

# Agenda

## Advancing economics in business

### Time for a rethink? The role of extrinsic incentives in the water industry

**The operation of the comparative competition/RPI – X incentive regime in the England & Wales water sector assumes that rivalry and externally imposed (economic) incentives drive innovation performance. Where problems have emerged, the solution adopted has been ‘more metrics, more external incentives’. However, recent advances in behavioural economics, psychology and innovation analysis suggest that such solutions may not tackle more fundamental problems, and that they can even exacerbate them in certain cases**

#### Taking a step back

The system of economic regulation in the England & Wales water sector, as overseen by Ofwat, assumes that innovation is—and has been—mainly driven by a combination of the economic incentives imposed by the regulator and a form of rivalry between water companies (comparative competition). Indeed, since privatisation in 1989, the regime has adapted to reinforce these dynamics, and has been successful in helping to deliver cost reductions, a significant capital programme, and improvements to service performance.

Nonetheless, it is unlikely that all innovation in water arises as a result of the regime once prices have been set. First, some forms of innovation may have occurred in spite of, rather than because of, the regime. Second, there are problems in relying solely on ‘more metrics, more incentives’ in tidying-up the residual problems in regulating water companies. The current regime emphasises *extrinsic* (externally imposed) incentives, and, seen from a different perspective, may take insufficient account of the potential negative impacts that these could have on *intrinsic* motivation in delivering performance. Care is therefore required in tweaking the regime at the margin. Third, prior to the regulator setting prices, companies need to be encouraged to forecast their capital expenditure (CAPEX) accurately through rigorous analysis, and avoid ‘gaming’ the review. Ofwat has, in effect, proposed both extrinsic and intrinsic incentives to encourage forecasting accuracy in the run-up to the 2009 periodic review (PR09).

#### The current regime

The incentive regime in the England & Wales water sector has developed considerably since privatisation. However, for the most part, the underlying ‘assumption’

of the regime remains unchanged—that economic incentives, and the rivalry that these incentives generate, drive innovation performance across a range of measures (such as efficiency gains, service performance and capital investment delivery). Economic incentives are the motivational tool; rivalry is the process; and innovation performance is the outcome.<sup>1</sup>

For example, the regime in water assumes that companies compete, at least in an indirect sense, with the regulator. Arm’s-length adversarial RPI – X-style regulation, and the setting of price limits for five years, is intended to produce an incentive for companies to outperform against the regulator’s efficiency assumptions. Where companies reside under private ownership, the economic consequence of this rivalry for individual companies is profit out- or underperformance. Thus RPI – X and equity are inherently intertwined in generating the incentives for firms to improve.

Another assumption of the regime in water is that companies have an incentive to compete with one another in some sense. While, given their regional naturally monopolistic characteristics, companies in the water industry do not compete directly ‘in the market’, comparative competition is intended to mimic ‘real-world’ competitive processes and thus provide additional incentives. It aims to provide an economic incentive for laggard companies to catch up with more efficient companies.<sup>2</sup> At periodic reviews, companies assessed as being less efficient are set tougher efficiency targets than those judged to be more efficient. The incentive effect generated is different from that of RPI – X alone.<sup>3</sup> Between reviews, Ofwat also publishes league tables of performance across various measures, providing further (albeit less tangible) pressure on companies.

Where incentives have been perceived as inadequate, the solution has been to enhance particular elements of the existing regime, or to ‘bolt on’ new components. Thus efficiency target setting has become more sophisticated; service performance assessment is now integrated in price limits; and rolling mechanisms have been developed and refined to encourage efficiency outperformance. In the run-up to PR09, Ofwat looks set to introduce ‘menu regulation’ to encourage companies to forecast their expenditure accurately.

The solutions to perceived shortcomings in the regime have therefore been ‘more metrics, more external incentives’.<sup>4</sup> However, this implicitly takes as given that rivalry and economic incentives *have* driven innovation in the water sector to date, and that they will continue to do so. Clearly, they have played a key role in delivering efficiency, capital investment and service performance, but have other factors also been at work?

