

In whose hands?



Exploring vertical integration in the water industry

ICS
consulting

Dr. Melinda Acutt & Dr. Scott Reid
ICS Consulting

TABLE OF CONTENTS

Executive Summary	3
Key messages.....	4
Introduction	6
Purpose of this report.....	6
Acknowledgements	7
About the authors	7
A brief history of the water industry	8
Origins of the present structure	8
What water companies do	8
Some terminology	9
The flow of things to come	10
The Invisible hand versus the velvet glove	11
A look at some numbers	13
Some more terminology.....	13
Some energy sector results	14
Results from international water sectors	15
Results for water (& sewerage) in England & Wales	16
<i>Earlier evidence for England & Wales</i>	16
<i>New evidence for England & Wales</i>	17
A summary assessment of the numbers	18
How it works in the world of water.....	20
Views from the front-line	21
<i>The view from water</i>	21
<i>The view from other sectors</i>	28
Beware of unintended consequences	30
Conclusions	31
Some messages about vertical integration in water	32
Bibliography	34
Appendix: What economics tells us about industry structure.....	36
Vertical coordination versus vertical integration	36
What drives vertical integration?	37
<i>The physical & engineering realities:</i>	37
<i>Transactions costs (aka the human realities)</i>	38
<i>The principal and the agent</i>	41
<i>When the invisible hand is broken or just not there</i>	42
Summing up the economic theory	43

The brief version



EXECUTIVE SUMMARY

There are currently 21 regulated providers of water and/or sewerage services, who supply a full end-to-end service in defined geographical areas of England and Wales. These companies acquire the water, they store it and transport it, they treat it and then send it to our taps via a network of pipes. On the waste side, the same or a different company will collect our wastewaters, transport them, clean them and then discharge back into the water environment and dispose of the waste they take out. And they also send us our bills for doing this. In the jargon, doing all these things means they are vertically integrated monopoly providers of water and sewerage services.

But is this best way to organise the water industry so that it meets our need for water services now and into the future?

Twenty or so years after the landmark change of privatisation, it may be surprising that such a question needs to be asked. The privatised water industry along with the system of regulation that was created then, and has evolved since, has helped deliver much in terms of improved service and efficiency. But twenty years is close to a generation. The world then is not the world now, nor the world of the future and so asking whether the current structure remains fit for purpose is legitimate and natural. To be specific, should policy makers, as some commentators are suggesting, look to encourage or allow the break up of this integrated structure? This, after all, would only be following the paths of the other utility sectors where the forces of the competitive market were established through the vertical separation of integrated businesses.

By asking and addressing this question, we hope to contribute to a clearer appreciation of the most appropriate structure for the water industry. In this report we review three types of evidence: the economic theory, the empirical evidence and the views of practitioners on the ground.

Our review shows that there is a clear theoretical basis for the idea that a vertically integrated structure can work in the best interests of consumers, by enabling firms to operate at lower cost. Effective regulation can ensure that these cost savings are passed on to consumers. There is also a large and growing body of empirical evidence supporting the idea that the costs of the provision of water and sewerage services are lower when production is vertically integrated as compared to a separated or unbundled supply chain. This efficiency from producing the various components of the supply chain together is known as *economies of scope*.

In the main report we provide details from a wide range of water & energy sector studies.

Key points from the evidence include:

- the most up to date study of the water & sewerage sector in England and Wales suggests that the costs of an average water and sewerage company would be 26% higher if production was vertically separated. Broadly, this equates to average bills that would be around £100 per year higher if services were provided by vertically separated companies;

- international evidence for scope economies in water and sewerage, notably between production and distribution/networks shows cost savings of up to 53%;
- unbundling energy in the US could lead to cost rises of up to 40-50%; and
- the recent McNulty report concludes that its fragmented structure is a principle cause of the vertically separated rail sector in Great Britain being 30% less efficient than it could be if it were more efficiently organised.

This finding is not unique to water or utilities in general. The comprehensive review by Lafontaine and Slade (2007) of over 150 academic studies – everything from petrol refining & sales to brewing to TV programming - arrives at the conclusion:

‘we did not have a particular conclusion in mind when we began to collect the evidence.... We are therefore somewhat surprised what the weight of evidence is telling us. It says that, under most circumstances, profit maximising vertical-integration decisions are efficient, not just from the firms’ point of view but also from the consumers’ points of view.’ (Lafontaine & Slade, 2007, p. 680)

Of course, individual statistical analyses can be challenged, but the overwhelming weight of this evidence should clearly be pertinent for policy makers wrestling with questions of the most appropriate structure for the water industry.

KEY MESSAGES

The range of insights, views & analysis we have reviewed points to a clear and straightforward conclusion. There are good reasons to accept the hypothesis that vertical integration works in the interests of consumers. This conclusion is strongest we think when applied to the asset intensive functions of water & sewerage companies. The implication that flows from this is also clear:

*...faced with a vertical arrangement, the burden of evidence should be placed on competition [**we would add “or regulatory”**] authorities to demonstrate that that arrangement is harmful before the practice is attacked. (Lafontaine & Slade, 2007, p. 680)*

Water & sewerage services are presently in the hands of largely vertically integrated businesses. The case for transferring this responsibility to new and maybe more hands, needs in our view to address or counter six key points:

#1 IF IT AIN'T BROKE DOES IT NEED FIXING?

Arguments around structural reform and competition in the water industry have an element of solutions in search of problems. The public desire for change has not been demonstrated and consumer satisfaction with their water services appears to be comparatively high (against other sectors). However, there are challenges and consumers will rightly expect the industry to meet them. Being more responsive, being more innovative and becoming more efficient should be the benchmarks for any good management. The framework of incentives created under regulation can be both problem and cure in this respect. Creating stronger and clearer incentives that reward good managements can shape how the industry responds to the challenges to a sustainable future for the water industry. That is: be clear about what needs fixing before attempting to fix it.

#2 MANAGING THE WHOLE IS MORE THAN THE SUM OF THE PARTS

Throughout our discussions and reviews we have been struck by the importance attached to holistic management of water & sewerage services. Whether it be drought risks, climate change or flood risks, management of water within its environmental and social context is important and this is best delivered when responsibility and objectives are defined for the whole and not just the parts.

#3 SEPARATION MAY BE SUITED TO TIMES OF SURPLUS BUT SCARCITY REQUIRES SOMETHING DIFFERENT

We have been struck by the views that the successes of separation in energy may not be transferable to water. Or at least it may be unwise to assume they are transferable. Separation in energy was conceived at a time of surplus & inefficient capacity in generation. This model may not be the best one for addressing concerns about supply *insecurity* in water.

#4 INTEGRATION CAN RESULT IN LOWER COSTS (AND HENCE PRICES)

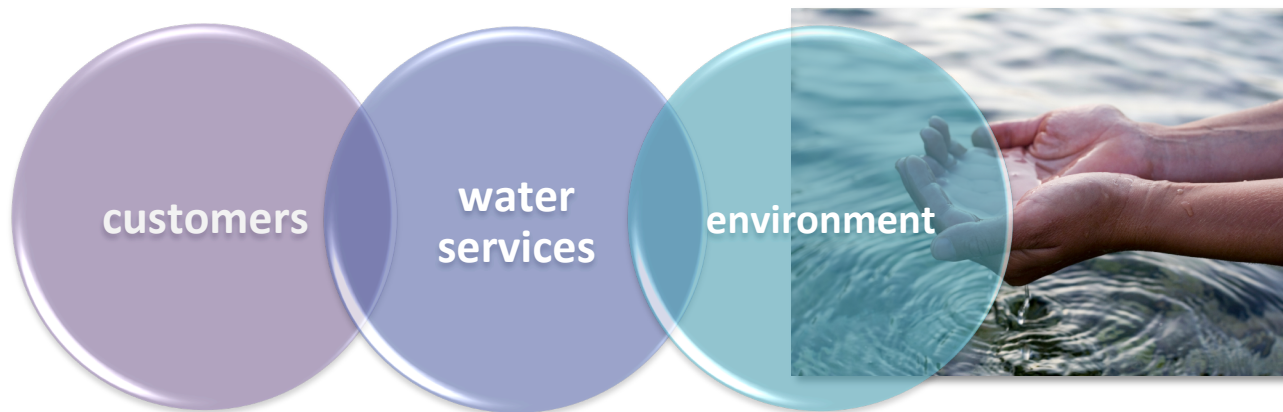
The academic empirical evidence overwhelmingly points to lower costs with the vertical integration of functions within water & sewerage. These lower costs may arise because integrated management allows cost dependencies and trade-offs across functions to be exposed and managed. It's simply cheaper to do it together.

#5 INTEGRATION KEEPS ACCOUNTABILITIES CLEAR

And perhaps vertical integration also results in lower costs overall because one of the things it does is make clear where accountabilities lie. This reduces the costs of managing interfaces and encourages doing the right thing.

#6 WATER BUSINESSES ARE BEST PLACED TO DECIDE ON INTEGRATION VS. THE MARKET

How much a company chooses to self-supply versus how much *it* relies on the market is something ultimately it should determine based on the incentives and objectives it faces. Observation shows that integrated companies may not always get that balance right, but they can demonstrate the ability to adapt and change their business organisation and processes to meet new challenges. And importantly, they should have the regulatory incentives to do this as they seek to provide their services in the most efficient way.



INTRODUCTION

What is the best way to organise the water industry so that it meets our need for water services now and into the future? Twenty or so years after the landmark change of privatisation of the 10 regional water & sewerage authorities and 35 years after the creation of the public water authorities, it may be surprising that such a question needs to be asked. The privatised water industry alongside the system of regulation that was created has helped deliver much in terms of improved service and efficiency. Drinking water has never been purer and the health of our rivers and cleanliness of our beaches rarely better.

However, the current debates around introducing competition into the water industry first introduced by the independent Cave Review and then by the sector's regulator Ofwat are suggesting that things may need to change in the face of new challenges to maintain these achievements for the water consumer. Markets, upstream market reform, water trading, accounting separation, retailers – to name a few - are now familiar buzzwords within the sector that reflect the idea that there might be alternative and even better ways of organising our water services.

The risk is that the glow of the alternatives may obscure a rational considered assessment of what we already have in terms of how water services are organised.

There are currently 21 main regulated providers of water and/or sewerage services, who supply a full end-to-end service in defined geographical areas of England and Wales. These companies acquire the water, they store it and transport it, they treat it and then send it to our taps via a network of pipes. On the waste side, the same or a different company will collect our wastewaters, transport them, clean them and then discharge back into the water environment and dispose of the waste they take out. And they also send us our bills for doing this. In the jargon, doing all these things means they are vertically integrated monopoly providers of water and sewerage services.

"If it ain't broke, don't fix it" is a commonly heard phrase. Our view is that understanding what works well and why it works well under the current structure for the water industry has to be an essential part of the debate. Because breaking it might only result in a need to fix it again.

PURPOSE OF THIS REPORT

United Utilities provides water and sewerage services to around 7 million people in the North West of England. They have commissioned this independent expert review of the vertically integrated water industry structure in England and Wales. By contributing to a fuller understanding of the current, vertically integrated structure,

the aim of this review is to ensure that decisions about the future structure of the water and sewerage industry in England and Wales are based on a sound understanding of all the options.

“such an understanding is an important precondition for the design of sensible public policy.... consumers are often worse off when governments require vertical separation in markets where firms would have chosen otherwise.” (Lafontaine & Slade, 2007, pp. 662-3)¹

Our approach to this review covers the following:

- ❖ a review of the economics literature on why firms may choose to vertically integrate;
- ❖ a review of the empirical evidence relating to the benefits of vertical integration, for water and other sectors; and
- ❖ practical examples of where integration may or may not work in the best interests of water consumers as gleaned from interviews with practitioners with experience of both integrated and separated structures.

ACKNOWLEDGEMENTS

We would like to express particular thanks to the organisations & individuals who agreed to be interviewed as part of the work for this review. Particular thanks go to: CC Water, CE Electric, Dr. Bill Emery, Environment Agency, Keith Harris, Northern Ireland Water, Paul Sankey, Severn Trent Water, Water Industry Commission for Scotland, Scottish Water & Yorkshire Water. We are also grateful for a number of discussions with individual and organisations who did not wish to be named. All views and interpretations offered in this report are those of the authors alone.

We also wish to express thanks for the project support & contributions provided by our ICS colleagues. Special mention goes to Lisa Gahan, Adrian Rees and Giordano Colarullo and also to Dr. David Saal of Aston Business School.

ABOUT THE AUTHORS

- ❖ **Dr Melinda Acutt** is a former executive director of Ofwat. An experienced economist, with a strong background in academia and the water industry, she has previously been Head of Regulation at Yorkshire Water and Director of Network Regulation at Ofwat.
- ❖ **Dr. Scott Reid** is a widely respected and experienced regulatory economist specialising in the water industry. His previous experience includes time at the water regulator Ofwat (1996-2000).

