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The Privatised Water Industry in the UK.
An ATM for investors. *

by
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*This report is a PSIRU reviewed, edited and expanded version of a MSc thesis at LSE, which was awarded a distinction.

The Public Services International Research Unit (PSIRU) investigates the impact of privatisation and liberalisation on public services, with a specific focus on water, energy, waste management, health and social care sectors. Other research topics include the function and structure of public services, the strategies of multinational companies and influence of international finance institutions on public services. PSIRU is based in the Business Faculty, University of Greenwich, London, UK. Researchers: Prof. Steve Thomas, Dr. Jane Lethbridge, Dr. Emanuele Lobina, Prof. David Hall, Sandra Van Niekerk, Dr. Vera Weghmann.

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Abstract

This paper aims to critically evaluate the privatised water & sewage industry in England. We find that the public-owned sector in Scotland delivers the service just as efficiently, albeit at a lower cost to consumers. Our econometric analysis suggests that the 40% increase in real household bills since privatisation was mainly driven by continuously growing interest payments on debt, contrary to the regulator attributing them to growing costs and investments. Finally, we show that the accelerating debt levels are primarily the result of disproportionate dividend pay-outs, which exceeded the privatised companies' cash balances in all but one year since 1989. We conclude that the way the industry operates may no longer be sustainable and seems to disadvantage consumers greatly without their knowledge, as there is a fog of misleading statements by the companies and the regulator.

Content

Section I - Introduction

The full privatisation of all 10 water & sewage companies in England in 1989 is still the subject of fierce debate, even today. On the one hand, it is argued that water is a public good and right, and as such should be affordable and accessible to all citizens, even subsidised by the government. Others claim that only the private sector could have efficiently managed the large amount of capital expenditure needed to modernise and sustain the aging infrastructure. The topic became a major discussion point during the 2017 elections, when Labour argued the price of water in England is excessively high compared to Scotland, where the water industry remains public (Labour, 2017). Nonetheless, the politicians never pointed to the root cause for this discrepancy. The UK water industry presents a rather unique opportunity to benchmark two different ownership types, allowing to verify the merits of privatisation. The purpose of this paper is to add substance to the discussion and determine why household bills in England are so high today.

To see what this debate stems from, **Figure 1** presents the average household water & sewage bills in England (weighted by households serviced per company) and Scotland (single provider - Scottish Water) benchmarked to the inflation rate during the same period. Values are normalised to 100% starting in 1990 (First Scottish Water data point in 2002 normalised to the inflation value on that date for comparative purposes - 147%). It turns out that prices in England are now 43% higher in real terms than they were in 1990. In Scotland, real bills are 2% lower than they were 18 years ago, while the equivalent period saw English bills increasing by 13%, from £358 to £405 - a significant difference.

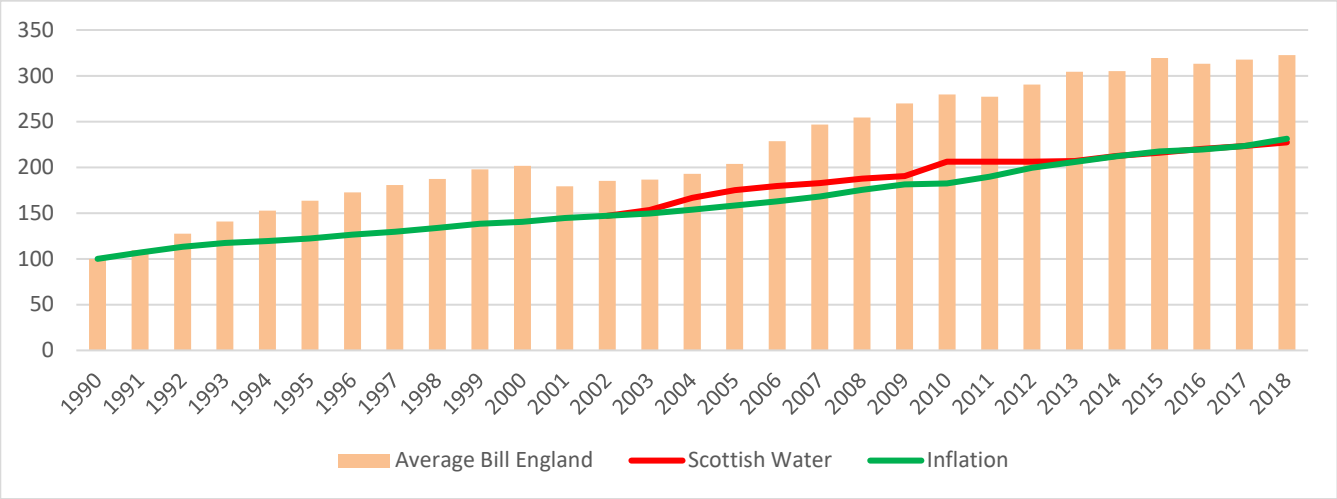

Figure 1 – Average household bill in England and Scotland vs Inflation (1990=100%)

Ofwat, the English industry regulator often provided reasons for the large surge in household bills. Some of those arguments will thus serve as structure for this paper:

- ***Hypothesis 1***. *"Thanks to private ownership, £140bn of investment has gone into the sector over the past thirty years with costs "kept in check" and bills "a third lower than they otherwise would have been in public hands" - Ofwat chief executive Cathryn Ross (2017)*