## Time for a ‘rethink’?

The water companies of England & Wales are private sector companies with a profit motivation, and thus are responsive to rivalrous monetary incentives.<sup>5</sup> However, it is difficult to think of any other regulated utility that provides as essential a public service as water companies. Water is a necessity and has a key impact on health. Effective sanitation is critical to the well-being of society. Water companies improve drinking water quality, and treat waste water to reduce its environmental impact. Reservoir schemes, mains repairs, and sewage treatment works must be managed carefully to minimise disruption and to be sympathetic to the visual environment. Water companies routinely interact with the public sector, including with Ofwat, the Environment Agency, the Drinking Water Inspectorate and government.

Is it therefore realistic to assume that water companies are driven purely by external economic incentives, or is some degree of underlying ‘public service ethos’ evident? Is a completely rivalrous or adversarial approach helpful in all situations, or do certain forms of innovation require cooperation between companies, and between companies and the regulator(s)?

The modifications to the existing regime seem to have largely ignored the wider incentives of water company managers, and how innovation systems might work in practice. After Ofwat has set price limits, innovation in water might be delivered through water companies:<sup>6</sup>

a) **competing with the regulator**—through seeking to outperform against the five-year RPI – X price caps, given the equity incentive (although the same psychology might also generate an incentive to mis-forecast at the business-planning stage);

- b) **competing with each other**—ie, comparative competition, spurred (for example) by the efficiency targets set at periodic reviews, and the publication of league tables between reviews;
- c) **adopting the innovations of others**—dissemination, including adoption of the innovations of other water companies, industry suppliers and outsourcing contractors;
- d) **collaborating where necessary**—to set standards or deliver multi-agent projects, through networking, project collaboration and engendering trust;
- e) **being intrinsically motivated**—undertaking projects for non-economic reasons, given the public service nature of water supply.

Economic regulation in water currently places emphasis on mechanisms (a) and (b) in delivering innovation. However, in many markets, it is acknowledged that not all innovation is created through rivalry or external economic incentives that engender rivalry. Cooperation may be required to set common standards, such as in the case of IT companies, or banks. Partnerships may be formed between firms and suppliers. In addition, in the public sector (eg, schools and hospitals) it is beginning to dawn on policymakers that the intrinsic motivation of individuals (teachers, pupils, nurses) is important to performance, and that too much emphasis on external metrics and incentives can undermine intrinsic motivation.

So if mechanisms (c) to (e) above are important in other markets, to what extent are they also likely to be important in the water sector?

## Innovation as a policy goal?

Introducing competition (or rivalry) in a market is not an end in itself—a fact often overlooked by policymakers and regulators. Rather, rivalry is a means to an end—for example, in delivering cost reductions (‘process innovation’) and service enhancements (‘product innovation’) to consumers. The water sector is no exception.

The assumption that innovation takes place in the water sector through rivalry and competition may be an oversimplification. While five-year price controls and comparative competition may have driven operating expenditure (OPEX) reductions in the past, it is not clear that innovation—in a more mature industry—will necessarily take place in this way going forward. Critiques of the regime have focused on the inability of the current form and length of the price control to deal with CAPEX (as opposed to OPEX).<sup>7</sup> However, a key part of the puzzle may have been overlooked: where

'market failures' exist, excessive rivalry may sometimes do more harm than good in delivering innovation.<sup>8</sup> In these situations, it follows that economic incentives that encourage rivalry can be harmful. To determine where rivalry helps and hinders, it is necessary to understand the 'innovation system'.<sup>9</sup>

There are indeed examples in the water sector where rivalry, instilled in the adversarial approach and comparative competition, may have hindered innovation. It has been less useful where the industry has needed to collaborate to agree common approaches, or standards—see (d) above. A pertinent example is the development of the Common Framework. In 2000, the Competition Commission criticised Ofwat (and the industry) for not developing an economic approach to maintenance.<sup>10</sup> Ofwat's reliance on hands-off RPI – X, coupled with comparative competition regulation, was not enough to move things forward, and more proactive coordination across the board was required. In practice, Yorkshire Water and UKWIR (the collaborative industry body) took the lead in this area. Innovation arguably took place in spite of the rivalry instilled within the regime, rather than because of it.

