. Until recently it managed most of the gas transmission system but partly sold this in 2023 to buy more electricity distribution assets.

National Grid is also a major utility in the Northeastern United States supplying electricity and natural gas to millions of customers in New York Massachusetts and Rhode Island. Regulated by Ofgem and US state regulators National Grid's capital structure and investment plans depend closely on regulatory incentives and energy transition goals (Pitchbook 2025)⁴⁷.

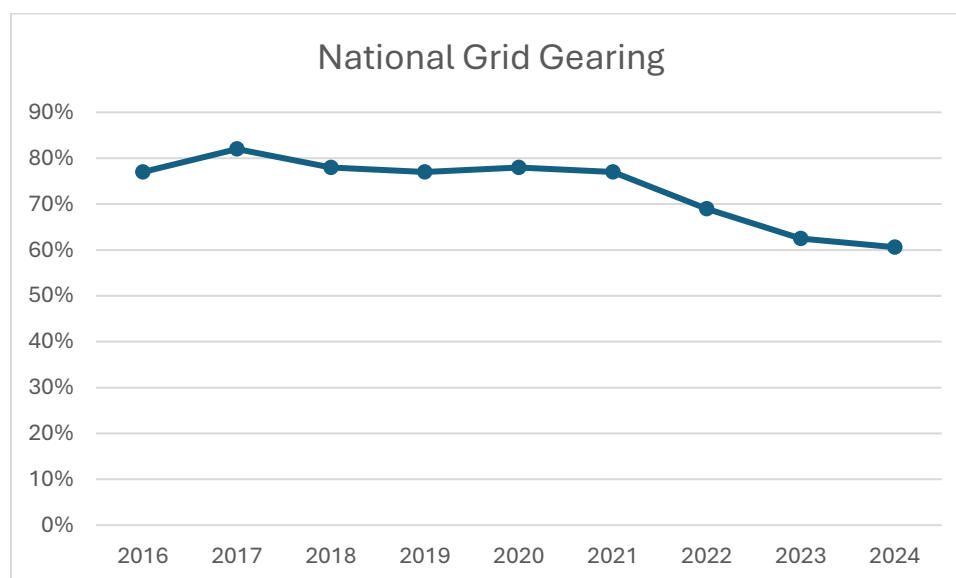


Figure 11. Average gearing ratio trend for National Grid from 2016 to 2024

Electricity North West:

Electricity North West Ltd is the licensed electricity distribution network operator for the North West of England. It serves about 2.4 million customers across Greater Manchester Lancashire and Cumbria. The

⁴⁷ Pitchbook, National Grid Company Description 2025

company owns operates and maintains the regional electricity infrastructure to deliver power safely and reliably from the national transmission system to homes and businesses (Pitchbook 2025)⁴⁸.

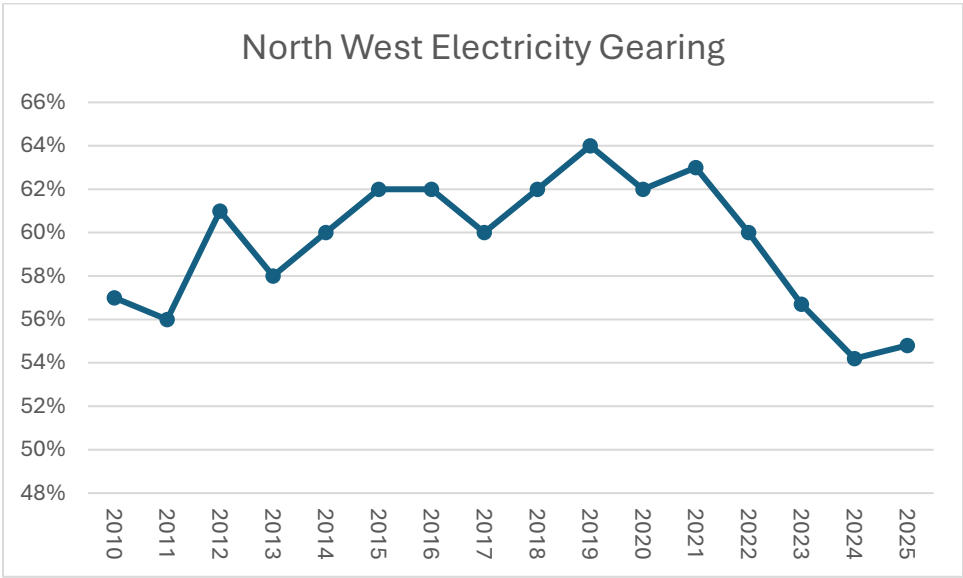


Figure 12. Average gearing ratio trend for Electricity North West from 2010 to 2025

UK Power Networks:

UK Power Networks is the regulated electricity distribution operator for London the South East and East of England. It serves about 8 million customers. Founded in 2002 and based in London the company owns and manages key electricity infrastructure in busy and important economic areas (Pitchbook 2025)⁴⁹.

⁴⁸ Pitchbook, Electricity North West Company Description 2025

⁴⁹ Pitchbook, UK Power Networks Company Description 2025

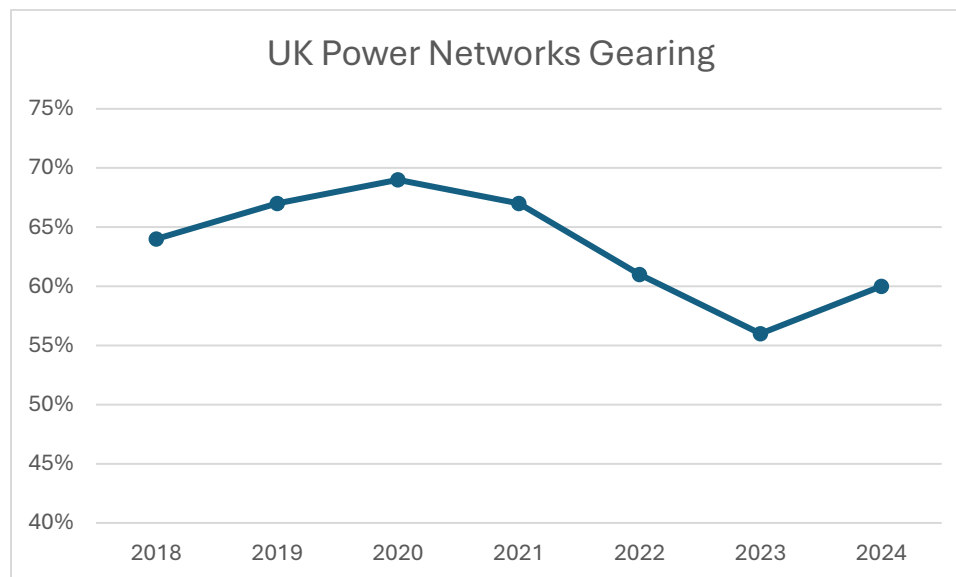


Figure 23. Average gearing ratio trend for UK Power Networks from 2018 to 2024

SGN:

Scotia Gas Networks (SGN), established in 2005 and headquartered in Horley, United Kingdom, is one of the UK's key regulated gas distribution network operators. The company serves over 5.9 million homes and businesses across Scotland and southern England, delivering both natural and low-carbon gases through its extensive pipeline infrastructure.

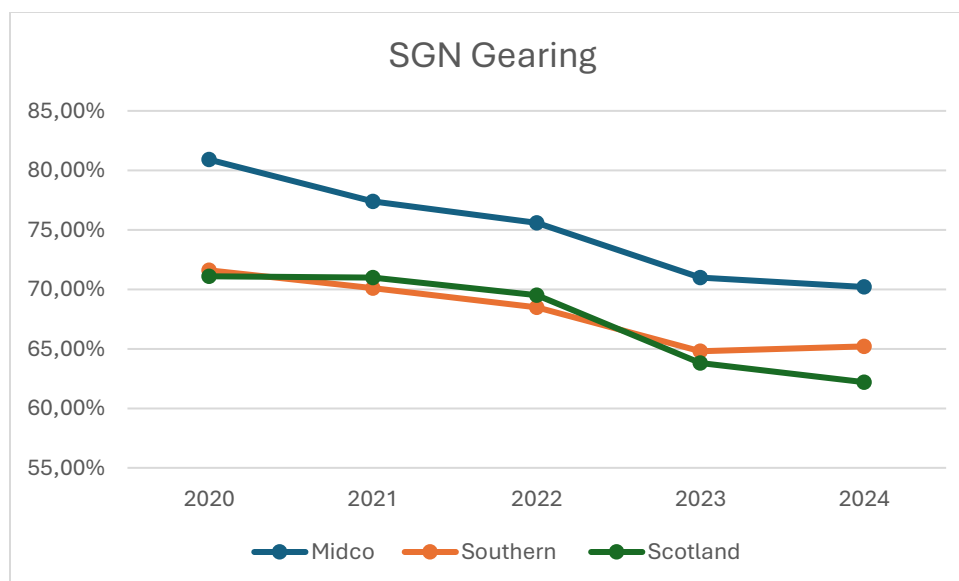


Figure 34. Average gearing ratio trend SGN from 2020 to 2024

Cadent utilities:

Cadent Gas is the largest gas distribution network operator in the UK. It manages over 130,000 km of pipelines across North West England, East of England, West Midlands, and North London. Formerly part of National Grid, Cadent became an independent company in 2017 after being acquired by a consortium led by Quadgas, backed by institutional investors and infrastructure funds such as Allianz and CIC. The company operates under Ofgem's price control regime (RIIO-GD2), which regulates revenues, investment plans, and financial returns. Cadent has a highly leveraged capital structure, with substantial long-term debt used to fund infrastructure maintenance and upgrades. (Pitchbook 2025)⁵⁰

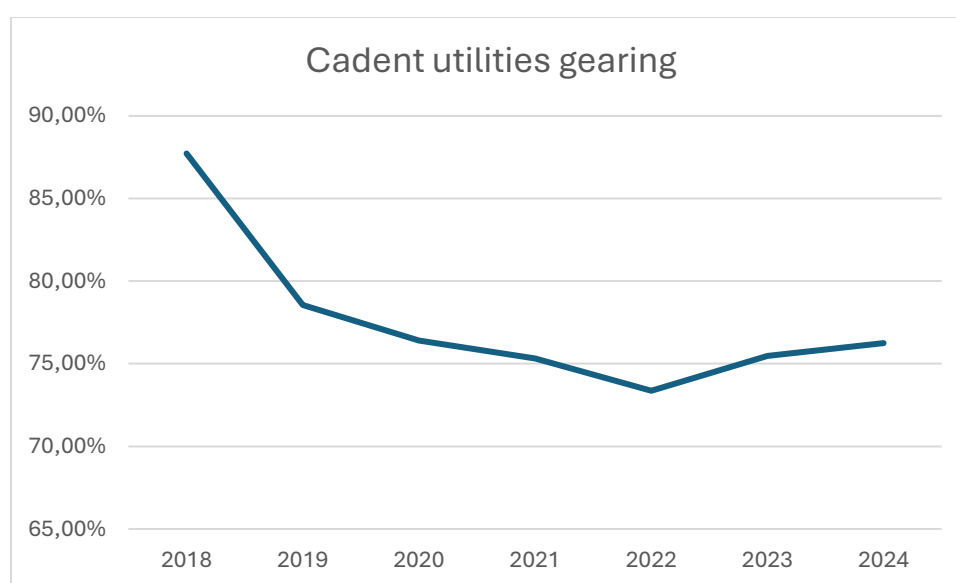


Figure 45. Average gearing ratio trend SGN from 2018 to 2024

Southern Electric Power Distribution (SEPD):

Southern Electric Power Distribution (SEPD) is the licensed electricity distribution operator for central southern England, covering key regions including Oxfordshire, Berkshire, Hampshire, and parts of Dorset and Wiltshire. It operates under the brand SSEN (Scottish and Southern Electricity Networks) and is a subsidiary of SSE plc, one of the UK's largest energy firms.