- ***Hypothesis 2***. *"The 4.2% annual increase in bills* ***before inflation*** *is needed to finance the substantial capital programme for further environmental and service improvements, and higher costs faced by companies." –* ***2004 Price Review*** (Ofwat, 2004)

  "Ofwat estimates that, since 1999, the main reasons for bill increases have been costs of complying with environmental and drinking water legislation and maintaining the existing network. Operational efficiencies have partially offset these cost drivers" – ***Audit of the English Water Industry*** (National Audit Office, 2015)

The goal of this paper is to test those arguments empirically and, in the process, establish the real cause behind growth of real bills and the price discrepancy with Scotland. To do so, we will analyse each of those statements individually:

- **Hypothesis I** - Private ownership led bills to be 33% lower than under public ownership due to efficiencies – verified by benchmarking England to public-owned Scotland
- **Hypothesis II** – It was growing investments and costs that drove average household bills to raise by over 40% in real terms since privatisation
- **Hypothesis III**: There are reasons, other than those in H1&2 that can explain the large real price growth.

Section II - Literature review (To be expanded)

There is a vast amount of literature relating to the UK water industry, which makes it surprising that to the best of my knowledge, there has not been a benchmark study comparing England and Scotland. This essay will among others attempt to fill this research gap.

Efficiency

There is considerable evidence showing that the efficiency of public ownership in the water industry is at least as good as that of private operators. A systematic review in 2008 of the global literature on all aspects of efficiency in water supply concluded that there is no direct evidence suggesting a causal relation between ownership type and efficiency (Gonzalez-Gomez & Garcia-Rubio, 2008). Another international review published in 2010 analysed 27 empirical studies on comparative efficiency in water services in various countries. It was found that private ownership is not systematically less costly than public owned" (Bel, Fagenda, & Warner, 2010). A 2007 study on England's efficiency concluded, that while technical change improved post privatization, productivity, average efficiency levels were actually moderately lower in 2007 than they had been at privatization" (Saal, Parker, & Weyman-Jones, 2007). The above conclusions were somewhat reaffirmed by Ofwat – a 2011 report found, that public-owned Scottish Water's cost efficiency was, "contrary to expectations", on par with England and Wales (Ofwat, 2011). In 2010, Scottish Water's Overall Performance Assessment (OPA), a broad measure of water companies' quality and efficiency calculated by the regulator Ofwat, was also on par with its English counterparts. (Water Industry Commission for Scoland, 2010)

Prices

A comprehensive study of water prices was conducted in France, where about three - quarters of the service was delivered by the private sector through concessions or lease contracts. It was found that in 2004, after making allowance for all other factors, the price of water provided by private companies was 16.6% higher than in places where municipalities provided it (Chong, Huet, & Saussier, 2006). In 2009, an independent review of charging for household customers in England concluded that water affordability in England is a real and an intensifying issue. Furthermore, it suggested the government offer support to customers in most expensive areas, which led South West Water customers to receive a £50 subsidy to offset their bills. (Walker, 2009)

An extensive report by the National Audit in England paints a positive picture of the privatised industry: "Since privatisation, Ofwat's price cap regulation has promoted substantial service and efficiency gains to the benefit of consumers, while maintaining a stable and attractive climate for investors". The auditors seemed satisfied with the regulatory framework of the industry, never questioning prices being too high. The audit also did not point out any problems with the growing debt levels of all companies. It did, however, put some question mark over the 5-year price setting system - according to the report, during 2010-15 the companies benefited from several factors outside their control (lower than Ofwat's assumed tax rate, higher inflation, lower cost of debt) to gain over £1.2bn in excess profits, whilst (as stated by Ofwat and not verified by the audit) passing on only 400m to customers through "incurring additional costs", without a single price decrease (National Audit Office, 2015).

Contrary to this positive outlook, PSIRU (a public services research unit within the University of Greenwich) has expressed – in numerous papers – their criticism of the water industry, calling it dysfunctional and unsustainable. In one paper, they argue that privatisation costs consumers £2.3bn more per year due to dividend spending and high interest costs. They also highlight potential problems resulting from extremely high levels of debt. (Bayliss & Hall, 2017). The issue of dividends is also brought up in a paper by Armitage, who argues that the high pay-outs

by the water industry in England cannot be explained by any mainstream dividend theories (tax, debt, agency costs etc.), and are the result of strong demand for dividends from investors. (Armitage, 2012).

While the brief literature casts a shadow of a doubt on our first two hypotheses, it is important to investigate the subject using actual financial data, which we will present in the following sections.

Section III - Data

Data collection began with finding all the average household water & sewage bills over the 28-year period for each company. The task required visiting tens of various online materials (annual reports, OFWAT and other institutional publications), but also reaching into the National Archives to find documents related to the early years after privatisation. To formulate the average price for England and Wales, each company's average household bill was weighted with the number of households it served to receive a better overall picture.

To determine drivers to price increases, I have manually compiled individual financial results from all 11 Companies under analysis, including their Revenues, Capital Expenditures (CAPEX), Operating Expenditures (OPEX) and Interest Payments over the years. I have also compiled data on individual companies' capital structures (yearly net debt levels) and dividend pay-outs. These were found again using annual reports, Ofwat publications and by visiting the National Archives. As a result, a full set of data points since 1989 was obtained for England and Wales, however, data for Scotland only starts from 2001/02. In that year, Scottish Water was established from a merger of previous 3 Water Companies established in 1996 (through a merger of previous 9 companies) (Scottish Water, 2018). As such, financial data wouldn't have been remotely comparable before 2002 due to potential synergies achieved after those organisational mergers (As stated in the response to my Freedom of Information Request). All financial and pricing data was next converted to 2018 prices using the official RPI record from the Office of National Statistics to eliminate inflation biases in our model, allowing us to analyse drivers behind real price increases (Office for National Statistics, 2018).