In addition, the regulatory framework may not recognise sufficiently that suppliers to the water industry are key 'enablers' of innovation, whereas water companies themselves are key 'adopters'—see (c) above. Paradoxically, suppliers have argued that the intensive short-term incentives under the current regime have undermined the take-up by water companies of more radical innovation.<sup>11</sup>

## A motivating force?

Ofwat recognises the need to avoid micromanaging companies—rather than telling companies what to do, it sets the incentives, with companies left to achieve the outcomes. There is also recognition that the right overall metrics should be chosen, to avoid perverse incentives. However, the regime still relies on extrinsic incentives, and rivalry, in delivering these outputs. Just as not all innovation is driven by rivalry, not all motivation stems from a desire to be rivalrous. Psychologists have known this for some time; economists have been playing catch-up, and, not surprisingly, economic regulation is only just beginning to wake up to the bad (or perhaps good?) news.<sup>12</sup>

Psychologists recognise that individuals are motivated through both externally imposed incentives and from within to perform an activity in its own right—intrinsic motivation (e). All agree that intrinsic motivation exists, and most agree that extrinsic penalties can undermine intrinsic motivation. The real controversy relates to whether extrinsic rewards reduce, or 'crowd out', an

individual's intrinsic motivation to perform a task—another potential source of market failure. Traditional economics assumes away this problem through treating intrinsic incentives as unimportant and/or assuming that the effects of extrinsic and intrinsic incentives are additive. Yet many psychologists argue that, given the available evidence, the crowding-out effects of rewards are pervasive; the effects arise with both monetary and less tangible external rewards; and that this applies to a wide range of settings—including education, work environments and sports. This nonetheless remains a controversial area.<sup>13</sup>

So why is it that extrinsic rewards *might* undermine (rather than reinforce) intrinsic motivation? 'Self-determination theory' asserts that the main negative effect of external rewards is that they forestall 'self-regulation'—people taking personal responsibility for motivating themselves.<sup>14</sup> People value autonomy and competence, and contingent extrinsic rewards can harm both. When individuals are highly intrinsically motivated to perform tasks, external incentives are perceived as 'controlling', undermining autonomy. In turn, individuals may feel that the results of their behaviour are not really 'self-determined'. Instead of performing a task for its own sake—the inherent challenge, to do 'a good job', or out of a sense of duty—the focus becomes the external standards (for their own sake). Over time, effort and outcomes may be driven by these standards rather than from within, undermining perceived competence, and hence motivation.<sup>15</sup>

Not surprisingly, intrinsic motivation is most likely to be harmed when tasks are inherently interesting, require creativity, or involve taking risks. So crowding-out effects are less likely for simpler, more mundane, day-to-day, tasks. However, much of the literature has focused on individuals, and on contexts in which there might be high endowments of intrinsic motivation that might be vulnerable to crowding effects—eg, teachers' approaches to incentivising pupils; manager–employee relationships; environmental performance; public sector performance-related pay. There has been less analysis of the relevance of the effects to profit-making firms.

However, profit-making firms are run by managers, who ultimately are individuals—as are the staff employed by firms. Firm performance will be an amalgam of the various motivational influences on its component individuals. Moreover, firms do not merely seek profit-maximisation, as recognised in 'behavioural theories of the firm'. So the application of the above might be broader. In the case of the water sector, as discussed above, there will inevitably be a public service ethos to some extent. What then are the potential implications for the water sector?