⁵⁰ Pitchbook, Cadent utilities Company Description 2025

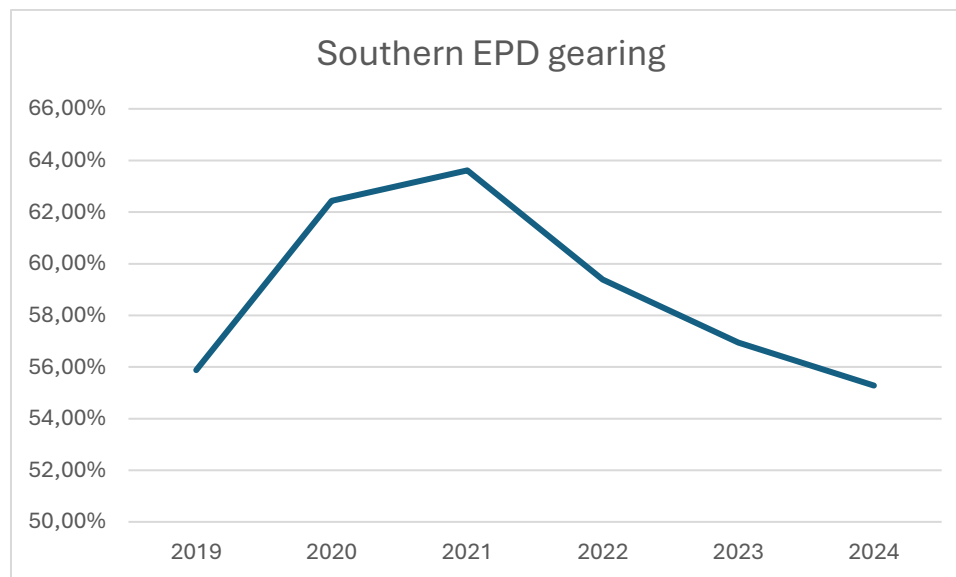


Figure 56. Average gearing ratio trend SGN from 2018 to 2024

Northern Powergrid:

Northern Powergrid is the electricity distribution network operator for Yorkshire and the North East of England. It operates two licensed companies, Yorkshire Electricity Distribution and Northern Electric Distribution, under a unified brand. The group has been wholly owned by Berkshire Hathaway Energy, part of Warren Buffett's investment group, since 2000. It operates under Ofgem's regulatory framework, with obligations on service quality, infrastructure resilience, and long-term investment planning. (Pitchbook 2025)⁵¹

⁵¹ Pitchbook, Northern Powergrid company description 2025

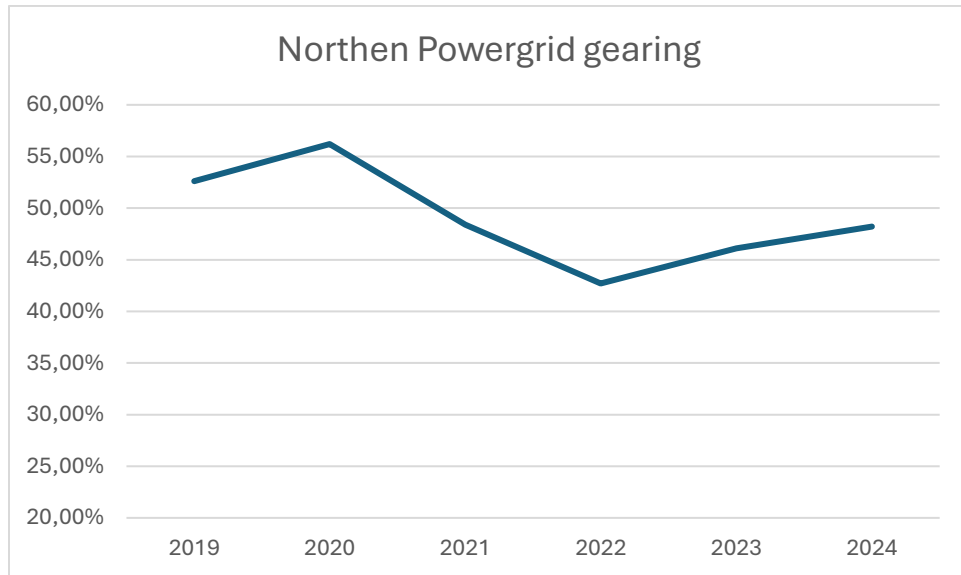


Figure 67. Average gearing ratio trend for Northern Powergrid from 2019 to 2024

AVG Energy Sector:

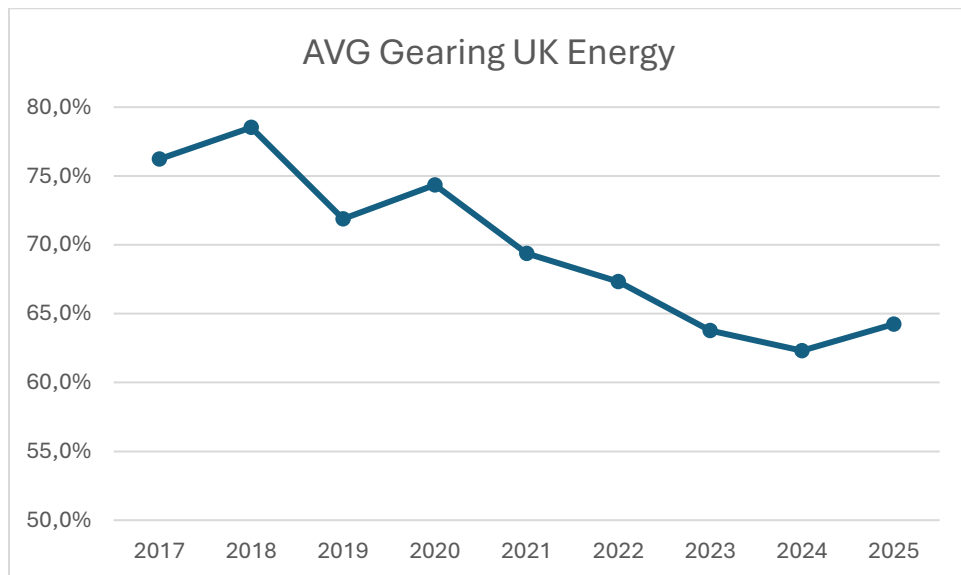


Figure 78. Average gearing ratio trend for UK energy industry from 2017 to 2025

The average gearing ratio in the UK energy sector shows a clear two-phase trend between 2017 and 2025. Starting at 76.2% in 2017 average gearing decreased slightly to 74.4%. From 2021 gearing dropped significantly to 63.8% in 2023 and is expected to stabilize around 64.2% by 2025. This change follows

Ofgem's regulatory reforms to improve financial resilience including capital floor rules better reporting and ring-fencing key assets. The data suggest stricter financial regulation is starting to control capital structure choices and reduce systemic risk in the sector.

Airports industry sector:

Heathrow Airport Holdings:

Heathrow Airport Holdings was founded in 1946 and is based in Hounslow United Kingdom. It owns and runs Heathrow Airport, the UK's largest and most important aviation hub. The company manages critical transport infrastructure serving over 80 million passengers every year. It employs about 90,000 people directly and indirectly (Pitchbook 2025)⁵².

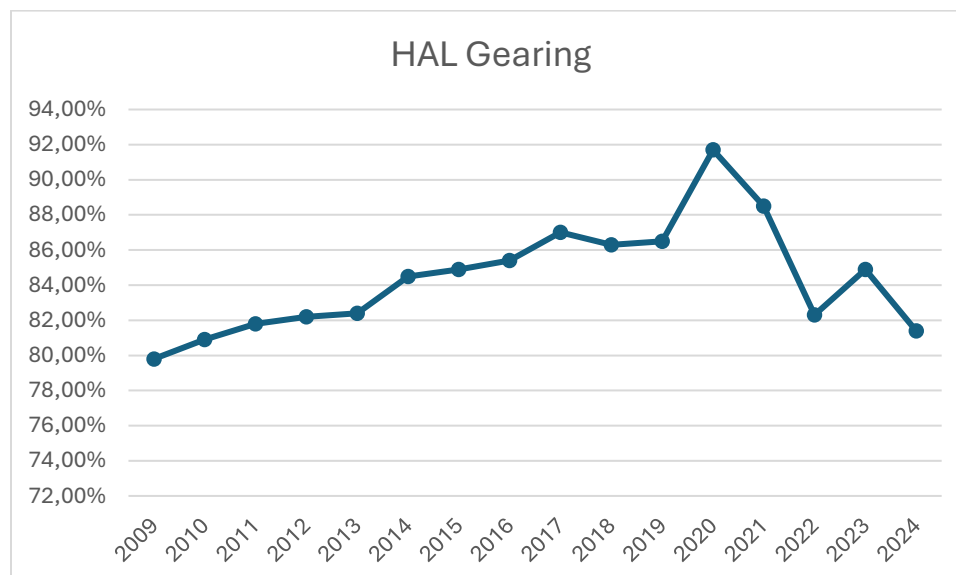


Figure 89. Average gearing ratio trend for HAL from 2009 to 2024

Manchester Airports Group:

Manchester Airports Group (MAG) was founded in 2001 and is based in Manchester England. It operates airports and provides aircraft and passenger handling services. The company employs 40,000 people. It also manages offices hotels and cargo properties.

⁵² Pitchbook, HAL Company Description 2025

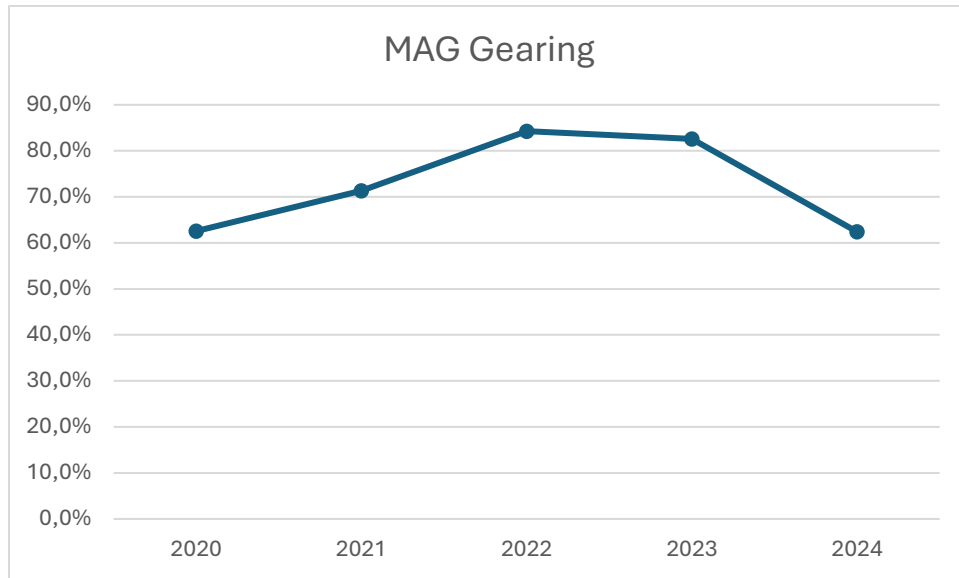


Figure 20. Average gearing ratio trend for MAG from 2020 to 2024

UK AVG Airports industry:

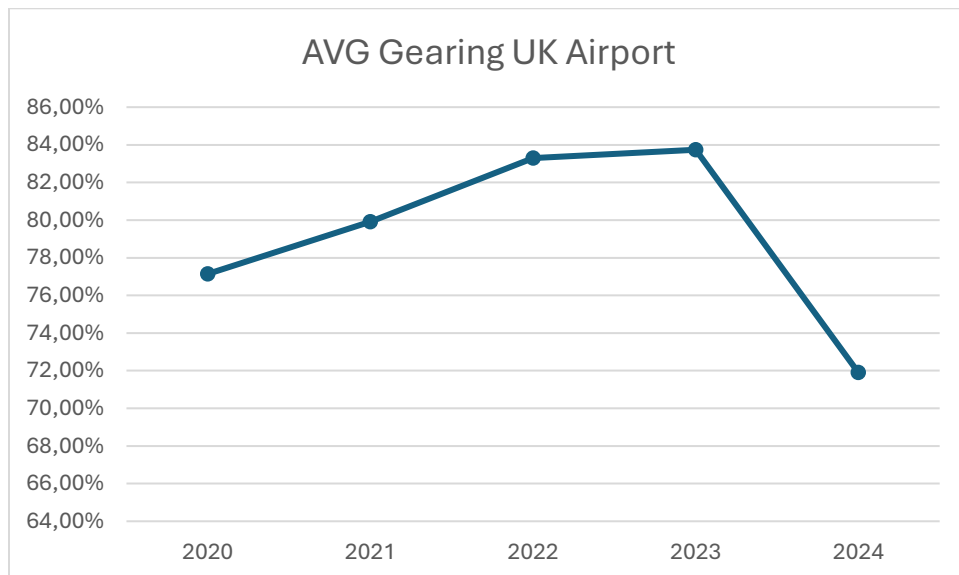


Figure 21. Average gearing ratio trend for UK Airport industry from 2016 to 2024

Gearing levels in the UK airport sector show consistently high financial leverage, especially for Heathrow, throughout the period. Heathrow's gearing stayed above 80% from 2010 on, peaking at 91.7% in 2020 during the COVID-19 crisis. This very high level reflects a long history of heavy debt and the sharp drop in revenue caused by the pandemic. MAG's gearing was more volatile, ranging from 62.6% in 2020 to

over 84% in 2022. The combined average rose to 83.7% in 2023 then dropped to 71.9% in 2024, showing a partial rebalancing. These numbers support the idea that UK airports, especially Heathrow, have used high gearing as a strategy to support investment and dividends, while using financial pressure to gain regulatory concessions as seen in the CAA's careful response to Heathrow's RAB review request.

5.2.1 Italian Historical Background

The historical evolution of regulated firms in Italy shows a slow and sometimes uneven shift from state-owned monopolies to partially liberalised markets with independent regulators. Unlike the UK where privatisation and reform were part of a clear political plan, the Italian model grew amid domestic resistance and pressures from European integration. The result is a mixed system where private ownership exists alongside strong public control and regulation has often lagged behind market changes.