Given the differences in populations served by the different water authorities, I decided to normalise all data points on a per-household basis, and therefore obtained the number of households per UK region from 1996-2018 (Office for National Statistics, 2017). I then used this data to extrapolate years 1989-1996 using individual population CAGRs of each region.

Section IV - Hypothesis I: Public vs Private Ownership

The CEO of Ofwat suggested that water prices under private ownership are 33% lower than they would have been in public hands. To verify this hypothesis, we proceed to compare the industries in Scotland and England. However, as already mentioned, prices in public owned Scotland are actually turn out to be nearly 14% lower. To determine the most likely cause for this discrepancy, it is worth analysing general financial trends exhibited by each industry.

As seen in **Figure 2**, real OPEX in England has been fairly constant throughout the period, with today's costs equalling those at privatisation. CAPEX fluctuated greatly, yet largely remained in line over the whole period, perhaps even exhibiting a slightly downward trend – last 10 years saw investments fall by 10% compared with both the two earlier decades. **Total investments until 2018 amount to 140bn** (**see Table 2**). Dividend payments (column values) have consistently been high, averaging at approximately £200m per year per company (£2bn aggregate), leading to a staggering amount of **£61bn being distributed to shareholders over the 28-year period (in real terms, the figure also includes inter-company interest payments which account for up to 20% of total, likely even less, thus leaving at least £48bn that went directly to shareholders)**. Perhaps the most striking feature of the industry is the skyrocketing debt level (RHS of the graph). When the 10 water companies were floated on the stock exchange in 1989, the government wrote off all their debts (£4.9bn) and injected a further green-dowry (£1.5bn) to meet the investment requirements stemming from EU regulations (Bayliss & Hall, 2017). Since then, the 10 companies took out an average of almost £2bn per year in debt aggregate, leading to

a £51bn industry net debt balance in 2018. As a result, annual interest payments of the industry jumped from 0 in 1990 to around £2bn today (corresponds to £80 per household).

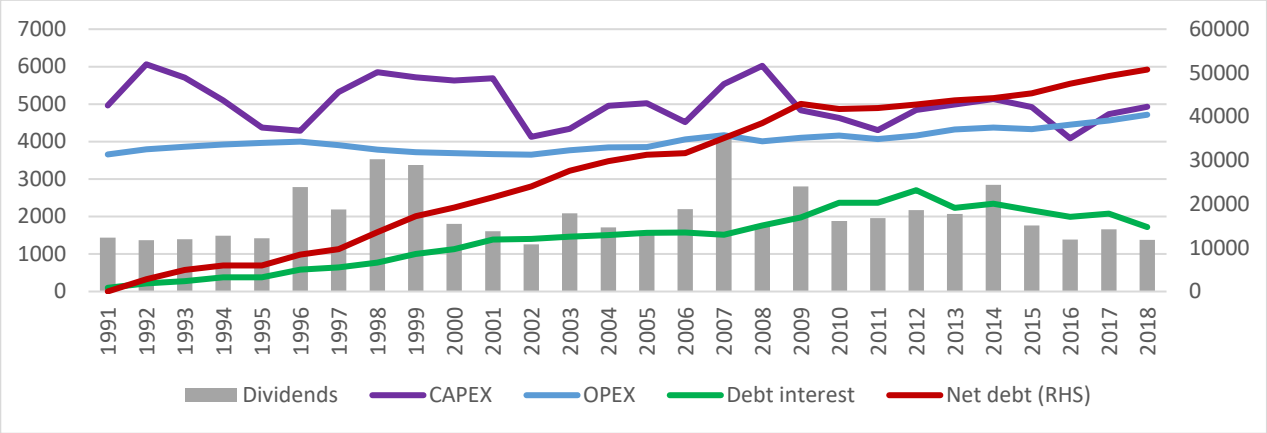

Figure 2 – England & Wales industry aggregate financial data since privatisation (millions)

When it comes to Scotland, the equivalent graph looks very different. OPEX declined significantly in the early years after the merger into Scottish Water, falling by approximately 40%. CAPEX rose substantially, declining slightly after 2010. The debt level today is actually 5% lower than 17 years ago and it's interesting to note its correlation with investments – after initially rising (likely to pay for CAPEX – more later), it then declined substantially with the fall in investments, rising again in 2015 after the announcement of a large investment programme (Scottish Water, 2015). Accordingly, interest payments have remained constant. Another striking difference is the complete lack of dividends - all profits are reinvested back into the company (Water Industry Comission for Scotland , 2010).