¹ Lafontaine, F. and Slade, M. (2007) Vertical Integration and Firm Boundaries: The Evidence. *Journal of Economic Literature*, Vol. XLV (September 2007), pp. 629–685.

Some background



A BRIEF HISTORY OF THE WATER INDUSTRY

In the nineteenth century the provision of water to households and businesses in England and Wales was carried out by a variety of private companies and undertakings. However this did not provide universal access. Two Public Health Acts, in 1848 and 1875, increased the responsibility of the local authorities to improve access to water supply & sanitation.

The responsibility of local authorities for water services continued to expand in the twentieth century, and in 1945 a Water Act was passed which established the Waterworks Code. This Code outlined standards that were to be set across the industry and at the same time, set up a structure that encouraged amalgamations and mergers between water suppliers. For the ensuing thirty years the industry continued to grow in this manner until the Water Act 1973.

The 1973 Act transferred the duties of providing water and sewerage services from the local authorities to ten publicly-owned water authorities. At the time, organising the water authorities along river basin lines was seen as desirable to aid planning and co-ordination. Twenty-nine privately owned statutory water companies (only supplying water services) remained outside of the scope of these new water authorities.

ORIGINS OF THE PRESENT STRUCTURE

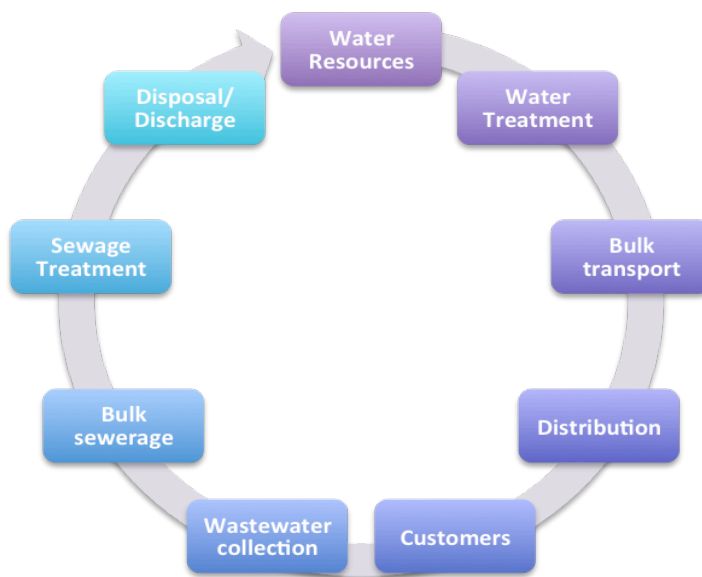
Throughout the 1980s the government began a series of privatisations of the nationalised industries. It started its programme of utility privatisations with the telecommunications industry in 1984 and the gas industry in 1986. The next focus was the water industry. On 1 September 1989 the ten water authorities had their assets and liabilities transferred to ten companies registered under the Companies Act 1985, which were then offered for sale on 10 November 1989. The newly created companies formed wholly owned subsidiary companies, which were appointed as water and sewerage undertakers or water only undertakers for distinct regional areas. These entities were to supply water to about three-quarters of all water customers and provide sewerage service throughout their areas. The remaining customers were to obtain water from the water only companies. The twenty-nine private water only supply companies retained their previous structure, but were brought under the new regulatory framework.

In 1991 the government consolidated the Water Act 1989 with the passing of the Water Industry Act 1991. The 1991 Act laid out the functions of the water and sewerage companies and of Ofwat, the economic regulator.

WHAT WATER COMPANIES DO

Under the current regime the undertakings licensed to fulfil these functions can be understood as “source to sea” regional monopolies. Their activities encompass the entirety of the water cycle – from the point that water is taken from the natural environment to the point that it is returned.

Figure 1: What water companies currently do



It is also worth noting some of the things that currently fall outside of this circle. What our current water companies don't do (or are precluded from doing) is just as relevant to understanding what integration offers us in terms of water management as the things that they do do. One example is private sewers, where Government has already determined that integration - via adoption by the water and sewerage companies - is the best way forward. Further examples include sustainable urban drainage (SUDS), where it's not very clear who does what, and upland catchment management where some water companies would like to do more than they are currently allowed.

SOME TERMINOLOGY

Before going much further, it may be helpful to define some terminology. A business is described as integrated when its activities cover the production or sale of a number of products or services, or a single product in a number of markets. There are two types of integration:

***Horizontal integration** exists when the same good or service is supplied by one business across a number of distinct markets. It occurs when one firm merges or takes over another firm which supplies at the same point of the value chain. .*

***Vertical integration** refers to a situation where a single business undertakes a sequence of related functions to serve a particular market. It occurs when a firm merges or takes over another firm that supplies at a different point of the same value chain and therefore can be seen as a form of self-supply.*

Both forms of integration can be observed in the current water industry.

They are horizontally integrated because the products of potable water supplies and drainage are provided to both household customers and business customers in the same region, and also because over time there has been notable consolidation in the number of undertakings.

They are vertically integrated because a service like the potable water supply itself is the product of a number of related activities, namely abstraction, storage & transport of raw water; treatment of raw water and

distribution / delivery of treated water. And the wastewater side of the service is similarly structured from collection to treatment through to disposal.

THE FLOW OF THINGS TO COME

In the next few sections we review the evidence and develop our arguments in the following way:

- ❖ After a brief summary of the insights provided by the theoretical economists, we review the numbers. We look at a range of literature that provides some quantification of the merits of integrated production compared to specialised production in the water industry, and utilities more generally. As we will see this analysis fairly consistently favours the idea of integrated production.
- ❖ We then turn to the views of practitioners and the theoretical literature to understand why we see such empirical support for integrated production in the cost data. That is, what features of producing water & sewerage services explain the empirical results that vertical integration is less costly than separation? We examine the theoretical explanations against the insights of a range of industry practitioners with experience of managing and regulating utility businesses.
- ❖ We provide a more detailed review and summary of the theoretical economic literature in the Appendix to this report.

What economics tells us about industry structure



THE INVISIBLE HAND VERSUS THE VELVET GLOVE

In the world around us businesses across a range of sectors operating in free (or non-regulated) markets often, but not always, choose a vertically integrated structure. This is a choice about whether to buy inputs in the market or to in effect 'do-it-yourself' within a business structure. This choice is driven by whether or not markets can be trusted to work effectively. When they do not exist, do not work effectively or are costly, an alternative structure is required and, as outlined in a large body of economics literature, vertical integration can provide a sensible solution.

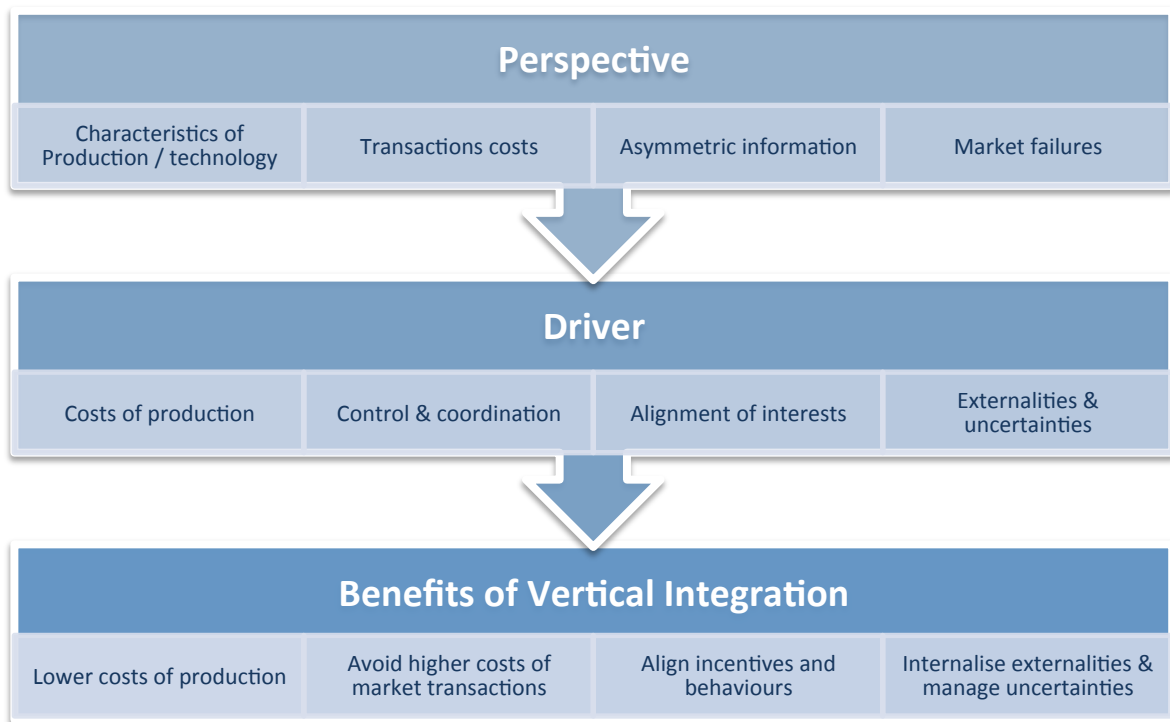
The economics textbooks tell us the market, like some hidden force of nature, provides the things we need and want, and does so in a way that can be described as efficient. And yet the dominant theme we encountered in both the literature and on the ground is about the difficulties and associated costs of organising through the interplay of specialised firms in the marketplace, the distinct yet related stages of a production process. Adam Smith's invisible hand can provide the goods consumers want in an efficient manner, but so too can alternatives like integrated production under a managerial velvet glove. The key is to know where and why either of these structures is preferable.

Our synthesis of the large – and in some cases Nobel Prize winning – literature on the where and why, points to four sets of reasons why integration can be superior to markets:

- ❖ The first reflects the characteristics of the technologies used in production. That is, the physical and engineering realities;
- ❖ The second relates to transactions costs – which reflect the organisation and governance required to make things work. In part, this derives from some human realities;
- ❖ The third is about incentives and, specifically, more about how we encourage others to do what we want them to do. This is the problem of ensuring the pursuit of self interest translates into serving the mutual interest (as Adam Smith predicts); and
- ❖ And finally, in some areas and activities markets simply do not function or even exist (such as the lack of competing water distribution networks).

A set of drivers for, and potential benefits of, the vertically integrated business model emerges from these four broad (and sometimes overlapping) categories. These are illustrated as follows:

Figure 2: The economics case for vertical integration



A more detailed review and summary of the theoretical economic literature is provided in the Appendix to this report.

Given the clear, theoretical underpinning for the idea of vertical integration, our next task was to understand how far a vertically integrated structure is supported by the empirical and practitioner evidence in the water and sewerage sector. Our data gathering encompassed discussions with those experienced in running and regulating water businesses and other utilities; as well as reviewing the empirical economics literature.

what the models say about industry structure



A LOOK AT SOME NUMBERS

Our review shows that there is a large and growing body of empirical evidence supporting the idea that the costs of the provision of water and sewerage services are lower when production is vertically integrated as compared to a separated or unbundled supply chain. This efficiency from producing the various components of the supply chain together is known as *economies of scope*.

In the following section we provide details from a wide range of academic water & energy sector studies. Our principal focus is on studies that have looked at how costs and industry structure are related. These studies use econometric methods to tease out some relationships and sense from the noisy reality of the cost data. The econometrician's approach is to formulate some ideas about how the costs of producing a number of outputs (intermediate and final) vary with the quantity (& quality) of the outputs themselves and test those ideas against the data. And the idea we want to test is a fairly simple one – ***does the integrated production of multiple outputs cost less than producing them separately?***

SOME MORE TERMINOLOGY

There are a couple of terms that are useful to an understanding of the insights of the econometric models.

The first is *economies of scope*. The scope refers to the scope of a firm's activities and whether it covers the production of more than one product or service. So the scope, for example, of a vertically integrated water supply business covers the collection and storing of raw water, the treatment of it and the distribution of it to the final consumer. This integrated scope produces economies if we estimate the costs of these activities when integrated are lower than if they were specialised activities undertaken by separate firms. The converse - diseconomies - arises if the total costs of an integrated supply chain are higher than those associated with specialisation across the supply chain.

The econometric models postulate that these economies of scope might be observed when at least one of two underlying drivers is present:



Indivisible inputs

- Some inputs can be shared across the supply chain and which would otherwise be duplicated
- An example might be the CEO's company car



Cost complementarities

- These are present when it can be observed that the production of one good makes it cheaper to produce another
- An example might be producing two car models in the same assembly plant. Another might be a financial services firm spreading risks across a portfolio of products

The second term to mention is *separability* or its converse *non-separability*. This relates to how costs and outputs relate across a number of outputs or services.