After World War II Italy had many public enterprises in key sectors like electricity gas telecommunications transport and water. These firms were usually vertically integrated and centrally managed as natural monopolies under state control. Major public companies such as ENEL ENI IRI and SIP served national industrial goals like low prices job support and regional development. The state combined ownership and regulation with little separation between politics and industry. Like in other countries this system was inefficient opaque and costly over time.

In the 1990s facing pressure from the European Commission and fiscal reforms Italy started large-scale liberalisation and privatisation. The aims were to cut public debt increase competition and align with EU rules on public services. Key firms like ENEL Telecom Italia Autostrade and parts of the railway were privatised fully or partly. While ownership changed regulation stayed weak as ministries kept strong influence on prices investments and service levels.

To fill this gap and follow EU rules Italy created independent regulators. The Autorità per l'energia elettrica e il gas (AEEG now ARERA) started in 1995 for energy later adding water and waste. The Autorità di Regolazione dei Trasporti (ART) formed in 2011 oversees access tariffs and quality in transport. These

agencies aim to separate ownership from oversight ensure price transparency promote investment and protect consumers (Baldassarri & Macchiati & Piacentino, 1997).

Despite progress Italy's regulation is more cautious than the UK's. Regulators focus on service standards price setting and investments more than on capital structure. WACC-based payment models are used but rules on notional gearing or credit ratings are not strict. Firms have wide financial freedom raising concerns about underinvestment high debt and dividend payouts.

Recently concern over financial fragility especially in water and local utilities has grown. But unlike the UK Italy does not widely use tools like cash lock-ups capital floors or dual credit ratings. Governance is also complex with many firms owned by local governments or financial groups with unclear ownership making regulation and transparency harder.

In this changing environment a key feature of the Italian model is the rise of multi-utility companies especially at local and regional levels. These firms combine services like water management energy distribution and environmental work under one corporate group. Leading examples are Iren Hera and A2A. Often partly owned by municipalities and publicly listed these companies show Italy's mixed governance model where public service duties mix with financial goals. While the multi-utility model can bring synergies and efficient investment it also makes regulation more complex as firms work across sectors with different rules and economic limits.

In summary Italy's regulated firms moved slowly from public ownership to market governance. Independent regulation exists but is less strict on financial discipline than in other European countries. Understanding this background is key to studying how capital structure and regulation interact in Italy and whether the system can ensure resilience and efficiency in the long run.

5.2.2 Italian companies under scope

Water utilities sector:

Acea:

Acea SpA was founded in 1909 and is based in Rome. It is a major Italian multi-utility company mainly

working in electricity and water. Its main activities include managing integrated water services electricity distribution public lighting and environmental services, mostly in Rome and the Lazio region. Acea's subsidiaries work in energy production including renewables, waste treatment and infrastructure projects. The company has nearly 9,000 employees and operates under regulation that shapes its priorities and financial plans. Its capital structure balances public service duties with long-term investment needs in vital infrastructure (Pitchbook 2025)⁵³.

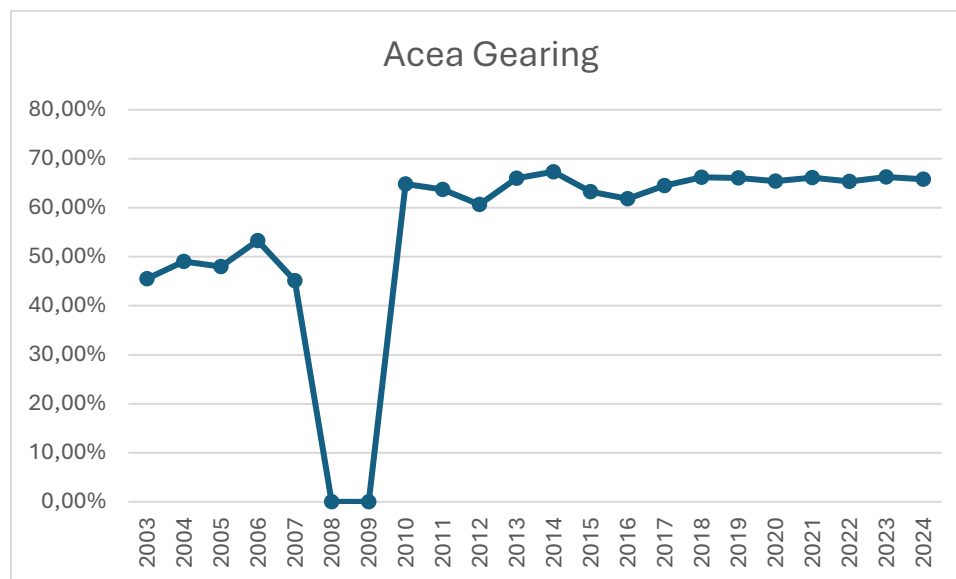


Figure 22. Average gearing ratio trend for Acea from 2003 to 2024

Publiacqua:

Publiacqua SpA was founded in 2000 and is based in Florence. It is a regional utility responsible for water services in central Tuscany including Florence. The company manages water capture treatment distribution and wastewater services across several towns. With about 640 employees Publiacqua works under a public-private partnership, showing Italy's mixed ownership style in utilities. Its activities are regulated by ARERA which influences its investment plans service quality and financial structure. As a medium-sized regulated operator its capital structure balances infrastructure resilience with public service requirements (Pitchbook 2025)⁵⁴.

⁵³ Pitchbook, Acea Company Description 2025

⁵⁴ Pitchbook, Publiacqua Company Description 2025

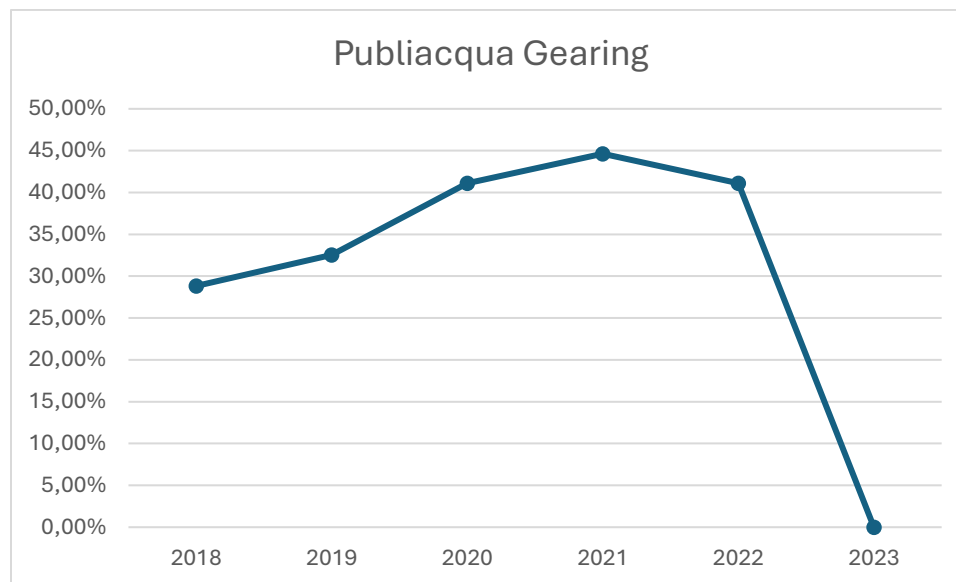


Figure 23. Average gearing ratio trend for Publiacqua from 2018 to 2023

Iren:

Iren S.p.A. was founded in 1905 and is based in Reggio Emilia Italy. It is one of the country's main multi-utility providers working in energy water and environmental sectors. The group manages electricity and gas distribution district heating water services and waste management through five main subsidiaries: Iren Energia, Iren Mercato, Iren Ambiente, Iren Acqua Gas, and Iren Emilia.

Iren is a publicly listed company with strong municipal ownership. It is regulated by ARERA which controls tariffs investment and service quality. Its diverse activities and presence in several regulated sectors make it a good example of how ownership and regulation shape financial strategy capital structure and investment in Italian utilities (Pitchbook 2025)⁵⁵.

⁵⁵ Pitchbook, Iren Company Description 2025

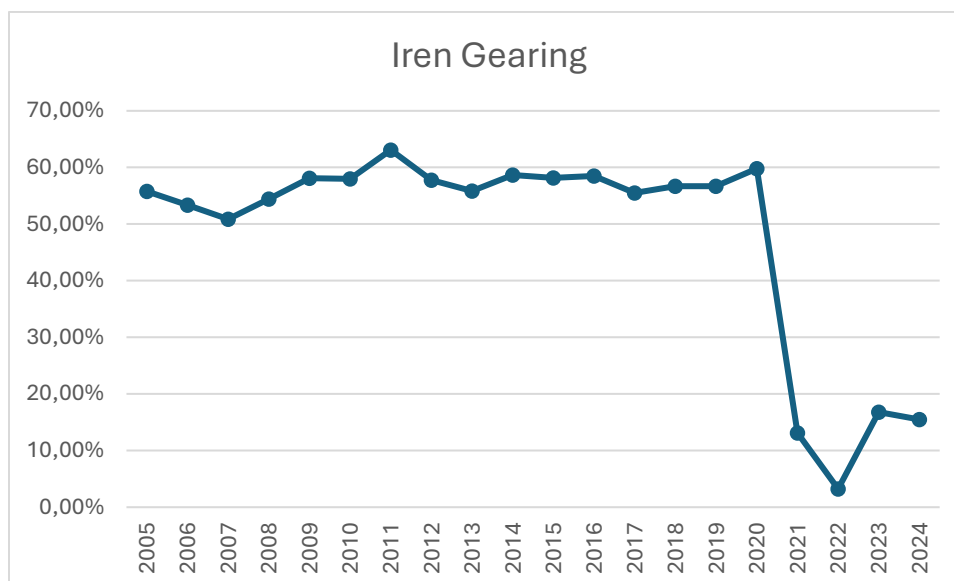


Figure 24. Average gearing ratio trend for Iren from 2005 to 2024

A2A:

A2A S.p.A. was founded in 1908 and is based in Milan. It is one of Italy's largest multi-utility companies working in electricity, gas and water distribution and retail. The company also operates in district heating energy efficiency environmental services like waste management and integrated water cycle services. With nearly 15,000 employees A2A plays an important role in supporting sustainable urban development and smart city projects in Italy.

A2A is partly owned by local municipalities and is publicly listed, placing it between public interest and market forces. Its work covers both regulated and liberalised sectors making its capital structure choices very sensitive to ARERA's signals and environmental policies. The company's long-term investments especially in waste-to-energy and water networks require financial strategies that balance shareholder demands with regulatory limits on returns debt and reinvestment (Pitchbook 2025)⁵⁶.

⁵⁶ Pitchbook, A2A Company Description 2025

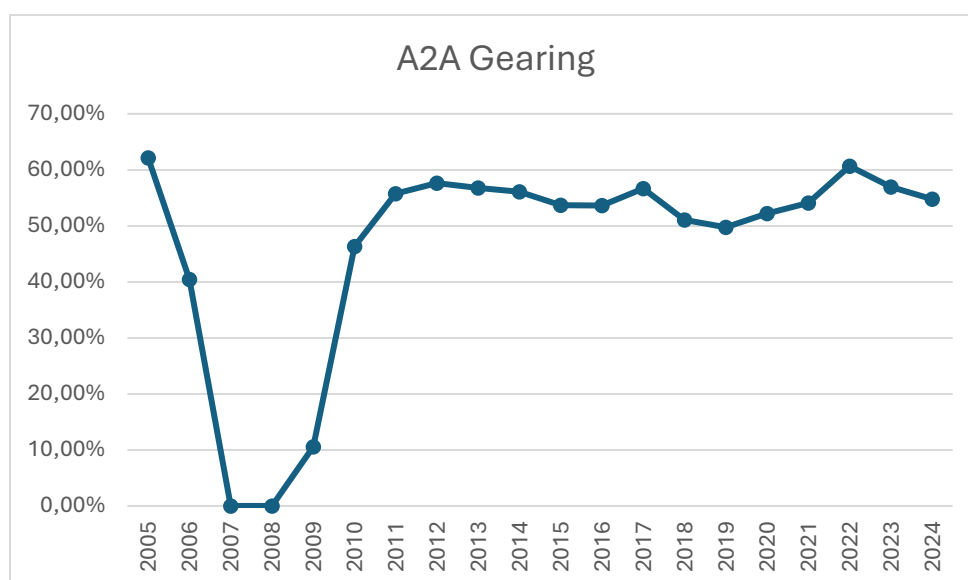


Figure 25. Average gearing ratio trend for A2A from 2005 to 2024

Hera Group:

Hera Group was founded in 2002 and is based in Bologna. It is one of Italy's largest multi-utility companies operating in water services energy distribution waste management and environmental services. The group serves over 4 million people across regions in Northern and Central Italy. Its activities include managing the full water cycle collection treatment and distribution electricity and gas distribution district heating and advanced environmental services through its subsidiary HERAmbiente. With a mix of public and private ownership and being publicly listed Hera balances local public service duties with financial sustainability goals. In the water sector Hera manages large infrastructure and treatment plants under ARERA's supervision making its capital structure important for long-term investment and service continuity. The company's integrated business model focus on circular economy and work in regulated sectors make it a good example of capital strategy under mixed governance and changing regulation (Pitchbook 2025)⁵⁷.