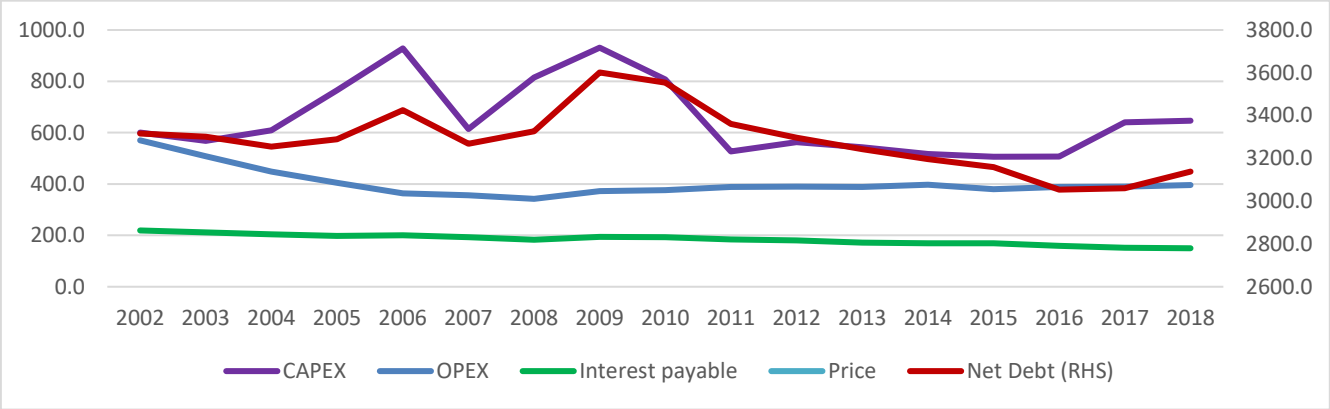

Figure 3 – Scotland financial data since inception (millions)

However, to understand the 14% price discrepancy between Scotland and England, we need to compare these numbers on a more granular level. In this paper, we analyse the following potential explanations:

a) Supply side - Companies in England have higher operating costs due to different market structures

As shown in **Figure 4**, OPEX on a per-household basis seem to be level in Scotland and England after Scottish Water initiated an efficiency programme in 2002 (even slightly lower in Scotland). This result seems consistent with Ofwat's analysis in literature review (Ofwat, 2011), and as such, the difference in prices seem difficult to explain with differences in cost structures. If anything, base OPEX could in theory be higher for Scottish Water, as it serves the most dispersed geographical area, requiring it to manage longer pipelines in less populated areas (H2O Building Services, 2017). This is the likely reason behind Scottish Water having larger leakages - 495 Megaliters per day (Water Industry Commission for Scotland, 2017) vs. approx. 345 in England (Ofwat, 2017), which is a major cost component for both industries. However, it is also worth adding that the difference in leakage stems from the massive length of pipes in Scotland. Adjusted for leakage per kilometre of pipes, Scotland performs just as well as an average English company (10.2k litres per km vs 22.1k Thames vs 10.8k United Utilities vs 9.5k Yorkshire – **see Appendix IV)**

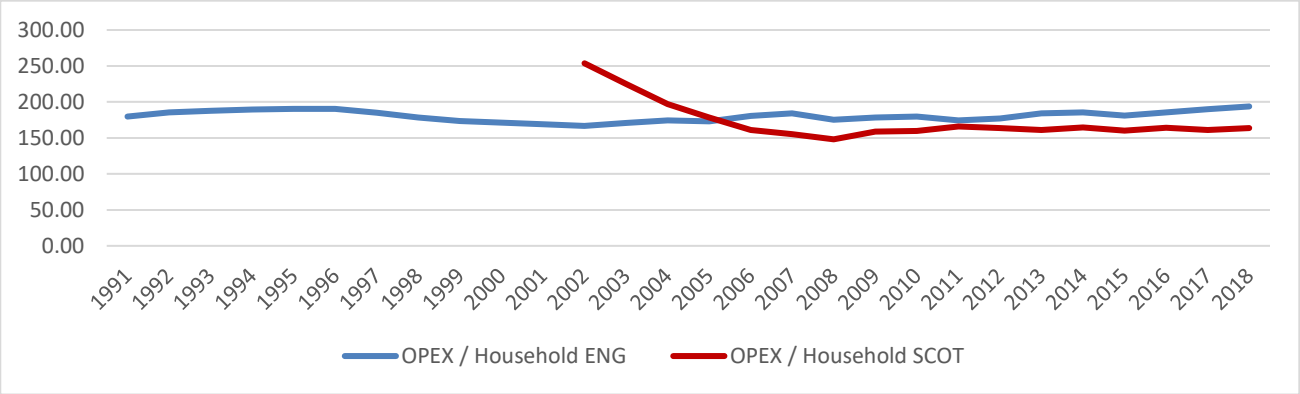

Figure 4 – Operating Expenditures on a per-household basis (£)

b) Demand side - consumers in England use more water per capita than in Scotland

Even though OPEX per household is roughly same, perhaps the proposed English efficiency can be found in the levels of water usage - if customers in England used more water per capita, equal costs would imply better efficiency. The average daily water consumption in Scotland is estimated to be 150 litres per person (Scottish Government, 2017), while the average for the UK stands at the same level (Department of Environment, Food & Rural Affairs, 2013). Thus, this reaffirms our conclusion and literature that the two industries seem equal in terms of cost efficiency, and neither supply nor demand factors point to any significant cost differences.