Take as a simple example a decision about printing on a home computer. The ability to print requires the inputs of some hardware (the printer) and some consumables (the printer ink). If the costs of printing were truly separable, then to minimise those costs we would simply buy the cheapest printer and the cheapest ink. However, the cheapest ink rarely works with the cheapest printer (which in this example might be part of the printer manufacturer's business strategy). Thus when deciding which printer to buy we would also take account of the price (& probably quality) of the associated ink. We might end up spending more than the cheapest printer-ink combination, but this is because the decisions are non-separable.

So non-separability occurs when one activity influences another so that input & output choices are interdependent across the supply chain. Integration could be a response to these cost dependencies and could, in theory, result in higher costs overall. But it is the interdependence of the required decisions that drives a need for coordination and potentially vertical integration.

SOME ENERGY SECTOR RESULTS

We begin our review with the energy sector. This sector has been a focus for reform in many developed economies with the production of energy re-structured into the vertically separate component parts of generation, transportation, distribution and supply. As a result, this sector has been a fertile area of research for academics testing the concepts of economies of scope and separability of costs.

Arocena, et al (2009) tested for the presence of scope economies in the US electricity industry, but also provide a comprehensive literature review of academic studies that have tested for vertical integration economies in the energy sectors.

Perhaps surprisingly given the regulatory hunger for market reform & separation in the energy sectors, the majority of these studies (15 of 18) suggest that separation of the supply chain should be rejected in favour of its integration. More specifically this body of evidence finds that:

- ❖ Generation and distribution are not separable activities, leading to the conclusion that coordination of input choices across the supply chain through integration is a superior and more efficient market structure;

- ❖ There is support for cost complementarities across the supply chain in energy, which as Baumol et al (1982) shows is a sufficient condition for the presence of economies of scope²; and
- ❖ Significant evidence of scope economies, quantified as anything up to cost efficiencies of 40-50%.

RESULTS FROM INTERNATIONAL WATER SECTORS

Saal, et al (2011) have provide the most recent and extensive review of the available econometric evidence on economies of scope in water & sewerage, both in international water markets and for England & Wales. Table 1 summarises the available evidence from a range of international water sectors, which is adapted from Saal, et al (2011).

Table 1: International water evidence on modelling of scope economies

Study	Market & sample studied	Main Findings
WATER SUPPLY		
Garcia et al (2007)	United States (1997-2000), 171 vertically integrated suppliers, 17 production only, 15 distribution only	Diseconomies between wholesale and retail functions, scope economies for smaller firms with high input prices for water
Kim & Clark (1988) and Kim (1995)	United States (1973)	Scope economies in joint supply of residential and business customers
Urakami & Tanaka (2009)	Japan (2001-06), integrated and specialised suppliers	Scope economies between water purification and delivery, estimated at 53% savings
Urakami (2007)	Japan (2003), integrated and specialised suppliers	Scope economies between water purification and delivery
Hayes (1987)	United States, 475 utilities (1960,1970, 1976)	Scope economies between wholesale and retail, smaller for larger size firms
Torres & Morrison Paul (2006)	United States, 1996 AWWA survey	Scope economies between wholesale and retail functions
Martins et al (2008)	Portugal, 218 utilities	Scope economies between water treatment and distribution system management
Garcia & Thomas (2001)	France, 55 utilities	Scope economies between water supply and network losses
WATER & SEWERAGE		
De Witte & Marques (2011)	Portugal, 63 utilities (2005)	No evidence of scope economies between water and sewerage
Nauges & Van den Berg (2008)	Brazil, Moldova, Romania	Find scope economies between water & sewerage but not quantified
Malmsten & Lekkas (2010)	Sweden, 25 utilities (2005)	Scope economies between water volumes and waste water volumes

Source: Adapted from Saal, et al (2011a)

The thrust of these studies is to suggest support for scope economies between production and distribution / network activities in water supply systems. On the issue of integrating wholesale and retail functions, on this evidence alone the jury would still be out. Some studies show diseconomies, others find economies. On economies of integrating water and sewerage functions, the econometric literature has even less in the way of clear cut findings.

² Baumol, W., Panzar J.C. and Willig, R. (1982) Contestable markets and the theory of industry structure. San Diego, CA: Harcourt Brace Jovanovich.

RESULTS FOR WATER (& SEWERAGE) IN ENGLAND & WALES

Our look at the evidence produced by the econometric models finishes with a review of the work relating to England & Wales. There are two categories of findings to take on board: the first is some earlier evidence from a number of mainly academic studies, while the second is some new evidence that can be considered as the most up to date and thorough view we have from the empirical evidence.

EARLIER EVIDENCE FOR ENGLAND & WALES

This earlier evidence – summarised below in Table 2 – uses a variety of modelling approaches to say something about economies of scope in water supply & sewerage.

Table 2: Earlier evidence on economies of scope for England & Wales

Study	Market & sample studied	Main Findings
WATER & SEWERAGE		
Lynk (1993) and Hunt & Lynk (1995)	England & Wales, 10 River Water Authorities and 28 water only companies, pre-privatisation period	Evidence of cost complementarities between water supply volumes and some wastewater volumes and complementarities between water supply and environmental management
Saal & Parker (2000)	England & Wales, water & sewerage companies (1985-1999)	Evidence of cost complementarities between water and wastewater loads. Evidence of non-separability between water & sewerage
Stone & Webster Consultants (2004)	England & Wales, water & sewerage companies, water only companies (1992 to 2002)	Mixed evidence on economies diseconomies of scope between water and sewerage services. Evidence of cost complementarities within water supply chain and converse within sewerage supply chain
WATER SUPPLY		
Stone & Webster Consultants (2004)	England & Wales, water only companies 1992 to 2002	Evidence of cost complementarity between water production and distribution activities

Source: Adapted from Saal, et al. (2011a)

The studies by Lynk (1993) and Hunt & Lynk (1995) are noteworthy because they suggest that the way the sector was privatised resulted in the loss of some coordination efficiencies. Specifically the separation of environmental management from water and sewerage operations gave up the previous economies of scope between these functions. This dislocation remains evident to the present, with water service providers, and more so Ofwat, questioning the scope of environmental investments supported by the now separate environmental regulatory functions.

The Saal & Parker (2000) results also pinpoint this role and influence of the recent quality agenda in water & sewerage. They find evidence of economies of scope once water and sewerage outputs are adjusted for changes in the quality of the volume throughputs. This could suggest that internalising environmental externalities between the two functions may be a source of cost efficiencies, a point we will come back to later in the report.

The Ofwat commissioned study by Stone & Webster Consultants (2004) confirmed the old maxim that different models can give different answers with the same data. A variety of ways of looking at the data resulted in conflicting evidence on the integration of water and sewerage. Within the sewerage supply chain there was no support for integrating networks and sewage treatment. By contrast, integration of the water supply chain was associated with strong economies of scope.

One further set of findings of note comes with Bottasso and Conti (2009).³ This study confirms the tentative Stone & Webster finding of diseconomies of scope between water supply & sewerage services. But notably, these authors at the same time reject separability between water & sewerage costs. This hints at the idea that integrating water & sewerage service may not bring cost benefits, but nevertheless input and output choices across the two services require coordination. This brings us back to the earlier findings of Lynk (1993) and Hunt & Lynk (1995) which highlight the benefits of coordinated decision-making when multiple objectives – delivery of public water & sewerage services and the management of environmental impacts – are present.

NEW EVIDENCE FOR ENGLAND & WALES

Two recent econometric studies (Saal et al., 2010 and Saal et al, 2011b) bring our overview of the evidence for England & Wales completely up to date.

Saal et al. (2011b) takes an updated look with data for the WoCs and WaSCs in England & Wales over the period 1992-93 to 2008-09. This study develops a new & more detailed way of measuring the difference in costs that arise from economies of scope under integration compared to the hypothetical alternative of non-integration.

The word hypothetical is important to note here. The current structure in England & Wales means we can only measure the performance of the whole – either a whole water supply company (WoCs) or a whole water & sewerage company (WaSC). Using the estimated models, the authors compare this with the sum of the parts when any cost interactions (for example the cost complementarities mentioned above) identified in the data are omitted. This sum of the parts calculation is a bit like a “what if” – what if things were produced separately, rather than on an integrated basis. This doesn’t capture the possibility that specialised separate producers might do their bits differently (different technology and processes). But within the constraints of the data for England & Wales, this “what if” is the best that these econometric models can offer us.

Table 3 below sets out some headline results.

Table 3: The costs of the integrated whole vs. the sum of the parts - new evidence for WaSCs

Scope of integration	% change in costs with the sum of the parts compared to the integrated whole	£m change in costs with the sum of the parts compared to the integrated whole
Integration of water & sewerage	-13.3%	-£52m
Integration of water supply functions	+20.2%	+£78m
Integration of sewerage functions	+19.1%	+£74m
All water & sewerage functions	+26%	+£101m

Note: These estimates are calculated on the basis of the sample average sized water & sewerage company.

Source: Saal (2011b)

The “whole” of an integrated company that looks like the average water & sewerage company is estimated to cost 26% less than the counterfactual of the same integrated functions undertaken on a stand-alone basis. Break that down a bit and it can be seen that the economies come from having water supply functions vertically integrated and sewerage functions vertically integrated – the integration of water and sewerage in

³ Bottasso, A. and Conti, M. (2009) Price cap regulation and the ratchet effect: a generalised index approach. *Journal of Productivity Analysis*, 32(3), pp. 191-201.

isolation from everything else goes the other way on this “what if”. So the picture this paints is that while it could be less costly to run integrated water and sewerage as separate businesses, operating water & sewerage as a combined business is still good for us so long as the water and sewerage functions are integrated across their respective supply chains. Moreover, like Bottasso and Conti (2009), this work rejects the separability of water and sewerage services implying water-sewerage integration brings some form of coordination benefit albeit with the higher (than otherwise) costs shown in Table 3.

A measure of how good this may be for the consumer can be gauged from what these figures mean in terms of the average bill. The 26% saving from integration equates to an average bill saving of about £100 per year per connected customer.

The work reported in Saal, et al (2010) focuses on scope economies within water supply and specifically water supply from WoCs. Two particularly noteworthy findings emerge:

- ❖ First, very small scope economies are estimated for wholesale and retail functions but these are within the margins of error. In other words, this evidence suggests that retail separation may, but would not necessarily, cost more than integration.
- ❖ Secondly, scope economies in water production (as opposed to distribution) vary considerably dependent on the type of source. Companies operating borehole sources would be better off as integrated operations. For other sources such as larger upland reservoirs, the findings are less clear cut. This we suspect captures the reality of cost diversity in water sources that derive from the geography of catchments and supply areas. The importance of this latter point is something we will return to later in the report.

A SUMMARY ASSESSMENT OF THE NUMBERS

Our review shows that there is a consistent body of empirical evidence that supports the choice of a vertically integrated structure of production. That is, given the choice between integrated production of the “whole” and specialised supply of the “parts”, the analysis of the cost data would advise integration.

Econometric models rarely enjoy the comparability found in other empirical literatures (like medical science). The real world data generated by business life never matches the cool, clinical precision of a laboratory experiment. Hence, with the econometrics of industry structure, any inferences must be mindful of the diversity of data quality, model specification and econometric method that will have been used.

Of course, individual statistical analyses can be challenged, but the overwhelming weight of this evidence should clearly be pertinent for policy makers wrestling with questions of the most appropriate structure or the water industry.

The evidence that can be observed in other walks of life bolsters this conclusion for water. Joskow (2010) in a review of up to 1,000 empirical studies of the transactions cost explanations for vertical integration concludes:

“The overwhelming conclusion of this large number of empirical studies is that specific investments and other attributes that affect transactions costs are both statistically and economically important causal factors influencing the decision to vertically integrate.” (Joskow, 2010)

Similarly, the comprehensive review by Lafontaine and Slade (2007) of over 150 academic studies – everything from petrol refining & sales to brewing to TV programming - gives rise to the revelation:

'we did not have a particular conclusion in mind when we began to collect the evidence.... We are therefore somewhat surprised what the weight of evidence is telling us. It says that, under most circumstances, profit maximising vertical-integration decisions are efficient, not just from the firms' point of view but also from the consumers' points of view.' (Lafontaine & Slade, 2007, p. 680)

And if vertical integration works in the interests of consumers, Lafontaine & Slade (2007) suggest the following conclusion that flows from this weight of evidence:

*...faced with a vertical arrangement, the burden of evidence should be placed on competition [**we would add** "or regulatory"] authorities to demonstrate that that arrangement is harmful before the practice is attacked.* (Lafontaine & Slade, 2007, p. 680)

But a challenge remains. Do the factors identified in the theoretical literature – such as specific investments, transaction costs, efficiency of decisions to vertically integrate – lie behind these findings we observe for the water industry? Can the empirical results be explained by the reasons suggested in the economics literature? This is the question to which we now turn, and to answer it, we needed to talk to those who know about how utilities work.