First, in considering the addition of further economic incentives at the margin for PR09, Ofwat should look at whether this would lead to detrimental effects to intrinsic motivation. For example, hypothetically, if further economic incentives were to be introduced to encourage the efficient use of water, it would be necessary to ask *why* water companies encouraged customers to save water. Is this solely to meet regulatory targets, or because of a sense of duty? Similarly, when a number of water companies sought to restore supplies following the floods of 2007, was their immediate concern to 'do the best they could to assist', or was it that a failure to do so would, at some future juncture, risk public outcry or regulatory sanction? It is probable that both concerns were considered. But would they have been any more responsive had aspects of their performance, during the period, been subject to further scrutiny and regulation? Or would performance have suffered, due to crowding out of what was perceived as important at the time and therefore intrinsic motivation?

Second, as noted, intrinsic motivation appears to be associated with the part of human nature that takes risks and where more thought and creativity are required. So paradoxically, too much focus on high-powered extrinsic incentives and rivalry can undermine willingness to adopt innovative solutions. If incorrectly applied, external incentives in water might make companies risk-averse, focusing on the least-cost, least-risk, route to achieving the metrics set out, rather than adopting approaches that risk the realisation of the threats posed by the external measures.<sup>16</sup>

Third, intrinsic motivation can be undermined by external penalties—both *ex ante* and *ex post*. *Ex ante*, this mechanism works in much the same way as that described above for rewards: contingent penalties undermine autonomy, and thus perceived competence.<sup>17</sup> However, *ex post* assessments of performance, relative to peers, can also be detrimental. Ofwat assumes that league tables are beneficial in driving companies to succeed—in the same way that a company in a competitive environment that lost market share to a competitor would be motivated to restore profitability. However, as noted, water companies may be different. It is of note that *ex post* peer comparisons can also affect individuals' motivation directly, since people care about status. Similarly, a high ranking in a league table may indicate that the course of action followed by the manager is broadly 'correct', enhancing motivation. However, a low ranking provides a signal of poor competence relative to peers, which, as discussed above, can undermine intrinsic motivation. Penalties are also information-poor in providing a corrective course of action.<sup>18</sup> The potential undermining effects on staff motivation of school and university league tables are widely recognised.<sup>19</sup>

This does not mean that Ofwat should be 'soft' on water companies that underperform. After all, laggards in the sector might be taken over, and ineffective managers replaced with more motivated individuals. Yet does it make sense to hit a company repeatedly for 'failures'? What if poor measured performance is outside the company's control? Repeated criticism, if not simply leading to 'habituation', may undermine autonomy, control and perceived competence. Replacement of the existing management might not help. In water, situations in which there is often disagreement between the companies and the regulator regarding the degree to which problems are within managerial control include efficiency analysis and leakage. Where these issues are concerned, does repeatedly identifying poor performers motivate or demotivate management to improve?

## Truth in forecasting

The above discussion focuses on companies' incentives to perform after price limits have been set. However, a key problem has been in incentivising companies to forecast costs accurately at periodic reviews. Ofwat has become concerned with companies 'gaming' the review. In the 1990s, companies consistently spent less on OPEX and CAPEX than assumed, and not all of this was due simply to 'newly discovered efficiencies'. Incentivising companies to forecast CAPEX accurately remains a problem. Ironically, it is incentive (a), at the heart of the regime, which creates the gaming problems.

There are two views on why companies might get forecasts 'wrong' according to the behavioural economics of project forecasting in organisations. Various authors have studied why companies in many real market situations seem to underestimate costs and risk, and overestimate likely revenues and profits—so-called optimism bias. One view is that this tendency is accidental, stemming from limitations in human cognitive ability, a tendency to accentuate the positive, and too much focus on 'this' organisation rather than 'others'. This is the case for one-off projects, where there is little opportunity to learn from mistakes, but it also appears to be true of non-unique projects. Lovallo and Kahneman (2003) recommend that, to overcome these issues, managers take an objective 'outside view' in forming their forecasts.<sup>20</sup> Another view, put forward by Flyvbjerg, Holm and Buhl (2002), is that companies act in a 'Machiavellian' way, and 'cook' their forecasts.<sup>21</sup> This may be particularly relevant to the early stages of large infrastructure projects, where external funding is sought to get them under way.