b) Companies in England invest more in the infrastructure on a per capita basis

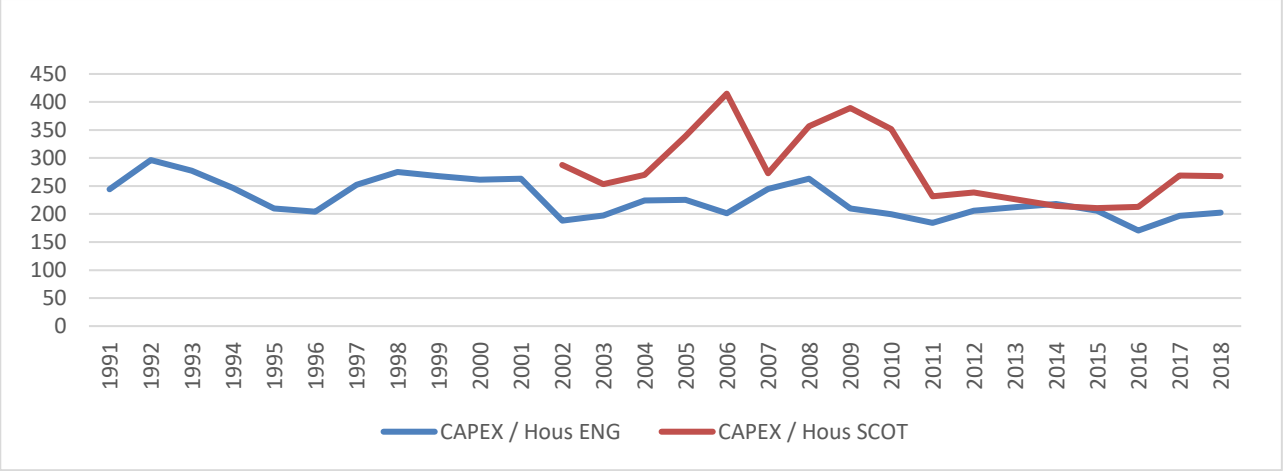

Figure 5 – Capital expenditures on a per-household basis (£)

To verify whether higher prices in England are the result of higher investments, **Figure 5** presents the annual per-capita capital expenditures. The actual result may seem surprising to say the least – it is Scottish Water that invests more on a per capita basis, a trend that has continued ever since Scottish Water was founded, and the difference is far from subtle. Looking at regulatory capital investments, **Scottish Water invested nearly 35% more per household since 2002** (average £282 per household per year vs England's £210 per year). **Had the 10 English companies invested at that rate, £28bn more would have gone into the infrastructure**. This information suggests that it is English water that should in theory be cheaper, and high capital investments that Ofwat praises (National Audit Office, 2015) not only do not seem to explain the difference in prices, but also present us with another interesting question to answer – **where does the extra £28bn go?** (**Section VI)**

c) Scottish Water receives subsidies from the Government to offset bill costs

As stated by the Water Commission for Scotland (Audit Scotland, 2017) , Scottish Water's only financing streams have been customer charges and government loans, which they pay interest on and must repay in full. The company receives no grants nor subsidies. Interestingly, it is the water industry in England that receives certain subsides – for instance, South West Water customers each receive a £50 subsidy to offset their bills, which are highest in the UK (National Audit Office, 2015). It is also this subsidised price that was used in **Figure 1**, which made the average English bill seem marginally lower than it really is.

d) Scottish Water pays much lower interest due to receiving cheaper government loans

As shown in **Figure 6**, interest payments per household in Scotland are indeed lower. However, this is most likely because Scottish Water has lower values of debt than the average English company – £3bn vs. £5bn in England. To see if it is in fact debt levels driving those differences, it is worth comparing the real interest rates paid by the companies on their debt.

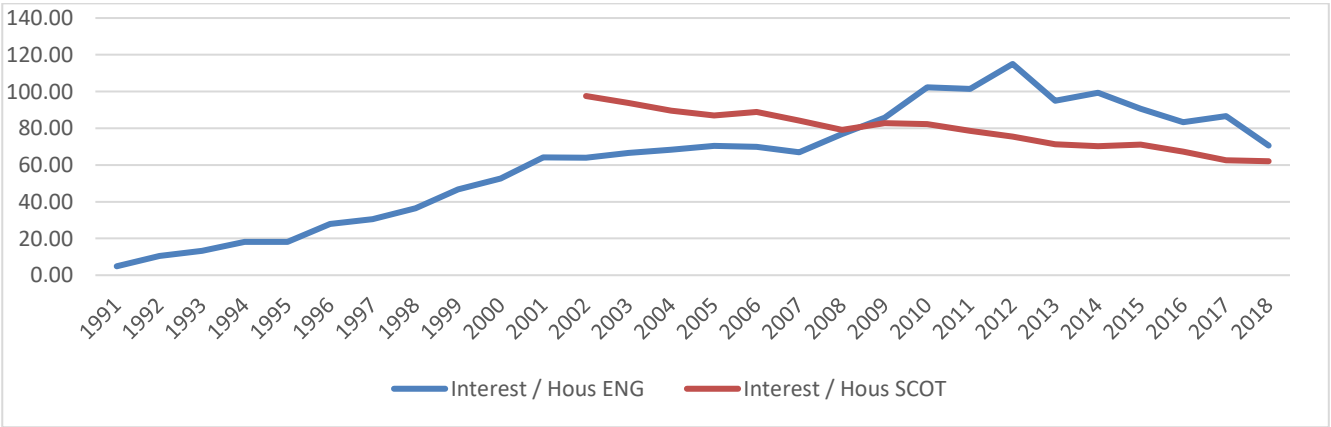

Figure 6 – Debt interest payments per household

As could be seen in **Figure A1** (**Appendix IV**), interest rates are slightly higher for Scottish Water, marking yet another unexpected discovery. The Scottish government charges Scottish Water relatively high rates, while the English companies have a strong preference to take on long-term debt with maturities lasting up to 2060, thus helping secure historically low interest rates (National Audit Office, 2015). Given the monopolistic character of the industry with steady and risk-less cash flows, the private companies manage to secure even better financing terms, and thus interest payments are higher due to larger debt stockpiles.