⁵⁷ Pitchbook, Hera Group Company Description 2025

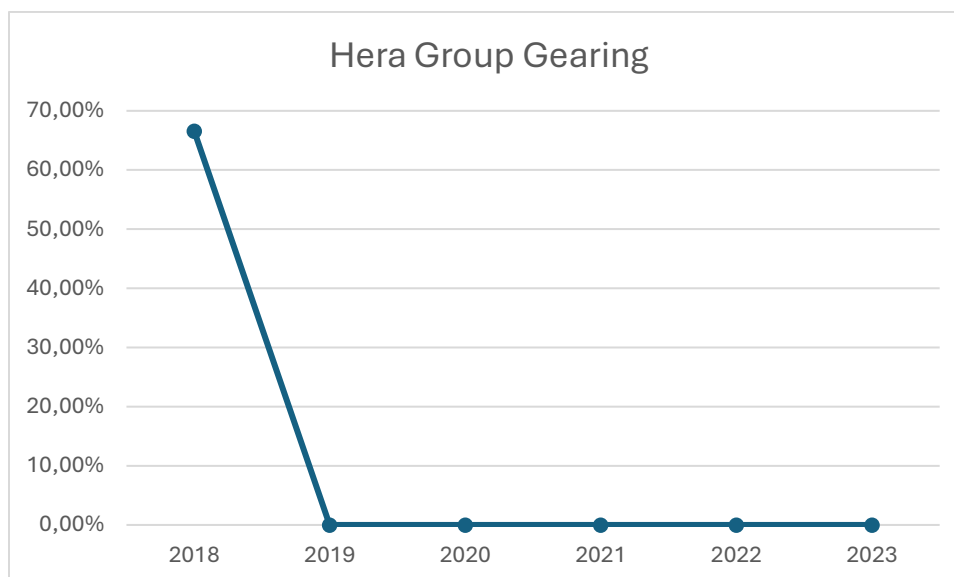


Figure 26. Average gearing ratio trend for Hera Group from 2018 to 2023

Acque S.p.A.:

Acque S.p.A. is a key provider of integrated water services in Tuscany, operating across more than 55 municipalities within the provinces of Pisa, Florence, and Siena. The company follows a public-private partnership model, with Acea S.p.A. holding a significant minority interest alongside a group of municipal shareholders. Regulated by ARERA, Acque S.p.A. oversees the entire water cycle, including abstraction, treatment, distribution, and wastewater services, in a region characterised by high population density and industrial activity. Its capital structure reflects the dual mandate of meeting public service obligations while delivering returns to private stakeholders. (Pitchbook 2025)⁵⁸

⁵⁸ Pitchbook, Acque S.p.A company description 2025

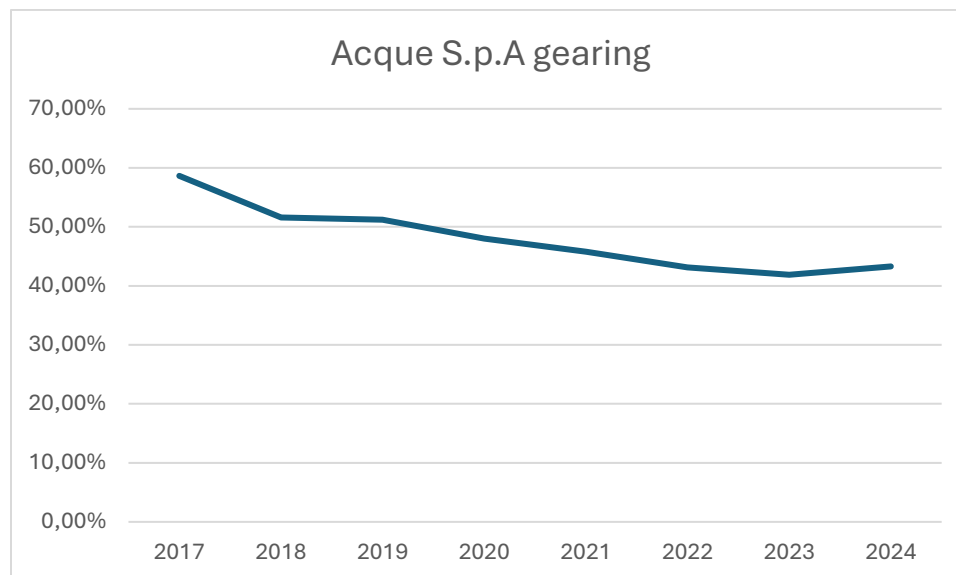


Figure 27. Average gearing ratio trend for Acque S.p.A. from 2017 to 2024

Nuove Acque S.p.A.:

Nuove Acque S.p.A. provides integrated water services across the province of Arezzo and parts of Siena, serving more than 400,000 residents over an area of approximately 1,300 km². Established in 1999 as Italy's first public-private partnership (PPP) in the water sector, the company operates under a long-term concession agreement and within the regulatory framework set by ARERA. Ownership is split between local municipalities (54.5%) and the international utility group Suez Environnement (Veolia Group), which holds a 45.5% stake through the Ombrone S.p.A. holding. Nuove Acque's capital structure reflects its hybrid governance model, combining public service objectives with the strategic priorities of a global private partner. (Pitchbook 2025)⁵⁹.

⁵⁹ Pitchbook, Nuove Acque S.p.A company description 2025

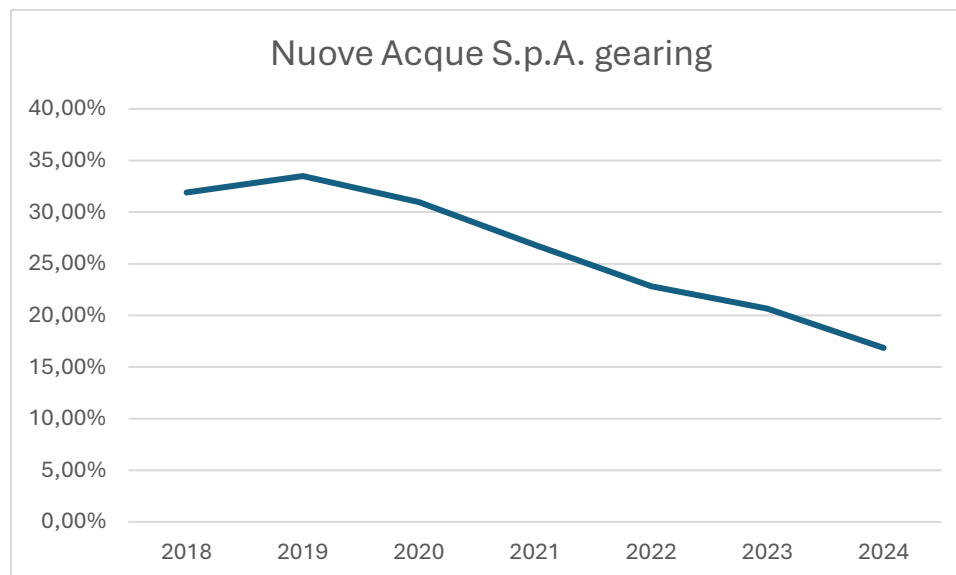


Figure 28. Average gearing ratio trend for Nuove Acque S.p.A. from 2018 to 2024

Padania Acque:

Padania Acque S.p.A. is the exclusive water service operator in the province of Cremona, Lombardy. While majority-owned by public municipalities, it is part of the A2A Group network, with A2A holding a strategic financial interest and operating through affiliated service agreements. The company is structured as a S.p.A. and subject to ARERA regulation. It manages water capture, purification, distribution, and sewerage services, serving over 300,000 people. The firm's financial statements show moderate but rising leverage linked to infrastructure renewal and regulatory compliance. (Pitchbook 2025)⁶⁰

⁶⁰ Pitchbook, Padania Acque company description 2025

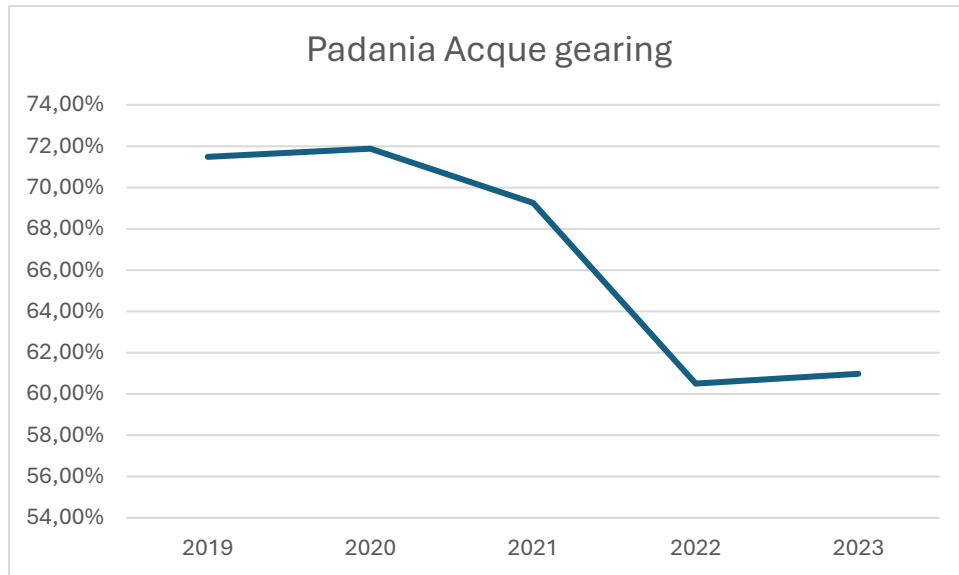


Figure 29. Average gearing ratio trend for Padania Acque. from 2019 to 2023

AVG Italian Water sector:

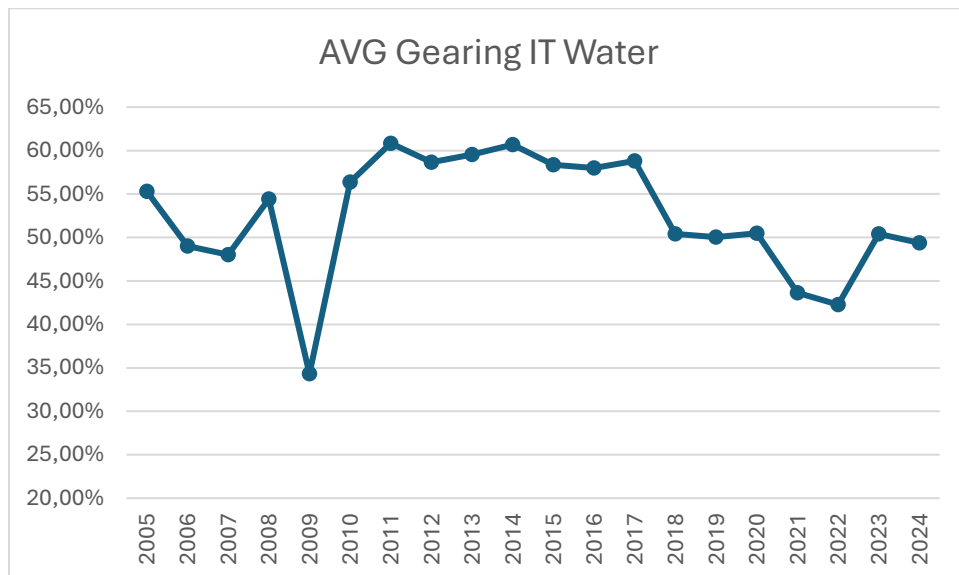


Figure 30. Average gearing ratio trend for ITA Water sector from 2005 to 2024

The average gearing ratio in the Italian water sector has shown a non-linear trend over the last twenty years. Starting at about 55% in the early 2000s it dropped sharply during 2008–2009 to a low of 34.3%. This likely reflects temporary debt reduction or accounting changes. After that gearing rose again to above 60% between 2010 and 2015 showing renewed debt-financed investments by major firms. Since

2016 gearing has gradually fallen reaching 49.4% by 2024. This trend shows moderate deleveraging by companies like Hera Group Iren A2A and Acea probably due to steady capital spending internal financing and focus on financial health. Despite regulated tariffs and long service duties capital structure choices seem to be firm-specific and not strongly limited by external rules on debt.

Energy sector:

Enel:

Enel S.p.A. was founded in 1962 and is based in Rome. It is a leading global energy company with core activities in electricity generation distribution networks and energy retail. Enel works widely in Italy and also has a strong presence in Spain and Latin America. The company manages about 81 GW of generation capacity, with over 56 GW from renewable sources like hydro wind and solar.