In practice, both effects may be present. Interestingly, in a water regulation context, the concern might be that companies exhibit pessimism bias and *overestimate* their cost projections. Nonetheless, the considerations are similar. For PR09, Ofwat has proposed that 'menu



regulation' will help ensure that companies forecast their expenditure accurately.<sup>22</sup> This extrinsic incentive to encourage forecasting accuracy appears to be directed at addressing any so-called Machiavellian tendencies. However, it is not the only approach proposed. Ofwat wants companies to 'take ownership' of their business plans in PR09 and to prepare these on the basis of how

they actually make business decisions, rather than as 'bids'. Furthermore, it has insisted that companies should undertake comprehensive cost-benefit analysis within their business plans.<sup>23</sup> These further measures place the onus on companies to take responsibility for their plans, thus 'internalising' them. This may help deal with the more benign biases in cost forecasting.

<sup>1</sup> Any external reward or penalty, whether tangible or intangible, can be regarded as 'extrinsic'. Monetary rewards and penalties, deadlines, sanctions, and even competition (rivalry) are all forms of extrinsic incentive, since they originate 'from outside' rather than 'from within'. Thus the threat of rivalry is a motivational tool (in addition to being a process per se). See Deci, E.L., Koestner, R. and Ryan, R.M. (1999). 'A Meta-analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation', *Psychological Bulletin*, **125**, 627–68.

<sup>2</sup> Ofwat has therefore emphasised the importance of retaining a sufficient number of independent comparators and good-quality data to assist the process in giving evidence to the Competition Commission on water company mergers.

<sup>3</sup> Under RPI – X, the efficiency target set for a company is dependent only on its own costs, and companies may anticipate this in the run-up to a review. Under comparative competition, an inefficient company knows that, if it fails to become as efficient as most other water companies, it will not fare well in the comparative efficiency assessments at the next review, and will face demanding efficiency targets.

<sup>4</sup> Changes in industry structure have brought to the fore further developments. Companies adopting not-for-profit-type structures have introduced within-firm incentives intended to compensate for the removal of conventional shareholder equity. These have included performance-related pay and incentives to deliver financial stability. These are further examples of extrinsic incentives, introduced to mitigate a perceived loss in traditional equity-based incentives.

<sup>5</sup> Most companies in the water sector retain some degree of traditional equity ownership. However, some have adopted thin-equity structures. Dwr Cymru, under the ownership of Glas Cymru, has adopted a not-for-profit structure. There is some debate over whether the incentives to perform are as strong under these alternative structures, given the thinner spreading of outturn profits, or the absence of profit in the traditional sense. There are mixed views on whether profit incentives are weaker under thin equity. However, Ofwat is of the view that incentives for performance are reduced under the Glas-type model.

<sup>6</sup> Chance events (luck and external events) are excluded from the five-point list since they do not relate to incentives.

<sup>7</sup> See Ofwat (2006), 'Setting Water and Sewerage Price Limits: Is Five Years Right?', MD 211, January 30th, and subsequent responses.

<sup>8</sup> See Oxera (2005), 'Innovation Market Failures and State Aid: Developing Criteria', report prepared for the European Commission, November.

<sup>9</sup> The innovation system defines the components, agents and interactions that generate innovation. It includes the various modes through which innovation takes place. See Oxera (2005), op. cit.

<sup>10</sup> Competition Commission (2000), 'Mid Kent Water Plc: A Report on the References under Sections 12 and 14 of the Water Industry Act 1991', September.

<sup>11</sup> Both of these issues are discussed in UKWIR (2006), 'Barriers to Innovation in the UK Water Industry', 06/RG/10/1.

<sup>12</sup> See Oxera (2007), 'When Economics Met Psychology: Rethinking Incentives', *Agenda*, March. Available at [www.oxera.com](http://www.oxera.com).