*what those in the business
said about industry structure*



HOW IT WORKS IN THE WORLD OF WATER

We have presented the question of industry structure in terms of a choice: a choice between buying inputs in the market or doing the same through self-supply as an integrated business.

The vertically integrated structure for the water industry was not a choice as such – at least not for those who are now accountable for the delivery of water & sewerage services. It was one of the inheritances that came with the new regime and the privatisation of the River Water Authorities in 1989. Water & sewerage services are largely local, at most regional and determined by the geography of people and hills. The origins of water lie in local waterworks companies and municipal drainage or sanitation services.

However, since that privatisation inheritance the water industry in England & Wales has been busy making choices about how to run its business driven, in part, by regulatory incentives to reduce costs. Hence, a range of structures now exist across the country. In Scotland and Northern Ireland a measure of separation in the guise of PPP/PFI has been a feature of the publicly owned water utilities. The privately owned companies in England & Wales have not been slow to use the market – outsourcing of call centres, outsourcing of leakage gangs, laboratories and procurement of works construction are all examples – when using the market makes most sense to the bottom line and all the while integrated management structures exist to ensure services get delivered. A not very often quoted fact for the industry in England & Wales is that in 2009-10, more was spent on hiring and contracting services (in the market) than was spent on employing people to do things within the companies.⁴

This reality paints a somewhat more refined picture of what vertical integration actually looks like in the water industry. It means that in the choice of market vs. the firm, water companies in reality have used both options when it comes to supplying inputs. It is not only the inputs, but also the end goals – the outcomes – that help to define the importance of vertical integration in water. Those end goals are defined first by statute and secondly by the licences of appointment. And maintaining clarity of accountability for delivery of these outcomes was a key theme emerging from our discussions and a key benefit of a vertically integrated management structure.

The Water Industry Act 1991 contains the definition of the end goals. We have summarised the ones we think are most important:

⁴ From the 2009-10 June Returns, for water supply services (Table 21) £223 million was spent on hired & contracted services compared to £194 million on employment costs. For sewerage services (Table 22) it was £263 million on hired & contracted compared to £197 million on employment.



Part III, Ch I General duties of water undertakers

- s37 It shall be the duty of every water undertaker to develop and maintain an efficient and economical system of water supply within its area.



Part IV, Ch I General functions of sewerage undertakers

- s94(1) It shall be the duty of every sewerage undertaker
 - (a) to provide, improve and extend such a system of public sewers (whether inside its area or elsewhere).. and so to cleanse and maintain those sewers ... as to ensure that that area is and continues to be effectually drained
 - (b)to make provision for the emptying of those sewers and such further provision (whether inside its area or elsewhere) as is necessary from time to time for effectually dealing, by means of sewage disposal works or otherwise, with the contents of those sewers

The emphasis in these duties on *system* is noteworthy and we think important. The Oxford Dictionary offers this definition of *system*:

a set of things working together as parts of a mechanism or an interconnecting network; a complex whole

(Source: <http://www.oxforddictionaries.com/definition/system>)

This message of interconnection featured heavily in our discussions with industry people; both in water and other sectors, as did the notion of component parts working together (i.e. non-separability).

Another important word from these duties is *area*. The importance of this word in water is evident upfront in the licences of appointments for water and sewerage undertakers. The first schedule of those licences talks in some detail (even in some cases individual addresses) about the geographical area for which appointments are made.

Thus, water and sewerage businesses at their most fundamental are geographical systems. Or at least that is how they are constituted in law. Is that an accident of history or indeed a reality of geography? This reality also featured strongly in our discussions.

VIEWS FROM THE FRONT-LINE

We conducted a series of interviews with a range of people with considerable experience of running, directing, observing and also regulating water businesses throughout the UK. We also spoke with people with similar experience from other utility sectors – energy and rail. These interviews were key to joining together the three types of evidence that we have explored. Could they provide us with an understanding as to whether the reasons identified in the theoretical literature to expect vertical integration to be beneficial do indeed explain the favourable empirical results?

THE VIEW FROM WATER

It could be tempting to anticipate that speaking to people from the water sector would generate a largely defensive set of views. But that wasn't our anticipation and nor was it what we heard. There was evidence of

convergence of views from people with quite opposing experiences and roles, as well as differences and some genuine expressions of “not sure about that”. The key points emerging from discussion with practitioners to explain the likely substantial cost implications of separation are set out below, and do indeed chime with the drivers identified in the economic literature review.

These are *our* interpretations of what we heard:

WATER & SEWERAGE SERVICES ARE PROVIDED BY COMPLEX INTEGRATED SYSTEMS

It is the efficient management of a *system as a whole* that is key to the effectual provision of water and sewerage services. Our current undertakers – be it for water supply or sewerage – are the stewards of systems. A system for providing water supplies efficiently and another that provides effectual drainage through public sewers and effectual disposal of what is in those public sewers.

As with any system of interrelated working parts, the nature and complexity of the interfaces within the system is important. In water the interfaces are both complex and numerous; and they criss-cross the various components of the vertical supply chain.

Further complexity arises from what can be termed product heterogeneity. Take energy as a contrast. There is a range of ways of producing energy, but the end product is still the same – kilowatt hours of a certain voltage or calorific value. Hence, in energy we observe variety in the way that power and heat are created, but homogeneity of what is transmitted via the wires and pipes. In water this heterogeneity runs right across production and delivery and the inter-relationships occur in both directions – both up and down the production chain. The nature and quality of the distribution system affects the quality of the water that is conveyed as well as the quality of the water being conveyed affecting the state of the distribution network – optimisation requiring integrated treatment and distribution decisions.

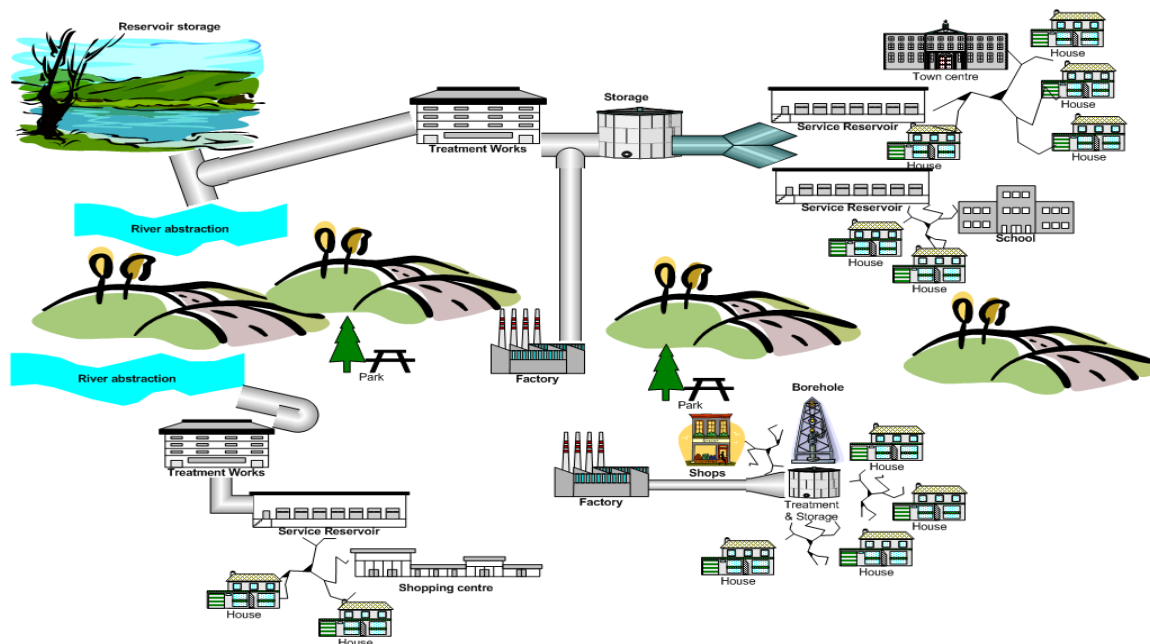
GEOGRAPHY AND TOPOGRAPHY ARE KEY

Integrated management of sources, works and pipes is a response to the geographical realities of river basins & catchments and the need for supply systems to grow around and service the populations that require them.

The picture shown below as Figure 3 is from our imaginations fuelled by our discussions with industry people. It highlights a number of the points made to us: the nature and complexity of the system, with numerous interfaces; the difficulties associated with practically defining the various components of the supply chain that are referred to in the policy debate such as ‘upstream’ and ‘downstream’; and the importance of geography and topography.

As the insights from the theoretical economic literature reveal, it is when the supply system in question is a complex whole, that the costs of using markets to co-ordinate activities can become high, and perhaps higher than the alternatives.

Figure 3: A schematic of how it looks in water supply



THESE SYSTEMS ARE DESIGNED TO MEET SPECIFIC LOCAL NEEDS

The complexity is exacerbated by asset specificity, whereby water sources and treatment plant are designed to meet the specific local circumstances. We heard that network configurations are ideally optimised to meet the demands & needs of the consumers in specific localities and in turn treatment works location and processes are determined by the water sources that feed them. It is these almost symbiotic relationships that give rise to the asset specificity that we think is observable in water (& sewerage), more so than other sectors. And this specificity also creates important cost dependencies across the value chain.

This asset specificity is another of the reasons highlighted in the theoretical literature explaining why vertical integration may be a preferable means of co-ordinating activities than the use of markets.

Figure 3 also illustrates another feature of water that was mentioned to us. The asset specificity – driven by the geography of regional catchments – means that even individual water businesses are typically composed of a number of discrete supply systems with limited degrees of interconnectivity (though interconnection has been a focus for recent investment across a number of companies where the economic case can be made) that have grown and developed over a number of generations. And a significant number of those systems are small. If water were to be compared to generation in energy then it would be the fledging micro-generation that is embedded within distribution networks (the growth of which is one of the challenges for the current structure of the energy sector) not the macro-generation that feeds the national grid.

The numbers back up this picture. The June Returns for England & Wales show that water companies access about 1,700 water sources, with close to 1,300 of those smaller borehole sources that often nestle within the networks and populations they serve.⁵ These sources feed around 1,200 works, which is interesting in itself as on a crude average measure each works is served by 1.4 sources. Crude no doubt, but indicative of the asset specificity present in the sector. Convert these sources to water supplied and the same June Returns show that 32% of supplies comes from these smaller borehole sources, only about 26% from the larger impounding

⁵ Our data is taken from the 2009-10 annual June Returns submitted by companies to Ofwat.

reservoirs (though it does vary across companies), with the remaining 42% taken directly in the form of river abstractions.

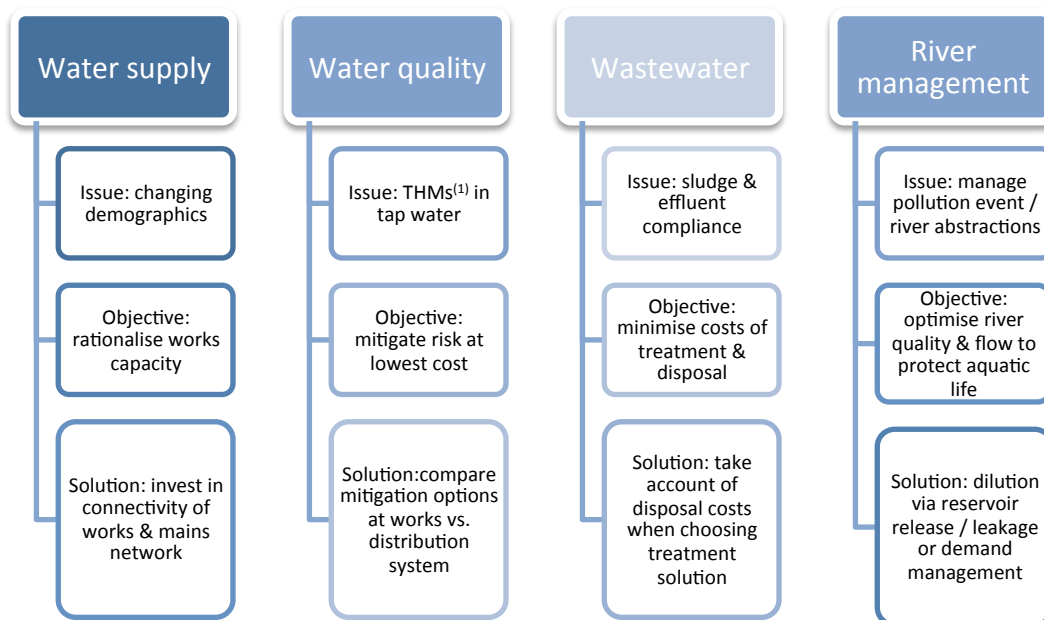
The picture for sewerage services is even more disparate with around 6,400 sewage treatment works discharging to the water environment on a controlled regular basis and close to 25,000 network overflows available for discharges on an intermittent basis.