In Italy Enel plays a key role in regulated electricity infrastructure. About 35% of its EBITDA comes from regulated networks, while the rest comes from liberalised generation and retail. Enel's capital structure and investments are influenced by ARERA's rules, especially on tariffs infrastructure resilience and sustainability. As a partly state-owned and public company Enel shows how big utilities handle complex regulation while working on decarbonisation and energy transition (Pitchbook 2025)⁶¹.

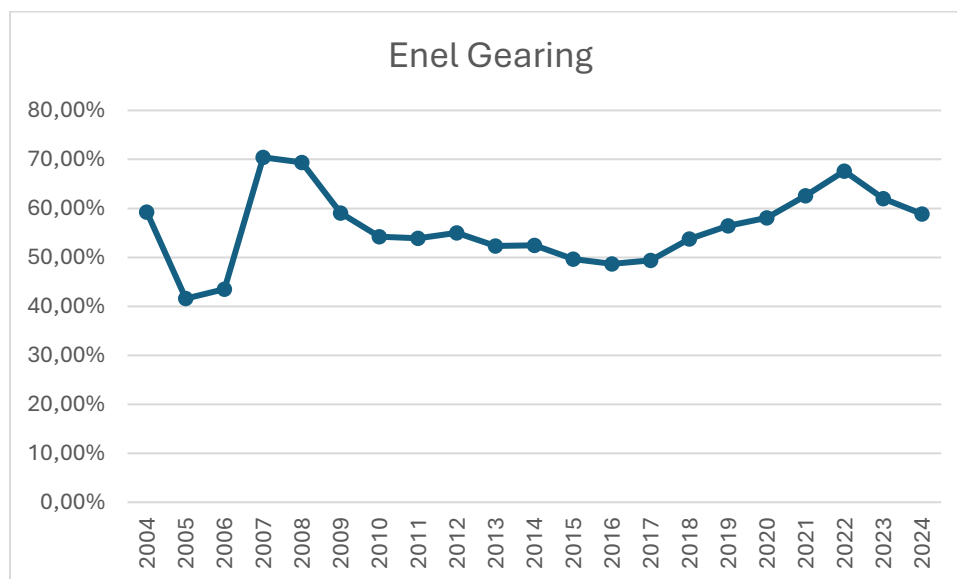


Figure 31. Average gearing ratio trend for Enel from 2004 to 2024

⁶¹ Pitchbook, Enel Company Description 2025

Edison:

Edison SpA was founded in 1884 and is based in Milan. It is one of Italy's oldest and most important energy companies. Edison works in electricity natural gas and environmental services and plays a key role in Italy's energy transition and supply security. The company has three main parts. Electric Power Operations generates electricity from hydro wind solar and biomass. Gas Operations handle buying transporting and selling natural gas. Corporate Activities support management and strategy. Edison has over 6,000 employees and earns most of its revenue from gas showing its strong position in that market. As a regulated utility with many activities Edison's capital structure choices depend on long-term infrastructure needs environmental goals and energy pricing rules (Pitchbook 2025)⁶².

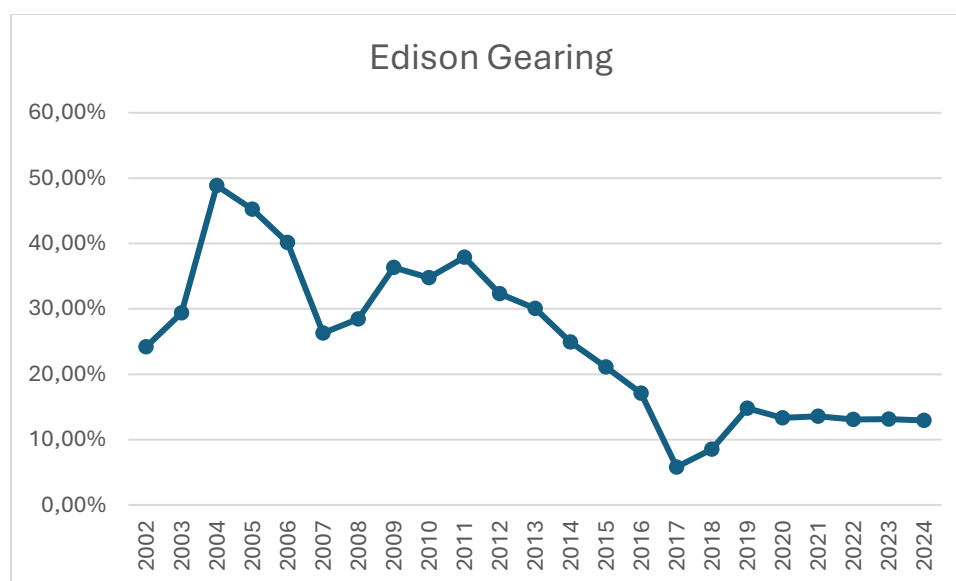


Figure 32. Average gearing ratio trend for Edison from 2002 to 2024

Terna S.p.A:

Terna S.p.A. is Italy's national electricity transmission system operator, managing over 74,000 km of high-voltage lines. It is listed on the Italian Stock Exchange and majority-owned by Cassa Depositi e Prestiti (CDP), with the remainder held by private institutional investors. Terna is fully regulated by ARERA under a revenue-cap model and plays a central role in infrastructure investment and energy transition projects. Its capital structure is characterised by stable, investment-grade debt and moderate

⁶² Pitchbook, Edison Company Description 2025

gearing levels, reflecting both regulatory constraints and the company's conservative financial strategy (Pitchbook 2025)⁶³.

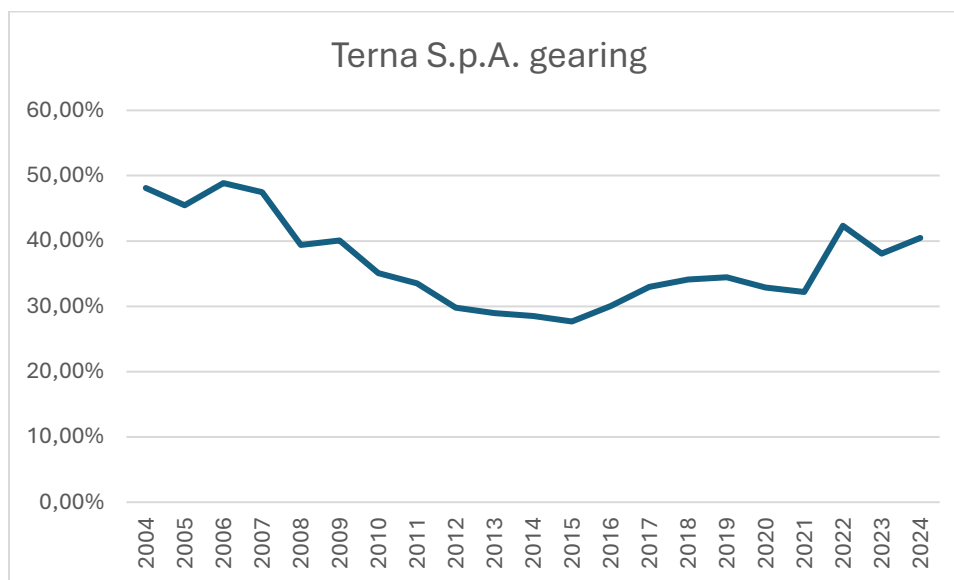


Figure 33. Average gearing ratio trend for Terna S.p.A. from 2004 to 2024

Snam S.p.A.:

Snam S.p.A. is a leading European operator in natural gas infrastructure, including transport, storage, and regasification. It operates over 32,000 km of pipeline and holds strategic stakes in foreign gas operators. Snam is listed on the Milan Stock Exchange and majority-owned by CDP Reti, with additional shares held by institutional investors. The company is regulated by ARERA and applies a WACC-based pricing system. Its capital structure is moderately leveraged, with substantial access to debt markets and a history of using bond issues to finance energy transition investments. (Pitchbook 2025)⁶⁴

⁶³ Pitchbook, Terna S.p.A Company Description 2025

⁶⁴ Pitchbook, Snam S.p.A Company Description 2025

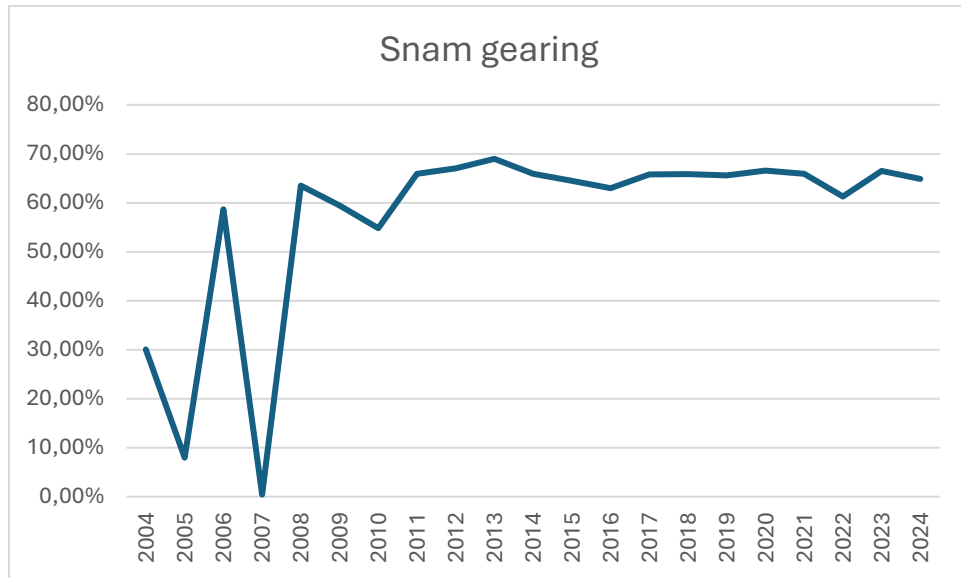


Figure 34. Average gearing ratio trend for Snam S.p.A. from 2004 to 2024

Italgas S.p.A.:

Italgas S.p.A. is the main gas distribution company in Italy, with over 80,000 km of networks and a presence in over 1,800 municipalities. Formerly part of ENI and SNAM, Italgas is now an independent, publicly listed company with CDP and institutional investors among its shareholders. It is regulated by ARERA and operates under a price-cap regime with periodic efficiency reviews. (Pitchbook 2025)⁶⁵

⁶⁵ Pitchbook, Italgas S.p.A Company Description 2025

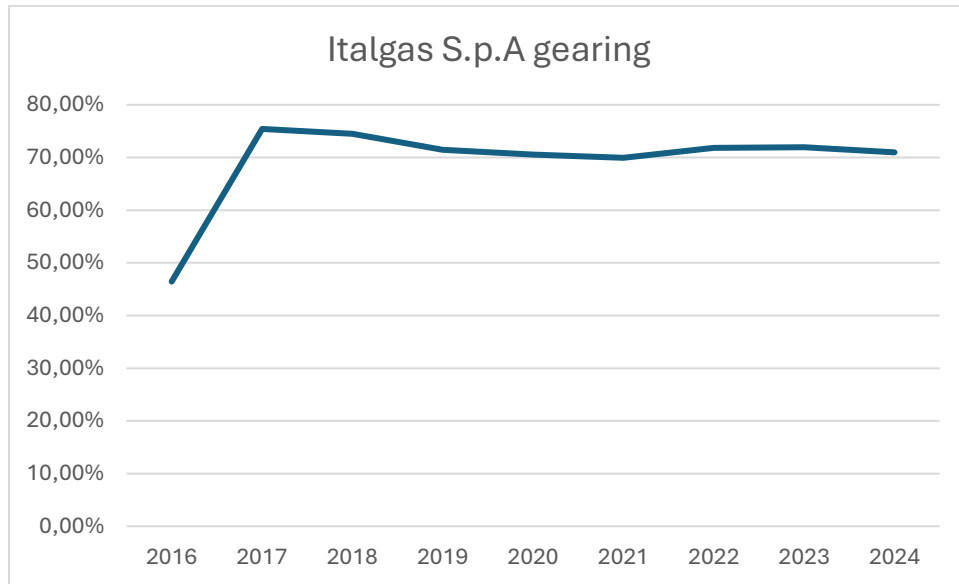


Figure 35. Average gearing ratio trend for Italgas S.p.A. from 2016 to 2024

AVG Italian energy sector:

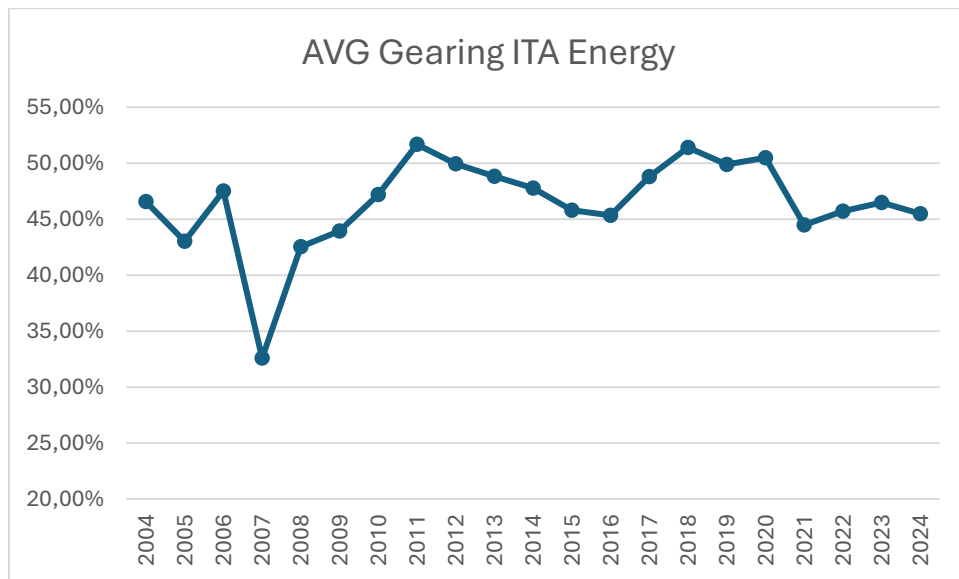


Figure 36. Average gearing ratio trend for ITA Energy sector from 2004 to 2024

The average gearing ratio in the Italian energy sector shows a long-term downward trend with periods of relative stability and adjustment. In the early 2000s leverage was above 45% on average reflecting moderate debt use by firms like Enel A2A and Hera Group. Between 2005 and 2008 gearing dropped sharply to a low of 32.5% before rising again over 50% by 2011. From 2012 to 2024 gearing stayed fairly

stable. This pattern suggests a gradual move toward more cautious financial structures likely due to less investment pressure more internal funding and shareholder expectations especially among listed multi-utilities. Despite working in capital-heavy sectors companies like Hera Group and Iren seem to keep leverage within careful limits in a setting where regulatory rules on capital structure are still limited and indirect.