<sup>13</sup> See Deci, Koestner and Ryan (1999), op. cit., and Deci, E.L. and Ryan, R.M. (2001), 'The Pervasive Negative Effects of Rewards on Intrinsic Motivation: Response to Cameron (2001)', *Review of Educational Research*, **71**:1, Spring, 43–51. These authors lean towards the cognitive school. Some argue that the crowding-out effects on intrinsic motivation are not pervasive, criticise the theory, and produce evidence of non-crowding. See Cameron, J., Banko, K.M. and Pierce, W.D. (2001), 'Pervasive Negative Effects of Rewards on Intrinsic Motivation: The Myth Continues', *The Behavior Analyst*, **24**:1, Spring, 1–44. These authors lean towards the behaviourist school. However, the main debate seems to be about when crowding occurs and its duration, not *if* it occurs. Both schools of thought also recognise that there are conditions under which external rewards do not undermine intrinsic motivation, and that external rewards (tangible or intangible) can be designed to minimise crowding effects.

<sup>14</sup> See Ryan, R. and Deci, E. (2000), 'Self-determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-being', *American Psychologist*, **55**:1, 68–78. Self-determination theory encompasses cognitive evaluation theory.

<sup>15</sup> The issue is not really whether the higher-level metrics are correct as ex post diagnostics of good overall performance, but that motivation may be forestalled if there is too much focus on external incentives ex ante to deliver the external metrics.

<sup>16</sup> See also the discussion on the adoption of suppliers' innovative technologies by water companies, above.

<sup>17</sup> Gneezy and Rustichini (2000) show how parents in Israel became less punctual in dropping their children off at daycare centres when penalties were introduced for lateness. Gneezy, U. and Rustichini, A. (2000), 'A Fine is a Price', *The Journal of Legal Studies*, **29**:1, 1–17.

<sup>18</sup> B.F. Skinner, of the behaviourist school, argued against punishment as an aversive stimulus when poor behaviour occurs since, compared with rewards for good behaviour, it provides little information (from a behaviour conditioning perspective). From a more cognitive perspective, early self-determination theory studies in the 1970s and 1980s claim that positive performance feedback could enhance intrinsic motivation, whereas negative performance feedback could reduce it. Vallerand and Reid (1988) and Whitehead and Corbin (1991) later demonstrated this in laboratory experiments. They told sports students at random that their assessed performance was in the high or low percentile. While success feedback enhanced interest and enjoyment and thus intrinsic motivation, failure feedback had the opposite effect. These effects were mediated by individuals' perceived competence. See Vallerand, R.M. and Reid, G. (1988), 'On the Relative Effects of Positive and Negative Verbal Feedback on Males' and Females' Intrinsic Motivation', *Canadian Journal of Behavioral Sciences*, **20**, 239–50; and Whitehead, J.R. and Corbin, C.B. (1991), 'Youth Fitness Testing: The Effect of Percentile-based Evaluative Feedback on Intrinsic Motivation', *Research Quarterly for Exercise and Sport*, **62**, 225–31.

<sup>19</sup> See Oswald, A. (2001), 'An Economist's View of University League Tables', May, University of Warwick.

<sup>20</sup> Lovullo, D. and Kahneman, D. (2003), 'Delusions of Success: How Optimism Undermines Executives' Decisions', *Harvard Business Review*, July.

<sup>21</sup> Flyvbjerg, B., Holm, M.S. and Buhl, S. (2002), 'Cost Underestimation in Public Works Projects: Error or Lie?', *Journal of the American Planning Association*, **68**:3, Summer.

<sup>22</sup> Oxera assisted Ofwat in undertaking research on this. See Oxera (2007), 'Assessing Approaches to Expenditure and Incentives', report prepared for Ofwat. Available at [www.oxera.com](http://www.oxera.com).

<sup>23</sup> See Ofwat (2007), 'PR09 Methodology Consultation Workshop 16 November 2007'.

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