Summary

The above analysis presented evidence to reject the first hypothesis. Similarly to the literature reviewed in **Section II**, data gathered shows that public ownership seems to have resulted not only in equal (or even lower) costs, but also led to higher investments while keeping costs to consumer below those charged by privatised companies – a 'win, win, win'. Additionally, it is worth noting that even without benchmarking to Scotland, it would prove difficult to find a 33% decrease in costs in England since privatisation. The only apparent differentiating factor between the industries is the interest paid on debt, and therefore this issue will be investigated further in the following section. To verify whether interest payments could in fact be the differentiating factor, the drivers behind price variations in both countries will be examined empirically.

Section V: Hypothesis II - Empirical strategy (To be expanded)

Although Ofwat attributes the real increases in customer bills to "growing investments and costs," this paper has already shown that the general financial trends do not reflect any such significant increases. However, to verify this hypothesis empirically, a simple model has to be established to determine drivers behind price changes in both industries. To do so, a balanced panel data set of all the individual companies' average household bills will be regressed on capital expenditures, operating expenditures and interest payments from 1989 to 2017 (2001-

2017 for Scotland). Given that we only consider household prices, we need to assume that the individual companies' split between household and retail customers remained approximately constant throughout the period (simplification). As a result, the annual proportion of CAPEX, OPEX and interest costs attributable to household customers is a constant % of total costs each year, and therefore proportional changes in our variables will have a proportional impact on household prices. We are then able to run a fixed effects panel data regression, controlling for unobserved company level heterogeneity and clustering standard errors by company:

$$(1)\ Log(Price_{it}) = a_i + \beta_1 Log(CAPEX_{it}) + \beta_2 Log(OPEX_{it}) + \beta_3 Log(Interest_{it}) + \gamma_i Rev_t + \varepsilon_{it}$$

Such a simple model should determine which financial components had the biggest impact on prices over the last 27 years, and perhaps give further clues as to why bills in England are so much higher. This specification should serve as a good approximation, especially to test Ofwat's hypotheses. That being said, pricing is not determined as a direct mark-up on costs, but rather depends on a more complicated formula, equalling the allowed rate of return with the weighted average cost of capital. However, that rate of return has historically been fairly constant, and depends directly on our parameters, which together cover almost all annual expenses. This specification also stems from Ofwat's analysis of individual components of average household bills (see **Appendix IV Figure A2**), which comprise exactly our three parameters and a fairly constant profit component. As a result, our model aims to analyse this exact bill decomposition empirically.

There are certainly other considerations worth investigating, such as breaking down those costs into further component parts (labour, sourcing costs etc.). Unfortunately, obtaining such specific data points for a long period requires a much more elaborate analysis than the scope of this paper. Moreover, the model depends on the accuracy and consistency of reporting – there could be potential measurement errors if certain reporting policies changed (not to my knowledge) or reporting was not done diligently. Additionally, one could argue there are endogeneity issues as higher prices could imply higher expenditures. This is unlikely to have a major impact, as prices get decided 5 years ahead based on expense forecasts in every price review. The long 5-year period

between Ofwat price reviews does present another problem we need to control for in the case of England. Our price data shifts with every price review, as Ofwat often corrects previous mistakes. As an example, the 1999 price review saw an average 12% immediate reduction in prices to correct excessive returns. To control for these persistent shocks shifting our price data, we introduce dummy variables "Rev_t" corresponding to each 5-year price review interval (1st: 1995-**1999**; 2nd: 2000-**04**; 3rd: 2005-**09**; 4th: 2010-**14**). No such shocks occurred in Scotland. For the purpose of establishing directional relationships and correlation between prices and expenses, our model should prove be sufficient.

Following the conclusions obtained in **Section IV**, we will also attempt to determine the driving factors behind debt-taking for both countries. We will again use a panel data set, this time using debt taken by each company in a given year as our dependent variable, controlling for CAPEX, OPEX, Interest and Dividends (in England), to see whether the growing debt levels and interest payments are the result of 'higher costs and investments':

$$(2)\ Log(Debt_{it}) = a_i + \beta_1 Log(CAPEX_{it}) + \beta_2 Log(OPEX_{it}) + \beta_3 Log(Int_{it}) + \beta_4 Log(Dividends_{it}) + \varepsilon_{it}$$

Here too the model should explain debt-taking well, as these parameters comprise the main financing activities. There could certainly be omitted variables as debt also depends on tax considerations as well as M&A activities. Yet for the purposes of this paper, these would have been difficult to parametrise. Thankfully, these expenditures would have still been marginal compared to the ones considered. However, to further verify the results of this regression, the analysis will be supplemented with a more in-depth look into the factors driving debt-taking in **Section V**. For the purposes of establishing correlation, the model should do well.