Airports industry sector:

2i Aeroporti:

2i Aeroporti provides airport construction services and has interests in Italian airports. The company owns shares in major airports in Italy offering passenger transport and cargo services. It helps airport authorities receive reliable services (Pitchbook 2025)⁶⁶.

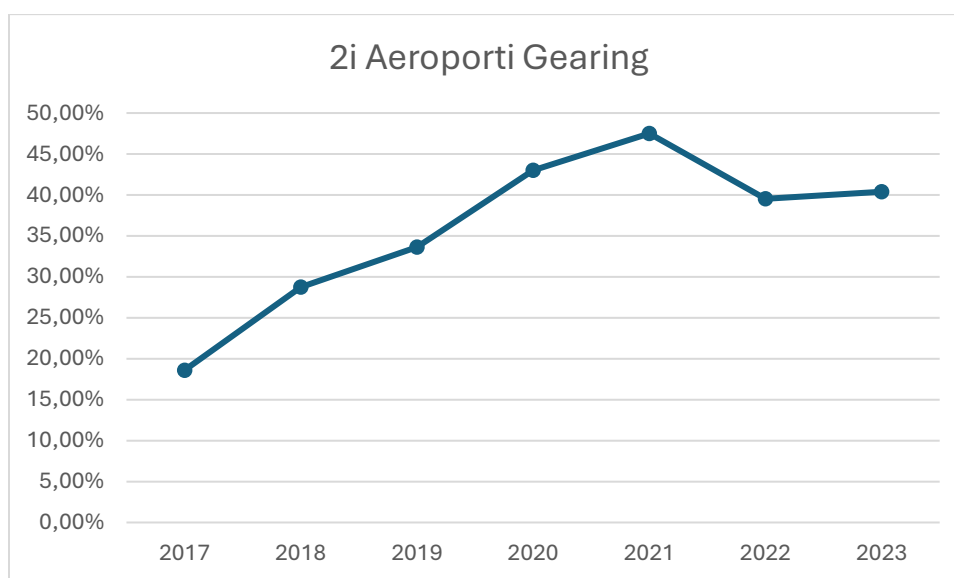


Figure 37. Average gearing ratio trend for 2i Aeroporti from 2017 to 2023

Aeroporto Bologna:

Aeroporto Guglielmo Marconi di Bologna SpA was founded in 1981 and is based in Bologna. It is a publicly listed company that manages one of Italy's main regional airports. The firm employs about 590 people and operates under a concession model. It has three main business units: Aviation Non-Aviation

⁶⁶ Pitchbook, 2i Aeroporti Company Description 2025

and Other. The Aviation segment covers airside operations passenger services and infrastructure development. The Non-Aviation segment manages commercial activities like parking retail concessions and real estate. As a regulated infrastructure operator the airport's financial strategy is guided by national rules and long-term investments. Its capital structure balances shareholder value with regulatory duties and service continuity in a capital-heavy sector (Pitchbook 2025)⁶⁷.

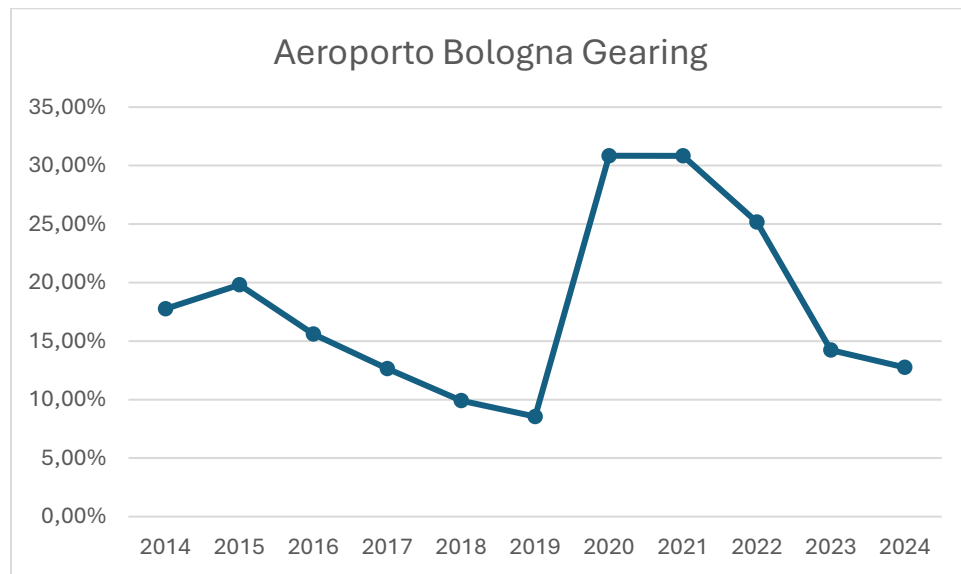


Figure 38. Average gearing ratio trend for Aeroporto Bologna from 2002 to 2024

⁶⁷ Pitchbook, Aeroporto Bologna Company Description 2025

ITA AVG Airports industry:

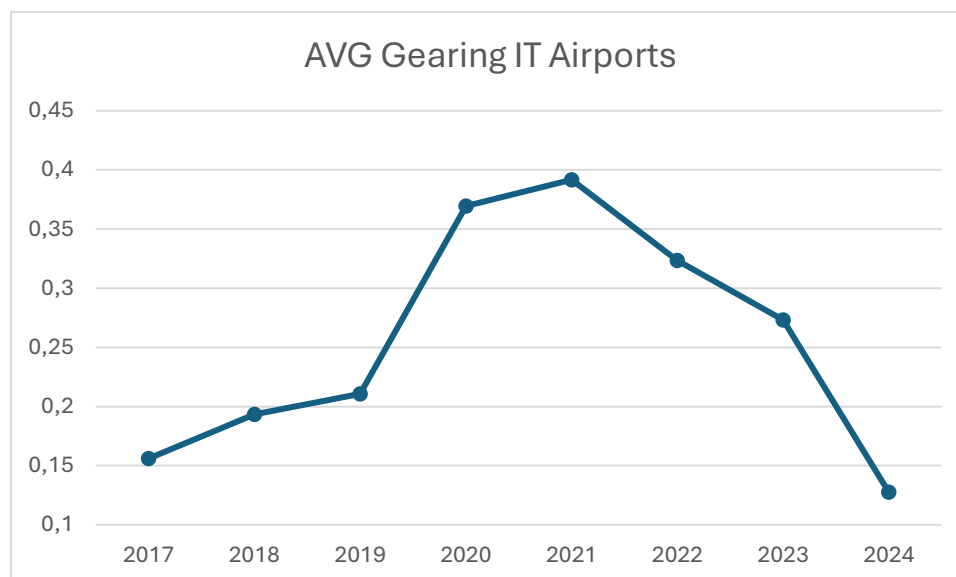


Figure 39. Average gearing ratio trend for Edison from 2002 to 2024

The average gearing ratio in the Italian airport sector shows a sharp but temporary rise followed by a quick correction. From 2016 to 2019 gearing stayed low and stable, averaging under 22%. In 2020 leverage jumped to 36.9% and peaked at 39.2% in 2021. This rise matches the COVID-19 crisis and shows how the sector faced sudden revenue drops and needed more debt to keep running. From 2022 on gearing steadily fell to just 12.8% by 2024. This drop suggests active financial restructuring cost control or capital injections to strengthen the balance sheet. Overall the data show a sector that can handle shocks and quickly restore balance, likely due to smaller firms tighter public control and less financial complexity compared to bigger infrastructure players.

5.3 Aggregate statistical evidence on leverage

The aggregate analysis provides a clearer picture of the patterns that emerge from the company-level evidence. Three dimensions are considered: ownership, country, and sectoral trends over time.

Ownership

Private utilities show on average a gearing ratio of 60.7%, compared with 53.9% for partially privatized utilities. The difference of about 6.7 percentage points is confirmed by a Welch's t-test, which returns a p-value of about 0.3%. This means that the probability that the difference is only due to random variation is extremely low, and we can be confident that the higher leverage observed in private firms represents a structural difference between the two ownership models.

Country comparison by sector

When we compare UK and Italian companies within the same sector, the differences are large and persistent.

- **Water:** UK water companies present gearing ratios between 65% and 70%, while Italian water utilities average between 50% and 55%. The average gap over the period is around 11 percentage points, with annual differences ranging from 8% to over 20%.
- **Energy:** The difference is more pronounced, with UK energy networks close to 70% on average, while Italian companies remain around 45–50%. The gap is consistently between 20 and 27 percentage points.
- **Airports:** The divergence is the largest. Heathrow and other UK airports operate with gearing close to 80–85%, while Italian airports remain between 15% and 35%. The average difference is about 55–60 percentage points.

In the water and airport sectors, the Welch's t-test confirms that the differences between UK and Italian averages are statistically significant at conventional levels ($p < 0.01$). In the energy sector, instead, the difference is not statistically significant.

Trends over time

To analyse the dynamic, is estimated a simple linear regression of gearing on year for each sector and country, the estimated β coefficients provide the following results.

- In the **water sector**, the estimated β coefficients are +0,23 points per year for UK companies and -1,71 for Italian ones. This means that the leverage in the UK has followed a clear upward tendency, while in Italy it has shown a reduced downward trend. Even if the direction in trends

differs, in both cases the changes are of similar order of magnitude, and the persistent gap in leverage levels between the two countries remains the most relevant feature. β Has been calculated for the 2015 to 2024 range to compare data.

- In the **energy sector**, the estimated β coefficients are of the same order as in water: about -2,15 percentage points per year for UK companies and +0,53 for Italian ones. This suggests a mild downward trend in the UK and a slight upward one in Italy, that overall remains stable. However, these opposite movements have been relatively small compared to the large and persistent gap in leverage levels between the two countries. β Has been calculated for the 2017 to 2024 range to compare data.
- In the **airport sector**, the estimated β coefficients are -2,58 percentage points per year for UK companies and -6,04 for Italian ones. This indicates that in both countries leverage has shown a downward tendency over time .The increase is stronger in UK, but in both cases the changes are modest when compared with the very large difference in average leverage levels between the two countries. β Has been calculated for the 2020 to 2024 range to compare data.

Summary

Overall, three conclusions can be drawn.

1. Ownership matters: private firms present higher average gearing than partially privatized ones, with a difference of about 6,7 percentage points. The Welch's t-test shows a p-value of 0,0032, meaning that the probability of observing such a gap only by chance is extremely low.
2. Country differences are large and persistent across all sectors. In water, UK companies operate on average about 15 percentage points more leveraged than Italian peers, with an increasing trend over the last years, reaching a max of 27,44% in 2022. In the energy sector the gap started even larger with a +28,20% of 2017 but is reducing over time reaching a difference of 16,83% in 2024. In the airport sector the gap reaches 59,14% in 2024 starting from a 40,21% of 2020.
3. The time dynamics indicate divergent patterns. In the water sector, the estimated β coefficient show an upward trend of +0,23 points per year for UK companies and a downward trend of -1,71 for Italian ones. In energy, β is negative for the UK (-2,15) and slightly positive for Italy

(0,53), while in airports both countries show a downward trend but the overall scale represents a different magnitude.