These numbers drive the observations we heard about lots and lots of interfaces – parts of the system that need to interact or transact – in water & sewerage. And this picture strongly contrasts the vertically separated energy sector where supply is dominated by around 30 large power stations who feed the high voltage national grid and by a handful of gas terminal points that bring that particular fuel to UK shores.⁶ If comparison across utilities is possible, water appears more akin to the railways where the number of entry points to the networks (a.k.a. stations) – akin to sources – are around 2,500 in total and even in the post British Rail days there remains strong Government control of mainly regional or line specific operators making use of regional, but interconnected, networks.

COSTS ARE INTERDEPENDENT AND ARE MANAGED BY OPTIMISING PROCESSES JOINTLY

The view we heard was that integrated management of these asset functions makes it easier to expose and make the trade-offs across numerous activities and processes. For example, the cost & location of sources and the pipe system needed for transportation. These lines of argument start to paint the picture that a water or sewerage system is really like the cogs of a wheel. Everything has to work in tandem for the wheel to turn. Figure 4 below elaborates some of the examples we were quoted of this need for components to work together across the chain of activities:

Figure 4: Some examples of integrated decision-making in water



(1) Trihalomethanes (THMs) are one the most widespread organic contaminants in drinking water. They typically are formed from reactions with chlorine used in drinking water treatment. Consumption of water with THMs has been linked to a number of health risks.

⁶ By large we mean plants with installed capacity > 1 GW, which according to Digest of Energy Statistics meet around 90% of UK energy demand.

A related point that was made consistently is that these integrated cogs mean that it is very difficult (possibly even verging on pointless) to try to define the boundaries between the asset (some people used the label wholesale) functions in water (& sewerage). And if these boundaries are difficult to define, it would seem brave for any regulator to start regulating on the basis of some assumed view of these boundaries. The danger – as was suggested by at least one regulator we spoke to – is that real business structures and processes start to mirror the image of some virtual regulatory view about those structures and processes.

The integrated cogs also bring other types of tangible benefit. One that was quoted springs from the diversity of asset knowledge and experience that integration brings. This, it was suggested, makes it easier within an integrated structure to forecast and understand the costs of the asset base. Other comments we heard echoed this point. This diversity of knowledge – which it was said contrasts with electricity where people tend to specialize in either power or wires - stems from the similar core competencies required across the water functions (excepting perhaps clean and dirty water). Again the message is that in water – at least for the asset bits – understanding the whole and not just the parts matters.

MANAGEMENT COSTS ARE REDUCED IF INTERESTS ARE ALIGNED UP AND DOWN THE SUPPLY CHAIN -

The many and varied interfaces in water & sewerage make information flows crucial for the management of performance risks. And information is costly to acquire, monitor and maintain giving rise to an important example of transactions costs. The more parties involved the higher the costs and the greater the risk that the parties' interests diverge and the greater the risk that the contracts do not cover all eventualities. One area highlighted in a number of our discussions was that it is when things go wrong or fail that the weak points in these interfaces – particularly when the relationships are arms length and contractual - are exposed.

We heard many examples of situations where separate parties were involved in components of production and, particularly when under pressure, the parties resorted to working to the terms of their contracts, rather than working together to resolve the problem, regardless of where the blame or the costs of rectification lay.

The context most likely to result in this breaking down - we were told – is where asset owners and asset operators are different. For example, accountability for pollution incidents rests with an asset owner (the principal), the day to day effort of avoiding pollution incidents sits with an asset operator (agent), but the operator argues they can only make best use of the tools (assets) they are given by the owner and it's not their fault when the owner makes the wrong investment. The impasse comes from separating the jobs of day to day operation from longer term investment planning.

The clearest view was that accountability is easiest to monitor and ensure within integrated management structures. With common sense, a bit of goodwill and easy to define service level agreements – which implies the absence of opportunistic behaviours - we also heard that accountability for some of the parts rather than the whole can also be made to work. But this is dependent on the particular parts in question. It appears easiest in a retailer-wholesaler relationship. Whereas in the more complex operational territories and a common view was the clear accountability is compromised by inevitably incomplete contractual arrangements.

Accountability that is easiest to monitor and ensure is also the easiest to communicate. The importance of this is greatest when things go wrong at the consumer end. We heard messages about consumer experiences in other separated sectors – energy and rail for example - which reinforced the view that a diffusion of accountabilities results in no accountability. In part, this is undoubtedly a function of system design and incentives more than say organisational structure. For example, in water in Scotland simple things like pre-payment of invoices ensures no ambiguity around supplier of last resort. Whereas on the railways short term

objectives reinforced by performance reliability penalties can give rise to large amounts of effort seeking to establish blame lies with someone else.

PROVIDERS NEED TO BE ACCOUNTABLE TO CONSUMERS

In an industry that provides services that are vital to public health and environmental protection accountability is clearly important. In general we heard that accountability is easiest to monitor and enforce within integrated management structures. We also heard that accountability for the whole means you care about the whole and you plan and manage accordingly. But it is important not only to have accountabilities and interests aligned - they also have to be focused on the interests of consumers.

Theoretically, one way of providing more accountability to consumers is to provide consumers with a choice. But to work, this requires that the consumers' choices have a meaningful impact on the service price and quality. An important message we heard – largely from the experience of energy - is that retailer incentives are only aligned with the consumer interest in some respects. For example, a consumer's retailing choice is predominately offered on price and price alone.⁷

This means retailers are only interested in the price offered by the wholesaler, because the reality is that this is the only thing they can influence. The quasi- public good (e.g. joint-ness in production) and monopoly characteristics of networks mean that no amount of customer switching will disturb the needs of a network of long-lived assets. The message offered here is that if service quality is more or less universal, then all retail competition does is create opportunities for arbitrage on price.

It would be foolish to ignore that change can be a force for good. On the more limited question of retail separation, the lessons learnt from experiences to date in Scotland highlight that the issues go far further than simple NPV calculations⁸. They highlight the importance of keeping visible the end goal, learning along the way and approaching with caution through careful & deliberate policy design.

We heard a range of views regarding whether a separate retail element would enhance or hinder the relationship between producers and consumers. But aligning with the consumer interest is not necessarily about structure. Good managements will deliver good outcomes under any governance arrangement. And creating the right consumer ethos is something that Government & regulators can shape through getting incentives right as much, if not more so, as industry structure.

INTEGRATION CAN PROVIDE CO-ORDINATION WHERE MARKETS CAN'T OPERATE

Markets can't operate well when they are awash with non-market values due to externalities or public good benefits. Markets tend not to be the most effective way of delivering the public as well as private benefits of water & sewerage services. Due to the nature of the services, most consumers can't simply pay for and consume their own bit of the service. Their consumption decisions are interdependent with others' and can have far reaching effects. When public health and environmental as well as economic outcomes matter, then

⁷ Recent academic investigation of consumer choices in the electricity market finds that the effectiveness of competition is hampered, not only by the cost of switching which deters consumers from changing supplier, but also by the choices that consumers make. Wilson & Waddams Price (2010) found that consumers switching for exclusively price reasons on aggregate only managed to appropriate half of the potential gains available to them and 17% of consumers switching were actually worse off after their change of supplier.

⁸ Water Industry Commission for Scotland (2011) Introducing retail competition in the UK water/waste water sector: a 'lessons learned' paper. (<http://www.watercommission.co.uk/UserFiles/Documents/LessonsLearned.pdf>)

integration provides the opportunity to spread the risks and costs of the public as well as private good. In addition, coordination and control are easier to ensure.

Carbon management and cost was one of the examples cited to us. Taking water from the environment and then cleaning it for human consumption uses energy and hence creates carbon. Within the same river catchment, collecting the wastewater and treating it before discharge also uses energy and creates more carbon. Some of the latter carbon can be avoided if abstraction is timed so that river flow rather than treatment technology is used to clean the sewage pollutants. Such innovative management requires that all costs and benefits of the impacts are internalised and this is what integration (in this case of water and waste functions) brings.

The case for using integration of functions to manage environmental externalities was also revealed to us through areas where integrated decision-making is presently missing or partial. The interesting thing to observe is that the drivers for some form of re-integration in these 3 cases has tended, but not entirely, to come from Government & regulators.

Figure 5: Examples of where integration encourages & supports internalisation of externalities

#1 Catchment management

Wessex Water don't grow food or keep livestock, so why do they employ a team of 6 people whose job is to provide to expert agronomic advice to local farmers. The answer is simple. Because helping farmers manage their farms in particular ways makes it cheaper for Wessex to manage water, specifically the quality of their raw water sources. Controlling chemical and pesticide use at source avoids expensive and carbon hungry water treatment.

#2 Surface water management

Ofwat points out that surface water flows impose costs on sewerage companies & customers. The current partnership model via Surface Water Management Plans may improve things. But we heard expressed the view – from the environmental regulator we should add - that fully integrating responsibility for surface water management within sewerage companies could encourage a more holistic and efficient balance between capacity in the sewer system and control at source.

#3 Private sewer adoption

Transfer of private sewers to the sewerage undertakers is a done deal, but why? Here is what Government said: "Transfer will also significantly help address a lack of integrated management of the sewerage network as a whole, and provide much greater efficiency of effort, environmental stewardship and expenditure at a time when climate change impacts and housing growth may impose greater demands on urban drainage systems."

The key message highlighted by these 3 cases is that a bit of coordination and a bit of integrated thinking can deliver better outcomes for both the environment and the bottom line. The sub-text is that having water businesses that have responsibility for managing their systems as whole – from source to sea – encourages this kind of thinking.⁹

⁹ Further details on the background to these examples is available at: #1 See the recent report Wessex Water, Catchment management: managing water – managing land, April 2011. (available at

If planning and coordination helps to deal with the missing markets that give rise to things like externalities in the here and now, they also help to keep an eye on the future.

Looking forward we repeatedly heard the view that an integrated business would have stronger incentives to think about the future. In the integrated water industry this emphasis on long-term planning and risk management takes institutional forms like, for example, 25 year water resource plans and even strategic direction statements. In the separated worlds of energy and rail, as contrasts, this focus on strategic planning is less apparent, and perhaps even absent. The consequence is that responsibility for the future risks is elevated to our elected politicians when ownership of those risks is unclear.¹⁰

THE VIEW FROM OTHER SECTORS

We have included most of the headlines of what we heard about the experiences of the energy and rail sectors in the discussions above, but some further points put to us also deserve highlighting.

ENERGY SEPARATION IN REALITY

Few, if any, would seriously challenge the view that separation in energy has worked. Energy businesses – especially in generation – are leaner and perhaps meaner. Revealing and ultimately removing inefficiencies present under public central planning was the right thing at the time. However, separation of energy was conceived at a time of surplus and inefficient capacity in generation. What can be questioned is whether the market that separation created is looking tired in the face of a new agenda driven by security of supplies and the decarbonising of energy.

This new agenda in energy has strong parallels to one that is already established in water. The informed view in water is that demographic and social trends are driving rising demands for water across all sectors, while environmental constraints and climate change uncertainties are constraining availability and driving water's carbon reduction agenda.

Thus if new interventions and incentives are required in the separated energy markets to resurrect the almost dormant practice of long term capacity planning, is now the right time to be importing an old energy business model into water? This energy model, originally aimed at driving efficiency in a time of surplus supply may not be the best one for addressing concerns about supply *insecurity* in water.

The introduction of some commodity trading could well be part of the mix in water for managing the future supply demand balance. But the consensus from our discussions was that better incentives and new tensions

<http://www.wessexwater.co.uk/environment/threecol.aspx?id=7199&linkidentifier=id&itemid=7199>); #2

<http://www.ofwat.gov.uk/future/sustainable/drainage/current> and

<http://archive.defra.gov.uk/environment/flooding/documents/manage/surfacewater/swmp-guidance.pdf>; #3

<http://www.defra.gov.uk/news/2010/09/06/private-sewers-statement>

¹⁰ Recent research in the energy sector

(<http://www.ofgem.gov.uk/MARKETS/WHLMKTS/DISCOVERY/Documents1/Project%20Discovery%20Presentation%20-%20Ian%20Marlee%2016th%20March%202010.pdf>), found consumers overwhelmingly felt that the Government was most responsible for maintaining secure supplies (over 55% of consumers held the Government responsible), whereas under 15% of consumers felt that energy suppliers were responsible, Ofgem less than 15% and generators less than 5%). This compares to recent research in the water sector (*Our Water, Our Future: A survey of public opinion on water reform issues for England & Wales: A report by ICS Consulting & YouGov*). This research found that 51% of consumers felt that water companies should have the most responsibility for meeting the challenges facing the water sector, with 30% placing responsibility with Government. This comparison may suggest that in the absence of a clearly identifiable, integrated company providing a service, consumers' may tend to place more responsibility on Government.

to support water trading could have some localised merit, but in a way that co-exists with - rather than supplants - the existing integrated businesses.