Section V: Hypothesis II – Results (To be expanded)

Price regression

The results of Regression 1 for Scotland are presented in **Table 1.** As one can observe, all coefficients are significant at the 1% level, and the simple model seems to explain the variation in average water bills well. The R^2 stands at 82%, and all the estimators except OPEX have a positive coefficient as we would have expected. The negative coefficient for OPEX is likely the result of operating expenditures falling by 40% in the early years. During that time capital investments increased even further likely driving prices higher, making the OPEX relationship seem negative. Confirming the early conclusions from **Section III**, there is a significant, positive relationship between interest payable and the average bills. Overall, Scotland's regression provides evidence that the simply constructed model should explain the variation in prices well. However, one has to be careful interpreting coefficients directly, as unfortunately the sample size is fairly small, therefore increasing the potential of errors.

Source	SS	df	MS	Number of obs	=	16
				F(3, 12)	=	18.52
Model	.005627905	3	.001875968	Prob > F	=	0.0001
Residual	.001215832	12	.000101319	R-squared	=	0.8223
				Adj R-squared	=	0.7779
Total	.006843737	15	.000456249	Root MSE	=	.01007

logprice	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
logcapex	.1321262	.0304222	4.34	0.001	.0658418	.1984105
logopex	-.1796042	.0547665	-3.28	0.007	-.2989302	-.0602782
loginterest	.3871495	.0862577	4.49	0.001	.1992101	.5750889
_cons	1.784626	.213143	8.37	0.000	1.320227	2.249025

Table 1 – Price regression for Scotland

The equivalent regression for the aggregate industry in England can be found in **Table 2**. Coefficients on CAPEX and OPEX aren't significant even at the 10% level and interest payments seem to be the only parameter explaining variation in real prices. This is also largely in line with expectations, as operating and capital expenditures oscillated at a fairly constant level throughout the period, therefore were unlikely to have caused bills to increase in the long run. The coefficients on dummy variables corresponding to price reviews are also in line with expectations, as the only review to reduce prices dramatically was the one corresponding to the

negative coefficient of Rev1 (1999). For the purposes of this paper, we are not looking to quantify what exact impact each parameter had, but rather analyse what has driven prices to behave as they have over the analysed period.

Initial evidence points at rejecting the second hypothesis presented by Ofwat as the significant price increases do not seem to have been caused by increases in operational and investment costs. These results seem to fit in very well with Ofwat's decomposition of average household bills seen in **Figure A2** (**Appendix II**), as there too growth in prices seems to come mostly from interest expenses. As supplement to the analysis, I also decided to run this specification on a per company basis as we did for Scotland, to see whether the panel results could be biased by just a few companies. The resulting 10 individual regressions showed similar results, with CAPEX significant in 3 cases, OPEX in 2, and Interest payments significant in all but one.

However, this does create another possible explanation - perhaps the "growing investments and costs" we seek were so high to start with, that sustaining them at these high levels required constant debt financing, which led to growth in debt and interest, putting upward pressure on prices. To verify this claim, a closer examination of debt taking is needed to show whether borrowings were the result of consistently high costs (see **Section V)**.

```
Fixed-effects (within) regression               Number of obs      =       270
Group variable: id                              Number of groups   =        10

R-sq:                                           Obs per group:
     within  = 0.7399                                         min =        27
     between = 0.4513                                         avg =      27.0
     overall = 0.0019                                         max =        27

                                                F(7,9)             =    299.57
corr(u_i, Xb)  = -0.6077                        Prob > F           =    0.0000

                                              (Std. Err. adjusted for 10 clusters in id)
------------------------------------------------------------------------------
             |               Robust
    logprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    logcapex |   .0492925   .0279777     1.76   0.112    -.0139974    .1125824
     logopex |     .09129   .0802916     1.14   0.285    -.0903423    .2729223
loginterest  |   .0423817   .0089146     4.75   0.001     .0222156    .0625479
        Rev0 |   .0278604   .0063416     4.39   0.002     .0135148     .042206
        Rev1 |  -.0346743   .0091264    -3.80   0.004    -.0553197    -.014029
        Rev2 |   .0251383   .0067161     3.74   0.005     .0099455    .0403312
        Rev3 |   .0414342   .0061879     6.70   0.000     .0274361    .0554322
       _cons |   2.136966   .2166437     9.86   0.000     1.646883    2.627048
------------------------------------------------------------------------------
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Table 2 – Price regression for England

Debt regression

Our next task is to then try to understand what drives the companies to take on debt, and what it is used to finance. The results of Regression 2 for Scotland can be found in **Table 3**.

Linear regression

Number of obs	= 16
F(3, 12)	= 25.01
Prob > F	= 0.0000
R-squared	= 0.8099
Root MSE	= 44.29

netdebttaken	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
capex	.5693319	.0857993	6.64	0.000	.3823913	.7562725
opex	.5428731	.1642618	3.30	0.006	.1849773	.9007689
Interest	-2.882137	.8094499	-3.56	0.004	-4.645777	-1.118498
_cons	87.43218	185.7663	0.47	0.646	-317.3179	492.1823

Table 3 – Debt regression for Scotland

Here too, the simple model seems to explain the variation in debt taken well. The coefficient on CAPEX is significant, which was to be expected from the analysis of Scotland's trends, where CAPEX and net debt seemed to be moving in the same direction. There also seems to be a significant correlation between interest payments, however, OPEX is only significant at the 5% level. The negative relationship with interest may seem odd at first. Perhaps as interest payments increase, the costs of debt become higher, which for a cost-averse company could be a good turning point to decrease debt taking to stop the upward pressure on costs. Looking at coefficient values, they also make logical sense, even though one has to be careful with direct interpretation of small sample sizes. A 1m increase in CAPEX was on average associated with a 0.57m increase in Debt, which is very reasonable considering that a large portion of that expense was financed internally, requiring only a part of it to be financed with debt. It also fits very well with the results presented in **Figure 11 (Section VI)**

The results of an equivalent regression for England, with the addition of dividends as potential drivers to debt, can be found in **Table 4**. Similarly, the dependent variables are all significant and appear to influence the amount

of debt companies take. Interestingly, there seems to be an exceptionally strong relationship between debt and dividends. This would in turn oppose the frequent statements made by Ofwat that pointed at high capital expenditures as the key reason for increasing debt levels (Ofwat, 2004).