Taken together, these results reinforce theoretical literature that views leverage as a strategic instrument in regulated industries. They show that higher gearing in the UK is not an isolated feature single firms, but a systematic outcome of the institutional and regulatory framework, while in Italy partial state owned and weaker independence of regulators translate into more conservative capital structures.

SECTOR	COUNTRY	β (pp per year)	p-value
WATER	UK	+0,23	0,007
WATER	IT	-1,71	0,097
ENERGY	UK	-2,15	0,670
ENERGY	IT	+0,53	0,159
AIRPORT	UK	-2,58	0,056
AIRPORT	IT	-6,04	0,144

Table 1. Average β pp per year and p-value for each sector and country analysed

Chapter 6 – Structural and Technical Problems in Regulation

Regulation aims to ensure financial health consumer protection and steady investment. However regulatory tools can have unintended effects especially on firms' financial strategies.

The first part looks at how cost of capital is estimated in regulated settings. It reviews standard models like the Capital Asset Pricing Model or CAPM and the Weighted Average Cost of Capital or WACC. The focus is on their assumptions limits and practical impact on pricing and investments. Special attention is given to how firms might respond to strict or mismatched rules such as fixed gearing targets or delayed beta updates by adjusting their capital structures strategically.

The second part explores institutional and organisational limits in regulation. It covers information gaps between firms and regulators limited technical and financial resources and risks like regulatory inertia and capture. These issues can reduce oversight effectiveness and allow opportunistic behaviour especially when firms have better information or strategy.

Together these two aspects technical model limits and institutional constraints show why regulatory frameworks even if well designed may fail to shape firm behaviour as intended. Explaining these challenges prepares for a critical discussion on how to make regulation more flexible transparent and aligned with long-term sector resilience.

6.1 Tariff Implications of Allowed Returns in Regulated Sectors

In regulated infrastructure sectors the cost of capital is key to deciding the returns firms can earn on their asset base. This return rate affects the tariffs consumers pay and the financial health of long-term investments. Since regulated firms often work in capital-heavy industries with large illiquid assets and long investment cycles even small changes in the cost of capital can greatly impact company behaviour and household bills.

A common measure in these sectors is the Regulatory Asset Value or RAV. This shows the value of the capital base on which firms can earn returns. In the UK the total RAV for regulated utilities is over £100

billion. If the allowed return is 5 percent on this amount the annual return equals £5 billion. A 0.5 percent rise would add £500 million to firms' earnings which consumers ultimately pay (Jenkinson, 2006)⁶⁸.

Example: The UK water sector has a total RAV of about £35 billion. At a 5 percent allowed return companies can earn £1.75 billion yearly. Raising the return to 5.5 percent increases this to £1.925 billion an extra £175 million. Spread over 50 million customers this means about £3.50 more per person each year. This seems small per person but the total effect is large and raises questions about how cost of capital is calculated.

Because of this sensitivity regulators' methods for estimating cost of capital get much attention from academics and policymakers. The assumptions in these calculations affect prices but also firms' financial choices such as capital structure dividend policy and investment plans. A lower allowed return may push firms to be efficient but could discourage investment or cause finance issues. A higher return supports spending but risks upsetting consumers and politicians.

Understanding the technical challenges of calculating cost of capital is important not only in theory but also for judging regulatory design and its impact on firms (Jenkinson, 2006)⁶⁹. The next sections look closely at common regulatory methods and the assumptions they make.

6.2 Estimating the Cost of Capital: CAPM and WACC Methodologies

In most regulated sectors the standard method to estimate the cost of capital is based on the Capital Asset Pricing Model or CAPM. The CAPM provides a way to estimate the cost of equity which is then combined with the cost of debt to calculate the overall Weighted Average Cost of Capital or WACC. The WACC is the benchmark return that regulated firms can earn on their Regulatory Asset Value or RAV. It plays a key role in setting tariffs and investment incentives (Jenkinson, 2006)⁷⁰.

⁶⁸ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

⁶⁹ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

⁷⁰ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

The CAPM assumes investors need compensation for two parts: the time value of money represented by the risk-free rate and the risk of the specific investment measured as a premium over the market return. The cost of equity is estimated as:

$$r_e = r_f + \beta * (r_m - r_f)$$

Where:

r_e : is the cost of equity

r_f : is the risk-free rate often taken as long-term government bonds

β : beta measures how sensitive the firm's equity returns are to market returns

$(r_m - r_f)$: is the market risk premium

After finding the cost of equity regulators calculate the WACC as a weighted average of the cost of debt and equity using a notional capital structure. The simplified post-tax formula is:

$$WACC = g * r_d * (1 - \tau) + (1 - g) * r_e$$

Where:

g : is the notional gearing or assumed debt proportion

r_d : is the cost of debt

τ : is the corporate tax rate

Estimating the risk-free rate and cost of debt is fairly simple. Government bond yields are easy to find and for public companies debt premia can be observed directly. When specific data are missing regulators use comparable firms or sector averages.

The hardest and most debated part is estimating beta. Beta shows the firm's non-diversifiable or systematic risk and affects the cost of equity. In practice beta estimates vary widely depend on data and are not stable over time. Different regulatory reviews show beta can change greatly depending on time period data frequency and peer group chosen. Also for regulated utilities with stable and partly

protected revenues beta should be low. But observed betas have often been close to or above one raising questions about their accuracy (Jenkinson, 2006)⁷¹.

Another problem is the link between beta and gearing. As firms increase leverage equity risk and beta rise. Regulators should update beta for capital structure changes. But these updates often lag actual firm changes causing gaps that affect fairness and credibility.

While CAPM and WACC offer a clear replicable model applying them in regulation is difficult. Assumptions like market risk premium notional gearing and peer group have big effects on allowed returns. Since assumptions are revised rarely firms react strategically to expected rules changing their behaviour in ways that challenge model neutrality (Smithers & Co, 2003)⁷².

The next section looks in detail at the challenges in estimating beta and how technical uncertainty affects risk views and regulatory outcomes.

6.3 Beta Volatility and the Limits of Risk Estimation

Among the components of the CAPM estimating the equity beta is one of the most challenging in regulatory practice. Beta measures the non-diversifiable risk of a firm compared to the overall market. It shows how sensitive a company's equity returns are to changes in the market index. Theoretically firms with stable cash flows and low exposure to economic shocks like regulated utilities should have low beta values. However real data often disagree.

In the 1990s beta estimates for UK regulated utilities were usually between 0.2 and 0.4 matching the low-risk nature of monopoly infrastructure. But during and after the dot-com bubble some beta estimates became very unstable. For some companies beta even went negative before rising above one later. This does not fit the stable revenues and inelastic demand typical of regulated industries.

There are several reasons for this mismatch between theory and data. One is limited data: many firms are not publicly listed or lack enough trading history for good estimates. Even with data available the

⁷¹ 'Regulation and the Cost of Capital.' Tim Jenkinson. International Handbook on Economic Regulation (2006)

⁷² 'Study into certain aspects of cost of capital for regulated utilities.' Smithers & Co. Ofwat (2003)

length of the estimation period such as five years or two years and the frequency of returns daily weekly or monthly can change results. The market index chosen for comparison also adds variability.

Another factor is the link between capital structure and beta. According to Modigliani-Miller more debt increases equity risk and beta (Modigliani & Miller, 1958)⁷³. In practice regulators may be slow to update beta when firms raise debt quickly especially if beta is based on past data. This lag can cause equity risk to be underestimated and cost of equity to be too low giving firms too high allowed returns.

The rise in beta estimates since the early 2000s partly reflects this delay. As firms in Europe increased gearing regulators raised beta to match higher equity risk. But these changes often came after the fact and may miss firms' strategic use of debt before regulatory reviews.

There is also a conceptual problem. If utilities face price controls have long licenses and steady demand their market risk should stay low no matter who owns or finances them. High betas above one question the idea that these firms are shielded from economic swings. This raises doubts about the accuracy of beta and the use of CAPM for regulating non-competitive sectors.

Because of these issues some experts doubt that market models are good for setting allowed returns in industries where equity risk is weakly linked to the market. Beta's volatility and sensitivity to method reduce its value as a stable fair regulatory parameter. This makes it harder to align regulation with the true economics of the sector.

The next section will look at how changes in capital structure further complicate the link between risk return and regulation especially with rising leverage and its effect on WACC estimates.

6.4 Capital Structure, Gearing and Financeability in Regulatory Practice

Over the past twenty years regulated utilities across Europe have steadily increased their use of debt financing. This trend called the dash for debt has changed the financial landscape of regulated sectors and raised concerns about capital efficiency financial stability and regulatory effectiveness. At first many

⁷³ 'The cost of capital, corporation finance and the theory of investment.' Franco Modigliani, Merton Miller. American Economic Review (1958)

utilities were privatised with low or even negative net debt. But over time steady dividend payments share buybacks acquisitions and low equity reinvestment caused gearing ratios to rise significantly (Bell & Jenkinson, 2002)⁷⁴.

In theory financial structure should not affect the overall cost of capital in perfect markets as stated by the Modigliani-Miller theorem (Modigliani & Miller, 1958)⁷⁵. Yet in practice timing and assumptions in regulatory models cause distortions. When leverage goes up equity beta should rise reflecting higher shareholder risk. However regulators often update beta estimates late compared to real firm behaviour. This lag can lower WACC temporarily and increase allowed returns encouraging firms to raise debt strategically between price reviews.

Many regulatory models use a notional gearing assumption which sets an ideal capital structure usually with fifty-five to sixty-five percent debt to calculate WACC. If firms have higher actual gearing the return allowance may not match their true financial risk. This creates regulatory arbitrage where firms increase returns to equity while pushing financial risk to consumers or the regulatory system. This causes a mismatch between real behaviour and regulatory assumptions.

Because of these changes regulators focus more on financeability meaning a firm's ability to generate enough cash to pay debts and access capital markets under fair conditions. Financeability matters especially during big investment cycles or economic uncertainty when retained earnings and allowed revenues may not cover needs.

In the UK Ofwat includes financeability checks in its decisions. It uses financial ratios to see if companies can keep an investment-grade credit rating during the regulatory period. If a firm seems unable to regulators may adjust allowed revenues or ask for shareholder support such as new equity or dividend limits. These steps aim to keep firms investable and protect long-term service during financial stress but not to guarantee profits (Ofwat, 2004)⁷⁶.

⁷⁴ 'New evidence of the impact of dividend taxation on the identity of the marginal investor.' Leonie Bell, Tim Jenkinson. *Journal of finance* (2002) page 1321-1346

⁷⁵ 'The cost of capital, corporation finance and the theory of investment.' Franco Modigliani, Merton Miller. *American Economic Review* (1958)

⁷⁶ 'Future water and sewerage charges: Final determinations.' Ofwat, 2004

Focus on financeability also increased use of credit ratings which show a firm's ability to raise funds on good terms. Some regulators added rules like dividend lock-ups triggered by credit downgrades or minimum capital requirements. These protect consumers and the regulatory system by stopping firms from risking financial health with too much debt or risky finance moves.

In short regulators do not directly control capital structure but recognise its effect on pricing and service. The rise in debt and fixed WACC rules highlight the need to watch financial choices carefully not to limit freedom but to avoid encouraging financial weakness. As capital structure becomes part of regulatory negotiation the challenge is to align financial incentives with long-term sector stability.

6.5 Governance Challenges and the Limits of Regulatory Control

While regulation is a necessary response to natural monopolies in infrastructure sectors it is not without costs. Modern regulatory theory shows that regulation creates inefficiencies not only through distorted price signals or imperfect incentives but also because of its governance limits. These include rigid structures information gaps slow change and the constant risk of regulatory capture.

Regulators operate with limited information and bounded rationality. They must make long-term decisions based on incomplete or uneven data often relying on firms to provide the information needed to assess compliance and performance. (Tapia, 2009)⁷⁷ This dependence creates a persistent risk of opportunistic behaviour where firms may present their financial or operational condition to gain favourable regulatory treatment. This problem is especially clear in capital structure regulation where firms stress high gearing tight liquidity or limited capital market access not always to show real fragility but to secure concessions.

Crew and Kleindorfer argue that regulation imposes institutional constraints that cannot be fully solved by better modelling or stricter enforcement. There is a trade-off between discipline and flexibility (Crew & Kleindorfer, 2009)⁷⁸. Detailed rules may limit discretion but block needed adaptations to market

⁷⁷ 'Is the regulatory control of utilities' capital structures always justified?' Javier Tapia. Second annual conference on competition and regulation in network industries (2009)

⁷⁸ 'Regulatory Economics and Price Cap Regulation.' Micheal Crew, Paul Kleindorfer. SSRN Electronic Journal (2009)

changes. Looser frameworks encourage innovation but open the door to gaming and strategic misrepresentation. Either way regulation's governance creates costs that are both administrative and economic.

Another challenge is regulatory inertia or the tendency of institutions to resist change even when rules become outdated or misaligned with market realities. Regulatory regimes are often written into law backed by political consensus and designed for long-term stability. As a result regulators may respond slowly to shocks crises or technological shifts. In sectors with sunk irreversible capital this lag can have serious effects on financial health and service continuity.