THE COSTS OF GETTING THE TRAINS TO RUN ON TIME

The imperative of safe rail travel drives current Government control & direction of the railways to an extent that is not mirrored in the approach to meeting the imperative of safe drinking water. The Government role in the railways would appear to be compensating for something that is missing in the separated day-to-day management of track and trains, but is present in the integrated water industry.

There also appears to be a significant cost to the complex, detailed and fragmented approach to expenditure & performance control in rail, which becomes evident when comparisons are made with rail network operators in Europe and the U.S. The message here is that addressing the practicalities of efficiency improvement through encouraging more streamlined and effective ways of doing business – becoming best in class - offers more certain & tangible gains than theory driven reforms and restructurings.

In the foreword to his recent report on value for money in the GB rail sector Sir Roy McNulty makes the point that:

The causes of GB rail's excessively high costs are many and complex. The Study was asked to examine "barriers to efficiency" and we have identified that among the principal barriers are fragmentation of structures and interfaces, the ways in which the roles of Government and industry have evolved, ineffective and misaligned incentives, a franchising system that does not encourage cost reduction sufficiently, management approaches that fall short of best-practice in a number of areas that are key cost drivers, and a railway culture which is not conducive to the partnership and continuous improvement approaches required for effective cost reduction.¹¹

The report goes on to recommend that:

In some cases there may be a strong case for vertical integration, for example where there is one dominant franchised operator, but, in others, intermediate levels of alignment, or cost/revenue sharing, may be appropriate. The Study recommends that the aim should be to have at least two joint ventures or alliances in place by 2013/14 and at least one vertically-integrated pilot in place by about the same time, subject of course to these being demonstrated to represent value for money compared with other approaches. (Summary Report, page 50)

Thus the idea of experimenting again with vertical integration across the value chain in rail is back on the agenda as a means for improving performance and cost efficiency.

¹¹ Realising the Potential of GB Rail, Report of the Rail Value for Money Study, (May 2011)
<http://www.dft.gov.uk/pgr/rail/strategyfinance/valueformoney/realising-the-potential-of-gb-rail/pdf/realising-the-potential-of-gb-rail-summary.pdf>

BEWARE OF UNINTENDED CONSEQUENCES

A final set of remarks relates to how things often don't turn out how you think they will - a theme that we heard more than once and across sectors and across roles within sectors.

Put simply, intended actions often have unintended consequences. Counter-acting anti-competitive behaviour either via the creation of Chinese walls or enforced separation has often been a prime driver of regulatory approaches to market reform. But we believe there are enough words of caution in the evidence provided above to establish that the first priority is to establish that the competitive model is indeed the right choice for industry structure. Only then, does anti-competitive behaviour truly present a concern. Companies working together to share water resources at a time of drought to protect supplies to consumers could, in one light be considered anti-competitive, but it is clearly in consumers' interests. The danger is to repeat the experiences evident in other places at other times. To cite only two:

PETROL RETAILING

In the US, several state authorities prevented the ownership and control of petrol stations by oil companies as they were concerned that the integrated oil companies might discriminate against independent retailers. However, contrary to the hopes of the authorities, the evidence is that retail prices and costs were higher and opening hours shorter, after vertical separation (Lafontaine and Slade, 2007).

BREWING

In the UK brewing companies were required to sell off a large number of pubs in the 1990s in the hope that this would reduce retail prices and increase choice. However, the evidence is that this policy actually led to higher prices and had made both brewers and consumers worse off (Slade, 1998).

what have we learnt about vertical integration in water?



CONCLUSIONS

We started this report with a question:

What is the best way to organise the water industry so that it meets our need for water services now and into the future?

An understanding of the fundamentals of what it takes to produce those water services is vital to answering this question. Reviewing the evidence, our considered view is that observing the way those services are produced today is a pretty good starting point for understanding how to best deliver them into the future.

Sometimes accidents of history and geography lead individuals, businesses, industries and Governments down paths that with hindsight do not generate the best or ideal outcome. When it comes to the organisation of water services, the realities of geography play a large part in explaining why we have what we have. That is, principally vertically integrated service providers that are responsible and accountable for water supply and sewerage *systems*. We emphasis *systems* because a key fundamental is that the delivery of water supply and sewerage requires a set of activities and functions that work together as part of an interconnected whole. And this is embedded in the history of how water & sewerage systems have evolved over decades and even generations.

Another key message is that how the water industry should best coordinate the activities and decisions that need to be transacted can and should be viewed as a choice. This is the choice between the using the invisible hand of the market place versus keeping buying and selling decisions within the business structure.

Neither approach, we suggest, is a priori right or wrong. It depends on the circumstances that determine how things are produced and what governs the behaviour of the people who do the producing. Our review of the factors influencing this choice boils down to the statement that:

“virtually all theories of vertical integration turn in one way or another on the presence of market imperfections – deviations from the long list of explicit and implicit assumptions that are associated with textbook models of perfect competition and anonymous spot market transactions that are mediated through hypothetical perfectly competitive markets.” (Joskow, 2010)¹²

So the simplest way to think about the benefits of vertical integration in water & sewerage is that it overcomes some of the factors that undermine the effective workings of Adam Smith’s invisible hand.

¹² Joskow, P. (2010). Vertical Integration. The Antitrust Bulletin, Vol. 55(3), pp. 545-586

Another point is that market reforms that promote some form of vertical separation are premised on the idea that the requirements for that effective working are, or will be, in place. The problem is that markets and the competing forces they require just aren't in place, nor given the characteristics of the water industry are they likely to come into place, and so the suggested solution is to attempt to create them.

This prognosis and prescription misunderstands or overlooks, we think the first pre-requisite. That is that the requirements to make markets work are present and by extension present in water & sewerage systems. As we have outlined, issues like cost dependencies across functions, coordination of multiple and complex interfaces, the misalignment of interests & incentives and the presence of externalities all point towards the conclusion that those requirements are not sufficiently met for water & sewerage. This conclusion is strongest we think when applied to the asset intensive functions of water & sewerage companies.

These assertions about the fundamentals of doing business in water & sewerage, we also believe, are supported by the balance of experience and data analysis that we have seen, heard and assessed in the course of undertaking our review.

SOME MESSAGES ABOUT VERTICAL INTEGRATION IN WATER

Water & sewerage services are presently in the hands of largely vertically integrated businesses. The case for transferring this responsibility to new and maybe more hands, needs in our view to address or counter six key points:

#1 IF IT AIN'T BROKE DOES IT NEED FIXING?

Arguments around structural reform and competition in the water industry have an element of solutions in search of problems. The public desire for change has not been demonstrated and consumer satisfaction with their water services appears to be comparatively high (against other sectors). However, there are challenges and consumers will rightly expect the industry to meet them. Being more responsive, being more innovative and becoming more efficient should be the benchmarks for any good management. The framework of incentives created under regulation can be both problem and cure in this respect. Creating stronger and clearer incentives that reward good managements can shape how the industry responds to the challenges to a sustainable future for the water industry. That is: be clear about what needs fixing before attempting to fix it.

#2 MANAGING THE WHOLE IS MORE THAN THE SUM OF THE PARTS

Throughout our discussions and reviews we have been struck by the importance attached to holistic management of water & sewerage services. Whether it be drought risks, climate change or flood risks, management of water within its environmental and social context is important and this is best delivered when responsibility and objectives are defined for the whole and not just the parts.

#3 SEPARATION MAY BE SUITED TO TIMES OF SURPLUS BUT SCARCITY REQUIRES SOMETHING DIFFERENT

We have been struck by the views that the successes of separation in energy may not be transferable to water. Or at least it may be unwise to assume they are transferable. Separation in energy was conceived at a time of surplus & inefficient capacity in generation. This model may not be the best one for addressing concerns about supply *insecurity* in water.

#4 INTEGRATION CAN RESULT IN LOWER COSTS (AND HENCE PRICES)

The academic empirical evidence overwhelmingly points to lower costs with the vertical integration of functions within water & sewerage. These lower costs may arise because integrated management allows cost dependencies and trade-offs across functions to be exposed and managed. It's simply cheaper to do it together.

#5 INTEGRATION KEEPS ACCOUNTABILITIES CLEAR

And perhaps vertical integration also results in lower costs overall because one of the things it does is make clear where accountabilities lie. This reduces the costs of managing interfaces and encourages doing the right thing.

#6 WATER BUSINESSES ARE BEST PLACED TO DECIDE ON INTEGRATION VS. THE MARKET

How much a company chooses to self-supply versus how much *it* relies on the market is something ultimately it should determine based on the incentives and objectives it faces. Observation shows that integrated companies may not always get that balance right, but they can demonstrate the ability to adapt and change their business organisation and processes to meet new challenges. And importantly, they should have the regulatory incentives to do this as they seek to provide their services in the most efficient way.

BIBLIOGRAPHY

- Anderson, E. (1985)** The salesperson as outside agent or employee: A transaction cost analysis, *Marketing Science*, Vol. 4(3), pp. 234-254.
- Arocena, P., Saal, D. & Coelli, T. (2009)** Measuring Economies of Horizontal and Vertical Integration in the US Electric Power Industry: How costly is unbundling”, *Aston Business School Research Papers*. RP 0917
- Arrow, K. J. (1969)** The Organization of Economic Activity: Issues Pertinent to the Choice of Market versus Non-Market Allocations’ in *Analysis and Evaluation of Public Expenditures: The PPP System*. Vol. 1, pp. 47-67, Government Printing Office, Washington D.C.
- Arrow, K. J. (1981)** Jacob Marschak’s Contributions to the Economics of Decision and Information, *Mathematical Social Sciences*, Vol. 1(4), pp. 335-338.
- Arrow, K. J. (1975)** Vertical Integration and Communication, *Bell Journal of Economics*, Vol. 6, pp. 173-83.
- Baumol, W., Panzar J.C. and Willig, R. (1982)** Contestable markets and the theory of industry structure. San Diego, CA: Harcourt Brace Jovanovich.
- Bottaso, A. and Conti, M. (2009)** Price cap regulation and the ratchet effect: a generalised index approach. *Journal of Productivity Analysis*, 32(3), pp. 191-201.
- Carlton, D. W. (1979)** Vertical Integration in Competitive Markets under Uncertainty, *Journal of Industrial Economics*, Vol. 27, pp. 189-209
- Coase, R. H. (1937)** The nature of the firm. *Economica*, Vol. 4, 3, pp. 386-405
- Hunt C. L. and Lynk E. L. (1995)** Privatization and efficiency in the UK water industry: An empirical analysis. *Oxford Bulletin of Economics and Statistics*, 57 (3), 371-388
- Joskow, P. (2010)** Vertical Integration. *The Antitrust Bulletin*, Vol. 55(3), pp. 545-586
- Lafontaine, F. and Slade, M. (2007)** Vertical Integration and Firm Boundaries: The Evidence. *Journal of Economic Literature*, Vol. XLV (September 2007), pp. 629–685
- Lynk E.L. (1993)** Privatization, joint production and the comparative efficiencies of private and public ownership: the UK water industry case. *Fiscal Studies*, 14 (2), 98-116
- Saal D. and Parker D. (2000)** The impact of privatization and regulation on the water and sewerage industry in England and Wales: A translog cost function model. *Managerial and Decision Economics*, 21, 253-268
- Saal, D., Arocena, P. and Maziotis, A. (2010)** Economies of integration in the English and Welsh water only companies and the assessment of alternative unbundling policies. *Aston Business School, Unpublished Draft, December 2010.*

- Saal, D., Arocena, P., Maziotis, A. and Triebs, T. (2011a)** Scale and scope economies and the efficient configuration of the water industry: a survey of the literature. Aston Business School, Unpublished Draft, March 2011.
- Saal, D., Arocena, P. and Maziotis, A. (2011b)** The cost implications of alternative vertical configurations of the English and Welsh Water and Sewerage Industry. Aston Business School, Unpublished Draft, February 2011.
- Slade, M. (1998)** Beer and the Tie: Did Divestiture of Brewer-Owned Public Houses Lead to Higher Beer Prices? *The Economic Journal*, Vol.108 (May), pp. 565-602
- Smith, Adam (1776)** *An Inquiry into the Nature and Causes of the Wealth of Nations*, Methuen, London, 1961.
- Stone & Webster Consultants (2004)** An investigation into evidence for economies of scale in the water and sewerage industry in England and Wales; Final Report. Report prepared for and published by Ofwat.
- Rey, P. and Stiglitz, J. (1995)** The Role of Exclusive Territories in Producers' Competition. *RAND Journal of Economics*, vol. 26(3), pp 431-451.
- Ruzzier, Charles A. (2009)** Asset Specificity and Vertical Integration: Williamson's Hypothesis Reconsidered. Harvard Business School, Working Paper 09-119.
- Water Industry Commission for Scotland (2011)** Introducing retail competition in the UK water/waste water sector: a 'lessons learned' paper. (Sourced at <http://www.watercommission.co.uk/UserFiles/Documents/LessonsLearned.pdf>)
- Williamson, O. E. (1971)** The vertical integration of production: market failure considerations, *American Economic Review*, Papers and Proceedings, Vol. 61, pp. 112-23.
- Williamson, O. E. (1973)** Market and hierarchies: some elementary considerations, *American Economic Review*, Papers and Proceedings, Vol. 63, pp. 316-25.
- Williamson, O. E. (1975)** *Markets and Hierarchies*, New York: Free Press.
- Wilson, C. M. and Waddams Price, C. (2010)** Do consumers switch to the best supplier? *Oxford Economic Papers*, 62 (4). pp. 647-668.