This issue is worsened by regulatory capture where agencies increasingly reflect the interests of firms more than consumers or the public. Capture can be clear in political lobbying or revolving-door appointments or subtle through adopting sector norms and priorities. Either way it damages the legitimacy and effectiveness of regulation creating a gap between formal goals and actual results (Tapia, 2009)⁷⁹.

Good regulation needs to balance many tensions between independence and accountability predictability and responsiveness technical rigour and institutional pragmatism. These tensions are most visible in financial oversight where wrong judgments or overreactions can cause systemic harm. Crew and Kleindorfer point out that regulators must see themselves not as all-knowing planners but as institutions in a changing environment (Crew & Kleindorfer, 2009)⁸⁰. Learning revision and flexibility are vital to effective regulation.

⁷⁹ 'Is the regulatory control of utilities' capital structures always justified?' Javier Tapia. Second annual conference on competition and regulation in network industries (2009)

⁸⁰ 'Regulatory Economics and Price Cap Regulation.' Micheal Crew, Paul Kleindorfer. SSRN Electronic Journal (2009)

Chapter 7 – Conclusions and Policy Implications

This final conclusion brings together the main insights developed in the thesis and reflects on their theoretical and regulatory implications. The study started with classical capital structure theories but showed how regulated firms differ from these models in reasons and behaviour.

The picture that emerges is one where financial decisions are shaped not only by internal optimisation but also by institutional incentives regulatory expectations and the wider governance context. In regulated sectors capital structure becomes a strategic choice with effects beyond the firm impacting consumers regulators and the regulatory system's integrity.

This section consists of two parts. The first reviews the capital structure debate in light of the empirical and institutional evidence highlighting the limits of traditional theory and the need for a more contextual understanding of firm behaviour. The second part offers policy suggestions to improve regulatory design and enforcement aiming to link financial resilience with long-term service and public interest goals.

7.1 Revisiting the Capital Structure Debate in Regulated Firms

The analysis in this thesis shows that classical capital structure theories, while important in corporate finance, do not fully explain how firms behave financially under regulation. The Trade-off Theory, Pecking Order Theory, and Agency Theory help understand tax incentives information gaps and governance issues in open competitive markets. However, these theories assume market discipline is the main control that decisions about capital structure are internal to the firm and that financial problems affect only the firm and close stakeholders.

In regulated industries these assumptions rarely apply. Firms work in markets where prices returns and investments are controlled externally. Their financial health is linked to public goals like service continuity infrastructure investment and protecting vulnerable consumers. So capital structure is not just a financial choice but a strategic tool shaped by and shaping regulation.

This thesis argues that high leverage in regulated utilities is not accidental but a deliberate strategy. Firms do not only react to tax or agency costs but also predict how regulators will read financial signals and change their behaviour. They use what is called regulatory gaming using debt as a sign of financial weakness to get benefits like higher tariffs relaxed rules or softer enforcement.

This behaviour is very different from traditional models. It adds a new view where capital structure is not only internal optimisation but also a way to negotiate with regulators. This means firm behaviour must be seen in its institutional context including regulation design oversight credibility and regulators' likely responses. Capital structure is not outside regulation but created in the relationship between firms and regulators.

This calls for a new approach to capital structure theory in regulated sectors. Instead of one universal model researchers and policymakers should study how institutions incentives information gaps and governance shape financial strategy. The next sections discuss how this view affects both economic theory and regulatory policy design and success.

7.2 Empirical and Institutional Insights (UK vs ITA)

This section compares the evolution of capital structure across regulated utilities in the United Kingdom and Italy using data from the water energy and airport sectors. The focus is on average gearing ratios as a measure of leverage and financial strategy. Each sector is examined separately followed by a general reflection on cross-country patterns and institutional factors.

Water Sector:

In the UK water sector average gearing has stayed high ranging between 66% and 71% over the last ten years with a peak of 70.9% in 2021. This high debt level reflects past leveraged buyouts dividend strategies and a regulatory framework that until recently allowed high gearing. From 2022 onwards a slow decline begins with projections showing a drop to 61.3% by 2025 matching Ofwat's increased focus on financial resilience credit quality and dividend control.

Italian water utilities show a different picture. Average gearing passed 60% in the early 2010s but steadily fell to about 45.4% by 2024. This shows a more cautious use of debt especially among multi-utility companies like Hera Iren and A2A where public ownership local accountability and long-term service commitments influence finance decisions. Regulation does not set fixed gearing limits allowing more variation and discretion but reducing systemic risk.

Energy Sector:

The UK energy sector had high leverage in the late 2010s with gearing over 79% in 2020. This was driven by integrated operators and infrastructure investors mainly in gas and electricity networks. After financial concerns following supplier failures Ofgem introduced reforms such as capital floors ring-fencing and forward-looking risk checks. As a result gearing fell to 64.2% by 2025 marking a move towards stronger capital structures.

In Italy the energy sector has followed a long trend of lowering debt. From over 50% in the early 2000s gearing dropped to 35.5% in 2024. The trend was stable with companies like Enel Hera Group and A2A keeping conservative balance sheets. Factors like being listed municipal ownership and diverse business models supported financial caution. Regulation has not directly targeted capital structure but market discipline and internal governance helped keep leverage low.

Airport Sector:

UK airport operators especially Heathrow show consistently high gearing often above 80% peaking at 91.7% in 2020 during the COVID-19 crisis. These firms use debt as a financial lever and regulatory signal seeking concessions when hit by shocks. Although some deleveraging happened after 2021 average gearing remains high reflecting the sector's capital needs and reliance on stable regulation.

Italian airports show a very different pattern. Gearing stayed below 22% until 2019 then jumped near 40% in 2021 due to the crisis. But rapid deleveraging followed with gearing falling to just 12.8% by 2024. This quick recovery suggests effective financial adjustments helped by simpler ownership public oversight or local concession models. The sector seems more responsive and less dependent on high debt.

General Patterns of Leverage:

Across all sectors UK firms have higher and more persistent leverage shaped by private ownership investor pressure and historically tolerant regulation. Recently regulators have increased focus on capital structure adding financial resilience to licences and risk management.

Italian firms show lower average gearing faster post-crisis deleveraging and more differences between companies. Financial decisions are more shaped by governance municipal involvement and internal policies than by regulatory pressure. Multi-utility companies in particular are cautious with debt despite capital-heavy sectors.

These results confirm that capital structure in regulated utilities is not just market optimisation but deeply linked to national institutions. Ownership models regulatory frameworks and sector traditions shape how firms use leverage both as finance and strategy in regulatory relations.

7.3 Financial Strategies and Regulatory Feedback Loops

One important finding of this thesis is the feedback loop between firms' financial strategies and the regulatory frameworks that oversee them. Unlike competitive markets where financial structure mainly comes from firm choices influenced by investors, in regulated sectors leverage interacts directly with regulatory design enforcement and institutional response.

Regulated firms in capital-heavy sectors like energy water and transport work under rules that often use financial indicators to judge performance resilience and investment ability. This creates a system where capital structure choices affect and are affected by regulator behaviour. For example a highly leveraged firm may seem financially weak leading regulators to raise tariffs or ease performance rules. Expecting this response firms may choose higher debt levels in advance.

This dynamic can distort the original incentives in regulation. If firms think financial weakness will be accepted or rewarded they may not keep conservative balance sheets or focus on long-term resilience.

This creates regulatory moral hazard where financial risk shifts from shareholders to consumers and public bodies (Crew & Kleindorfer, 2012)⁸¹.

Regulators also face limits. With essential services they may hesitate to punish or reject revenue requests that risk service. This caution makes firms' strategic use of leverage stronger and weakens regulation credibility. The problem grows when fragility is caused by choice not shocks as seen in UK cases earlier in this thesis.

This feedback loop shows regulation is not just enforcement but a relationship shaped by strategy. Firms expect regulatory moves and adjust finances accordingly. Regulators must see financial signals not as neutral but as possibly strategic. Good oversight needs technical skill institutional insight strategic vision and clear balanced responses.

Understanding this feedback is key for future regulation. Financial indicators are not outside variables and capital structure must fit into regulatory supervision. This means moving from fixed rules to adaptive risk-based forward-looking governance. The next section explores this further.

The goal is to give firms financial freedom while stopping them from using it to weaken regulation or shift risk unfairly to consumers and taxpayers.

By adding these tools to regulation authorities can bring discipline to capital structure choices and cut down on opportunistic financial tricks. This makes regulation more credible forward-looking and able to keep public trust in vital infrastructure.

7.4 Policy Proposals to Discourage Strategic Leverage

This section presents a clear set of regulatory proposals to reduce the harmful effects of too much financial leverage in regulated sectors. Each proposal focuses on a way firms might use capital structure to influence regulators or gain value at the cost of long-term resilience. Where relevant the text compares these ideas with current practices used by regulators like Ofwat and Ofgem in the UK.

⁸¹ 'Regulatory economics and the journal of regulatory economics: a 30-year retrospective.' Micheal Crew & Paul Kleindorfer. Journal of regulatory economics (2012) page 1-18

1. Stable Multi-Period Tariff Commitments

Regulators should commit to longer tariff periods that can withstand short-term financial changes. Reducing how often price reviews happen and limiting renegotiations would lower firms' incentives to claim financial weakness to get price hikes. UK regulators like Ofwat use five-year price controls but these commitments could be stronger and more rigid. For example mid-term reviews could only happen if firms meet strict financial and operational limits.

2. Contingent Return Mechanisms Based on Gearing Levels

The allowed return on capital should be adjusted according to the firm's actual leverage. This can be done by lowering the cost of equity or limiting the notional gearing when firms go beyond set limits. Ofwat has recently increased scrutiny on gearing and financeability but direct penalties on high leverage are still rare. Adding this feedback would better match risk and reward and discourage financial structures that weaken resilience.

3. Mandatory Reinvestment of Profits Following Regulatory Concessions

When firms get favourable regulatory treatment like higher tariffs or easier performance targets a mandatory reinvestment rule could require them to use part of their retained earnings for infrastructure upgrades or operational improvements. Though not formalised now this idea supports some of Ofgem's dividend rules and expectations for licensees with weak credit. Making this rule official would stop firms from taking short-term gains after regulatory benefits.

4. Automatic Governance Triggers Linked to Leverage Ratios

Financial limits like Net Debt to RCV or interest cover ratios could trigger automatic regulatory actions. For example when a firm exceeds a leverage limit dividend lock-ups stricter reporting or mandatory stress tests would start. Ofwat already uses this approach with its cash lock-up policy that links dividend limits to credit rating drops. Extending these tools to include direct financial ratios would make regulation more transparent and responsive.

5. Hard-Coding Financial Metrics into Licence Conditions

Key financial resilience indicators like dual credit ratings capital floor rules and limits on intercompany financial flows should be included directly in operating licences. Ofgem has made progress here especially with licence-based capital adequacy rules and asset ring-fencing. Making these rules non-negotiable and enforceable through licences would boost credibility and reduce the need for discretionary actions.

All these proposals show the need for a more integrated and proactive regulatory system. One that not only reacts to problems but prevents them by guiding firm incentives early. UK regulators have started using some of these tools but more coordination and formal rules are needed to ensure clarity transparency and resilience across sectors. Treating capital structure as a key regulatory focus will be vital to keep trust in essential services and align finance with public interest goals.

7.5 Concluding Remarks

This thesis examined the relationship between capital structure and regulation in sectors where firms do not operate under pure market conditions but face strong regulatory oversight. Starting from classical corporate finance theories it showed how traditional models such as the trade-off theory the pecking order theory and agency theory do not fully capture the strategic side of financial decisions in regulated settings.

The empirical and institutional analysis showed that firms in energy water and transport use leverage not only as a financial tool but also as a way to influence regulators. Evidence from UK cases especially recent actions by Ofwat and Ofgem suggests firms raise debt to appear financially weak strengthening their position when negotiating tariffs or performance rules. In this way capital structure becomes part of the regulatory game changing financial decisions from neutral choices to strategic tools.

These findings mean regulation can no longer see capital structure as only an internal or outside firm decision. It must become central to regulatory frameworks. Financial resilience governance and transparency are not side issues but essential for efficiency and service quality over time. Regulation

must include financial oversight in licensing price setting and monitoring. It should create incentives that discourage opportunistic leverage but still allow firms to invest and run well.

Looking forward further research could expand this work in many ways. Comparative studies across countries and regulatory systems could test these findings and find best practices. Quantitative models could study links between leverage investment and regulation over time. Theoretical work could combine institutional economics and behavioural finance to better understand firm responses to regulatory incentives. More focus is needed on ownership and group financial engineering shaping risk and accountability in regulated sectors.

Finally this topic goes beyond academic interest. Many countries face decarbonisation and digitalisation challenges. Regulated firms will need to make large investments under political financial and environmental uncertainty. To ensure fair prices reliable services and sustainable infrastructure regulation must recognise the strategic nature of capital structure and treat it as a key part of regulatory design not just firm choice.

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