*Appendix:
What economics tells
us about industry structure*



APPENDIX: WHAT ECONOMICS TELLS US ABOUT INDUSTRY STRUCTURE

We can readily observe in the world around us that firms that operate in free (or non-regulated) markets often appear to choose a vertically integrated structure. BP extracts the oil, it refines it and it will also sell it. But they can also choose not to be vertically integrated and instead buy what is required in the marketplace. Tesco has steadily expanded from selling groceries to supplying broadband, but hasn't ventured so far that they grow the carrots and build the networks. These examples highlight that products or services can be delivered in a diversity of ways. So there is a choice to be made.

Economists have long been interested in why, given free choice around structure, firms might choose different degrees of vertical integration and whether, and in what situations, this can be in the best interests of the firm, its consumers and other stakeholders. A number of economic theories have been developed that help us understand when a vertically integrated structure should or will prevail.

VERTICAL COORDINATION VERSUS VERTICAL INTEGRATION

Coordination and integration are not the same thing. One – coordination - is the end, the other is the means. All productive activity requires some form of vertical coordination. The myriad of transactions and processes that underpin these production relationships require coordination, but they need not imply or require integration. Markets can be used to deliver this coordination between independent business organisations or the required transactions and processes can be integrated within a single firm. It is this choice between using the market or internal managerial control that means we can ask - under what circumstances is integration preferable to the market?

Adam Smith first introduced the idea that specialisation in the organisation of economic activities would be the spur to improving a society's economic welfare. The father of modern economics commented that: "the division of labour is limited by the extent of the market". A division of labour (or more generally the deployment of inputs) implies specialisation and the "invisible hand" in the form of market price mechanisms providing incentives acts as the guide to the most efficient way of organising economic activities.

Vertical integration can be understood as the converse of specialisation. Instead of buying inputs and selling outputs in the open market, a vertically integrated business chooses to make the input or use the outputs in a further stage of production. It does a lot of things rather than concentrating on a few things. Does that mean it makes us poorer?

The answer is no and it's no because Smith's invisible hand doesn't always work or exist. The "invisible hand" is a metaphor for functioning markets. If there are no functioning markets in the required inputs or outputs, then vertical integration can be understood as a simple recognition of market failure. Moreover:

“virtually all theories of vertical integration turn in one way or another on the presence of market imperfections – deviations from the long list of explicit and implicit assumptions that are associated with textbook models of perfect competition and anonymous spot market transactions that are mediated through hypothetical perfectly competitive markets.” (Joskow, 2010)¹³

WHAT DRIVES VERTICAL INTEGRATION?

We will come back to Smith and the pre-requisites for his invisible hand. But for now it suffices to observe that understanding what drives vertical integration is about understanding how the deviations from the assumptions of competitive markets drive the choice of how to organise a set of economic activities. Our synthesis of the large – and in some cases Nobel Prize winning – literature points to four main sets of reasons why integration can be superior to markets:

- ❖ The first reflects the characteristics of the technologies used in production. That is, the physical and engineering realities.
- ❖ The second relates to transactions costs – which reflect the organisation and governance required to make things work. In part, this derives from some human realities.
- ❖ The third is about incentives and, specifically, more about how we encourage others to do what we want them to do. This is the problem of ensuring the pursuit of self interest translates into serving the mutual interest (as Adam Smith predicts).
- ❖ And finally, in some areas and activities markets simply do not function or even exist (such as the lack of competing water distribution networks).

THE PHYSICAL & ENGINEERING REALITIES:

The first set of literature looks at how things are produced and concludes that if it is cheaper to produce the successive stages of a product together, rather than separately, then vertical integration is a sensible thing. As anyone who has lived on their own as well as together with someone else can confirm, it is cheaper to share the rent and food bills between two – in the jargon, there are economies of scale as the extra person reduces the average cost (per person) of the household bills. In a similar way, doing different household tasks under one roof should also work out cheaper (e.g. a space to cook & eat, wash and sleep). The technical term for this is economies of scope.

These economies can arise because costs are shared across the supply chain – assets such as call centres, operations staff, head office and vehicles are used to carry out different functions. Or they can arise because integration allows adverse impacts in one function to be offset elsewhere, reducing the overall risk profile and so costs.

Or they can arise as, due to the very nature of the production technology, it is cheaper to produce it together – the production and cutting of steel (2 separate processes) are more efficiently located in the same plant to conserve heat and reduce energy costs than located separately. Or closer to our water industry home, lots of sources are located within the same geography as the pipe network as this can make it cheaper to undertake

¹³ Joskow, P. (2010) Vertical Integration. The Antitrust Bulletin, Vol. 55(3), pp. 545-586

abstraction, storage and transport of raw water together. Due to the high costs of moving raw water (without the aid of gravity) it can make sense to co-locate abstraction and treatment – and the treatment technology is matched to the raw water source.

TRANSACTIONS COSTS (AKA THE HUMAN REALITIES)

In his seminal 1937 article, Ronald Coase wondered why firms exist at all and why they do what they do. If Adam Smith's 'invisible hand' was so good, why do we need an organisation like the firm? His answer was straightforward. There are costs to carrying out market transactions – Coase labelled these *transactions costs*.¹⁴ And these costs need to be thought about when deciding the scope of a firm's activities. A firm, after all, is just the managerial control of a set of related economic activities. So, it is sensible for a firm to exist and undertake activities itself if the managerial organisation of transactions within the firm is less costly than using the market.

Transactions costs arise, and make the market more costly, in a number of areas. The costs of searching for and acquiring information required in the market, such as market prices, negotiating contracts, monitoring and enforcing contracts and punishing non-compliance to name a few. Coase recognised that there were costs associated with organising activities both within the market (transactions costs) and within the firm (organisational costs) and it is the balance between these two that determines the optimal size or scope of the firm.

Within this view vertical integration can be understood as a preferred means – over the market - of delivering vertical coordination when it is the lower cost option. These "costs" and "benefits" may derive from the physical and engineering realities that face the firm.

However other factors can also come into this calculus. Oliver Williamson has examined a wider set of reasons as to why the transaction costs of using the market may exceed that of the integration option.¹⁵ Williamson argues:

"The firm is not a simple efficiency instrument...but possesses coordinating potential that sometimes transcends that of the market" (Williamson, 1971, p112).

Williamson outlines a number of reasons why the costs of using the market can be high. These include:

- ❖ *Opportunism* – firms are self-interested – they are concerned with their needs and may behave opportunistically. This would seem to be no different to the motives that underpin Smith's invisible hand, but Williamson introduces a further dimension to self-interest. In the enlightened world of 18th Century Scotland that Smith helped create, decorum and a man's word would have mattered. In the 20th Century land of the American dream Williamson saw that "self-interest with guile" means that to lie, to cheat or to even steal can be part of the commercial landscape. For Williamson, such

¹⁴ Coase, R. H. (1937) The nature of the firm, *Economica*, Vol. 4, 3, pp. 386-405. In 1991 Coase was awarded the Nobel Prize in Economics "for his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy".

¹⁵ Williamson, O. E. (1971) The vertical integration of production: market failure considerations, *American Economic Review*, Papers and Proceedings, Vol. 61, pp. 112-23; Williamson, O. E. (1973) Market and hierarchies: some elementary considerations, *American Economic Review*, Papers and Proceedings, Vol. 63, pp. 316-25; Williamson, O. E. (1975) *Markets and Hierarchies*, New York: Free Press. Williamson was awarded (jointly) the 2009 Nobel Prize in Economics "for his analysis of economic governance, especially the boundaries of the firm".

opportunistic behaviour contrasts with the alternative of stewardship behaviour – stewardship involves a trust relation in which the word of a party can be taken as his bond.

In other words, people behave in strategic ways – they manipulate information, they are economical with the truth and may even misrepresent their true intentions (through threats or false promises) if that is what suits their purpose. Thus, while the truth may be out there, Williamson is really saying trust no-one. In this context, agreements and contracts are not enough – some organisational structure is needed to monitor and control opportunistic behaviour and enforce the required behaviours.

Applied to a value chain, this translates to the old maxim *caveat emptor* – let the buyer beware. Specialised firms will only care about their part, which is fine when this doesn't impact on the decisions of other specialised and when stewardship rather than opportunism can be taken for granted. When those conditions don't hold then an integrated organisational structure begins to look attractive.¹⁶

- ❖ *Bounded rationality* – economists like to presume that firms like individuals are rational things – rational means we know what we want and we know how to maximise what we want. But those of us that live in the real world recognise we are limited by the information we have, are limited by our ability to process the information we have and limited by the time we have available for that processing. If you have ever played chess, then you will have experienced the bounds of human rationality.

In economic life, the bounded scope for our rationality is another way of saying we can't anticipate everything and what we contract someone to do isn't always the same as what we wished they would do. Bounded rationality as a result breeds the problem of contract incompleteness, where situations arise that are not covered by the contract and so the parties haven't agreed in advance how best to handle them. The extent to which this becomes costly relates to how complex (how many & how often) the contractual relationships would need to be and how damaging the unanticipated situations are.

- ❖ *Asset specificity* – any transaction needs investments in some assets, whether those assets are resources, machines, know-how or time. If the value those investments can create is similar across a range of alternative purposes or transactions then those assets are non-specific. So an arable farmer's land and knowledge can be just as well applied to the growing of wheat as they can potatoes. But a milking machine is not of much help except if your potatoes are actually cows.

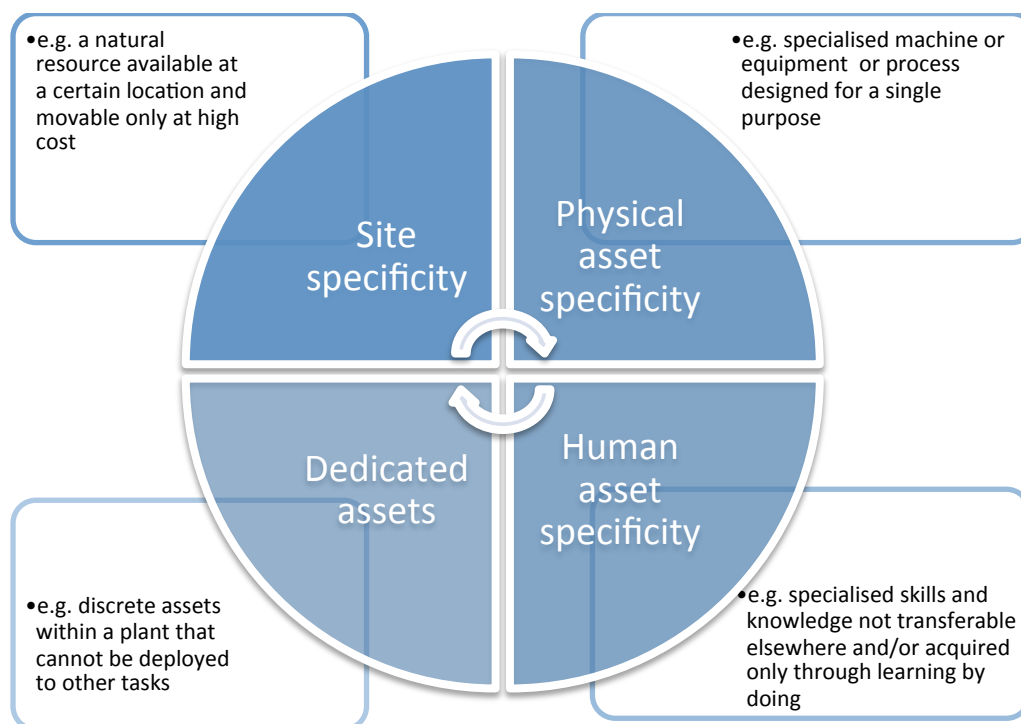
Asset specificity arises across a number of dimensions. Williamson suggested at least 4 types of specificity (see Figure A6 below) covering: location, equipment & processes and knowledge. To this could be added the specificity of time – the value created by an asset may be time limited or required at a specific point in time.

Asset specificity has two main implications for our choice of the market vs. managerial control. First, the more specific an asset the higher the dependence is between the transacting parties. This increases the risks to both parties and increases the cost of using the market. Secondly, asset specificity is the flip side of demand specificity and this restricts the scope for viable market

¹⁶ Anderson (1985) provides support for this in a study of people selling electronic components. She found significantly more opportunism occurred amongst vertically separated sales teams (separated sales reps) than for vertically integrated sales team (i.e. manufacturers' directly employed sales reps).

competition.¹⁷ In the most extreme case if one firm buys all of a particular product then they are the market (and so there is no benefit from using a market for the transaction).

Figure A6: The dimensions of asset specificity



Any of these factors – opportunism, bounded rationality and asset specificity – may or may not be relevant to a particular set of transactions. It is how these factors combine that ultimately shapes the most appropriate way of conducting those transactions.

So if we take opportunism and bounded rationality in economic life as a given and then observe a significant degree of asset specificity in the water and sewerage sector, then Williamson’s analysis points in the direction of organisational control rather than the market for the governance of economic transactions. Not because you can’t use the market, but with these conditions present it is simply less effective at getting things done. Planning is unsuccessful or partial, contracting is incomplete, promises cannot be trusted and the market is not competitive. Organisational control becomes the modus operandi in these circumstances - not because it is perfect, but because it is least bad.

KNOWN UNKNOWNNS AND THE UNKNOWABLE UNKNOWNNS

Information flows – and the lack thereof – are a large part of the transactions cost story on the market vs. integration choice. So it will be no surprise that the role of imperfect information has been of particular interest to economists. Another Nobel Prize winner – Kenneth Arrow – developed his thinking in a series of papers.

¹⁷ As indirect support for this, Ruzzier (2009) shows that in situations where asset specificity does not imply demand specificity (i.e. there are alternative demands for the service from the asset) – sectors with rapid innovation appear to be the mostly likely candidates - then market forms of organisation can be superior to vertical integration.

In 1969 Arrow observed that transactions costs depend on how firms and markets deal with the lack of complete and perfect information.¹⁸ Because information gathering, handling, transmission and utilisation (which are all required for the functioning of a market) are costly, firms create internal communication channels (Arrow, 1981)¹⁹. They develop codes and efficient short-cuts for information transmission and so can make savings, which can then be passed onto customers, if this information management can be undertaken more efficiently within the firm than it can be undertaken within the market.

Applying this thinking to industry structure, Arrow noted in 1975 that managers have an incentive to integrate as a means of obtaining information about the markets to which they sell or buy from.²⁰ If as a downstream producer you buy inputs from an upstream firm your ability to make good decisions about how much input to use relies on the vagaries of those upstream markets. Integration may be the easiest option to restore some certainty.

Related arguments are also developed by Carlton (1979)²¹. Combine those upstream uncertainties with lags in downstream responses to market changes and there is a risk of either over- or under-production by the downstream firm. Vertical – or backward – integration provides a way for downstream firms to manage and avoid these risks.

THE PRINCIPAL AND THE AGENT

Another of Adam Smith's bright ideas was the division of labour. Suppose you are the owner of a 21st Century pin factory, your division of labour might be spot on but can you be sure everyone is putting in the required effort? With pins it should be fairly easy to observe how many are being produced, but in most realms of modern economies the translation of effort to outcome is less easy to observe. And the rewards that people covet or desire are unlikely to be limited to the wage on offer for pin production. When self-interests are not aligned to create a mutual interest and when efforts and behaviours cannot be easily observed, then the problem of the principal and agent arises. Principals – employers, shareholders, clients, house-sellers – get frustrated because agents – employees, managers, consultants, estate agents – spend more time feathering their own nests than looking after the interest of those that employ their services.

The relevance of this to vertical integration will become clear shortly, but first we need to note that the principal agent problem tends to be most acute when risk aversion and moral hazard are present. According to Wikipedia early usage of the term moral hazard was associated with fraudulent or immoral behaviours in 19th century insurance markets, but economists labouring under the illusion of ethical neutrality prefer to now see it as a kind of inefficiency in how risk was handled within contracts. So, under this view moral hazard occurs when a party insulated from risk behaves differently than if fully exposed to the risk. Therefore, if a contract between a principal and an agent inappropriately insulates the agent from risk then the agent lacks an incentive to act in the best interests of the principal. Opportunism rather than stewardship again rears its ugly head in economic life.

¹⁸ Arrow, K. J. (1969) The Organization of Economic Activity: Issues Pertinent to the Choice of Market versus Non-Market Allocations' in *Analysis and Evaluation of Public Expenditures: The PPP System*. Vol. 1, pp. 47-67, Government Printing Office, Washington D.C.

¹⁹ Arrow, K. J. (1981) Jacob Marschak's Contributions to the Economics of Decision and Information, *Mathematical Social Sciences*, Vol. 1(4), pp. 335-338.

²⁰ Arrow, K. J. (1975) Vertical Integration and Communication, *Bell Journal of Economics*, Vol. 6, pp. 173-83.

²¹ Carlton, D. W. (1979) Vertical Integration in Competitive Markets under Uncertainty, *Journal of Industrial Economics*, Vol. 27, pp. 189-209.

Lafontaine and Slade (2007) offer some conjectures about what this all means for vertical integration vs. the market using the example of a manufacturer (the principal) and a retailer (the agent). They show that both parties will under-invest compared to the level that is best overall. Retailers who work hard and are productive – a.k.a. good at selling the manufacturer’s output - will reduce the need for vertical integration, while a more productive & efficient manufacturer will look to vertical integration as the best way to reward its efforts. Likewise risk averse retailers and high costs of contracting will point in the direction of vertical integration.

The standard way to overcome principal-agent situations is to design incentive compatible contracts – hence employee bonuses in the form of share options, hence excesses as part of insurance contracts. But as Lafontaine and Slade (2007) also predict, vertical integration becomes preferable the more tasks the agent has to carry out. Here the poor principal finds it more difficult to design incentive-based reward systems that are workable making vertical integration look more efficient and probably more straightforward.

WHEN THE INVISIBLE HAND IS BROKEN OR JUST NOT THERE

We have already emphasised the importance of market failures – invisible hands that are broken. In addition to the ones already outlined the problems of double marginalisation and missing markets are also worth highlighting.

MARKET POWER AND DOUBLE MARGINALISATION

Double marginalisation occurs when there are two or more successive stages of production (e.g. manufacture and retail), undertaken by separate firms, where the two firms *both* have some market power. This is clearly important for the water sector, given that the local nature of water sources combined with the high costs of transportation make it highly likely that there will be dominant players in water markets. These separate firms go about their business making pricing and output decisions that suit their own objectives. The result – see for example Rey and Stiglitz (1995)²² – is that consumers end up paying prices that are higher than that required or set by an integrated firm. A prerequisite for avoiding this outcome is typically that competition in the consumer market is high. Or of course end user prices are just controlled by a regulator.

MISSING MARKETS

And what of the situation when the hidden force of the invisible hand can’t be seen because it just isn’t there?

Consideration of the scale and impact of activities that are not priced by the market is key to consideration of the choice of the most appropriate industry structure. Activities that have no price because markets don’t exist result in externalities – this is most acute in cases like the environment and the production of public goods where ownership rights are difficult to define and / or enforce.

Externalities occur whenever one party makes a decision and does not take into account the effects of that decision on another party – the external effects or externalities arising from the decision. The decision-maker only takes account of the internal effects.

And without some form of intervention markets aren’t particularly good at handling externalities. The simplest way to incorporate these external effects into the decision – and so to get a better decision – one that takes account of all the impacts of the decision – is to make the external effects fall on the decision maker –

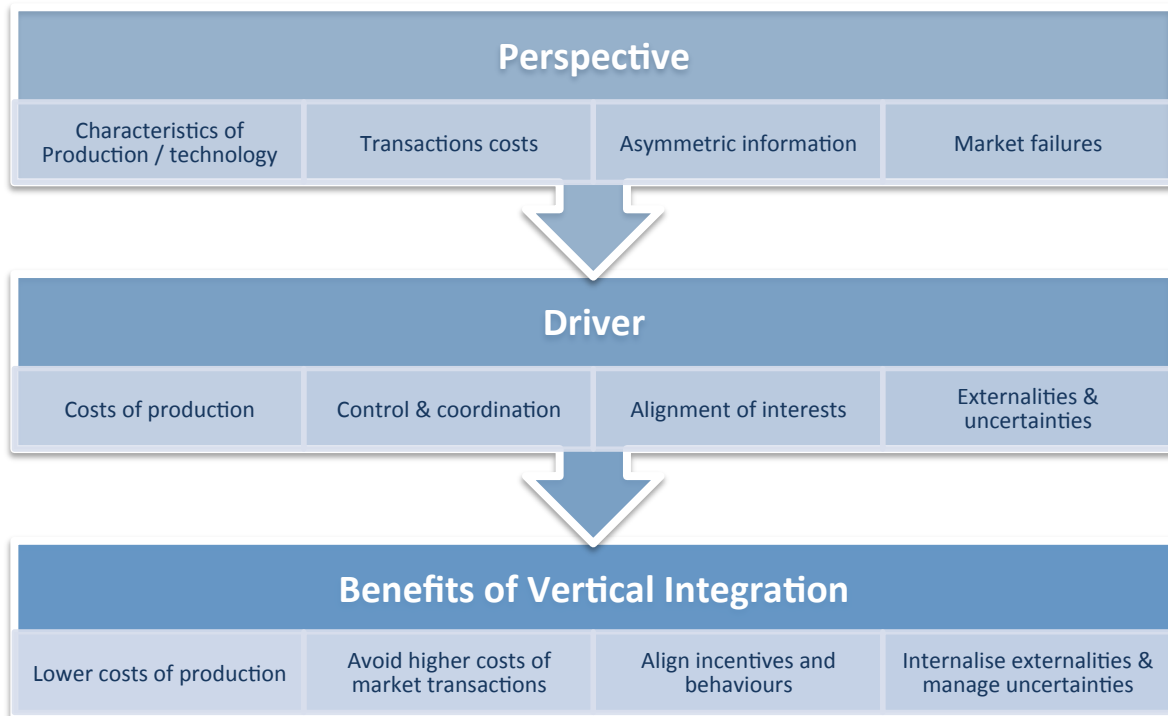
²² Rey, P. & Stiglitz, J. (1995). "The Role of Exclusive Territories in Producers' Competition," RAND Journal of Economics, vol. 26(3), pp 431-451.

economists describe this as ‘internalising the externality’. Clearly, if the external effects are felt at different stages of the production chain, then vertical integration would achieve the benefit of internalising the externality, improving decision making and avoiding more costly outcomes.²³

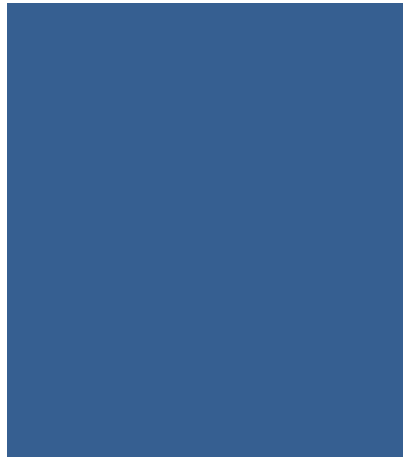
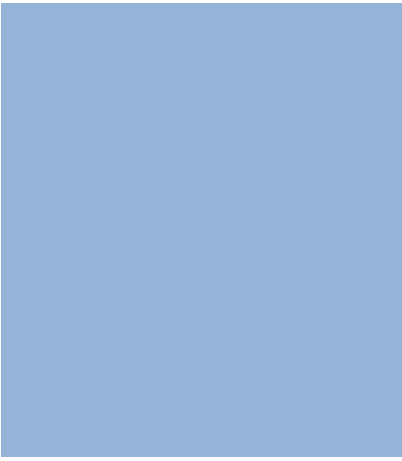
SUMMING UP THE ECONOMIC THEORY

We have distilled the essence of our interpretation of what the economic theory tells us about vertical integration in Figure A7 below.

Figure A7: The economics case for vertical integration



²³ The double marginalisation problem just discussed is really just another type of externality.



ICS
consulting

ICS CONSULTING

Peartree House
Little Smeaton, North Yorkshire WF8 3LG

T 01977 621188
F 01977 621199
www.icsconsulting.co.uk