```
. xtreg $ylist $xlist, fe robust

Fixed-effects (within) regression               Number of obs      =       270
Group variable: id                              Number of groups   =        10

R-sq:  within  = 0.3156                         Obs per group: min =        27
       between = 0.5601                                        avg =      27.0
       overall = 0.3523                                        max =        27

                                                F(4,9)             =    142.84
corr(u_i, Xb)  = -0.0474                        Prob > F           =    0.0000

                                    (Std. Err. adjusted for 10 clusters in id)
```

debttaken2	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
capex	.8509852	.1937738	4.39	0.002	.4126385	1.289332
interest	.6912111	.1559753	4.43	0.002	.3383705	1.044052
dividend	.8287935	.0599505	13.82	0.000	.693176	.9644109
opex	-1.07456	.248	-4.33	0.002	-1.635575	-.5135451
_cons	38.02459	95.17149	0.40	0.699	-177.2683	253.3175
sigma_u	86.590824					
sigma_e	247.79074					
rho	.10882677	(fraction of variance due to u_i)				

Table 4 – Debt regression for England

The financial cost parameters seem to explain the variation in debt levels in Scotland well, however, in England, the situation is not as explicit as a potential alternative explanation was uncovered - dividends. In the view of the above findings, before rejecting the second hypothesis, the relationship between debt, investments and dividends needs to be explored in more detail, as the proposed growing costs could still hide within interest payments.

Section VI: Alternative explanation

Data

Having witnessed strong correlation between prices and interest payments, the exact drivers to debt taking have to be investigated in each of the industries to see whether debt was taken to the benefit of consumers. To do this, we will analyse individual cash flow data for all 11 companies from 1990 to 2018 (2003-2018 for Scotland) in

2018 prices, expanding the analysis of S. Armitage (Armitage, 2012). The description of each parameter is presented in **Table 5** below. All values are presented in real terms (adjusted for inflation).

Operating Cash Flow	Cash flow gross of capex, tax, interest, dividends
Capital Expenditure	Investments in infrastructure and maintenance
Free Cash Flow (FCF) before interest	Operating Cash Flow net of capex, taxes, plus proceeds from sale of financial assets and investment income
FCF after interest	FCF before interest net of interest payments
Dividends	Total dividends paid out (deflated - excludes special dividends until 2006)
Cash missing	FCF after interest net of dividends
Debt taken	Debt taken per company per year = ($Debt_{t+1}$ - $Debt_{t)}$ x Inflation Correction

Table 5 – Description of parameters

Results

Table 7 here from Appendix I

The results of the aggregated, industry-level analysis can be found in **Table 7 (Appendix I)**. In England, Operating Cash Flows increased consistently since privatisation from £3.4bn to £5.9bn. Throughout the reviewed period, Capital Expenditures remained very high in relation to operating cash flows, yet exhibit a downward trend especially in the last few years (investments in the last decade are 10% lower than both the two previous decades). As a result, FCF (Before Interest) increased considerably since 1990, averaging at around £**1.5bn** per year. However, this growth has been accompanied by even faster growth of interest payments, leading the water companies to have, astonishingly, almost **zero Free Cash Flow** (after interest) left at the end of the year **on average** during the analysed period. Yet despite this cash depletion, the industry proceeded to pay out **nearly £2bn in dividends per year**, which directly implies that to finance them, the companies had to borrow around **£1.9bn per year in Debt**. In theory (ceteris paribus), the industry could have afforded to pay an average of £1.5bn in dividends per year without taking on any debt at all (Free Cash Flow before interest), but instead chose to pay more than balances allowed, driving the need to take on debt. As a result, total dividends paid since privatisation

till 2017 amounted to around £53bn, which led to an aggregate **£51.7bn shortfall in cash**. Today, the industry's debt level stands at around **£51bn** and the similarity of those numbers doesn't look to be coincidental.

An equivalent analysis of the Scottish industry again paints a very different picture. Operating Cash Flows seem to have moved with prices – rising initially, only to start falling in 2009, likely due to real-term decreases in prices since that year - today, they are much lower than they were 16 years ago. Interestingly, reaffirming our previous findings, **Capital Expenditures form the vast majority of Operating Cash Flows**, exceeding the relative investment levels in England. As a result, FCF (Before Interest) averaged around £130m per year and FCF (After Interest) had an average **negative balance of 80m**. This negative cash balance thus seems to have been the result of extremely high capital investments, as the company **never paid out dividends**.

To verify whether the uncovered gap in cash has been the driving factor behind debt taking, it is worth plotting the Cash-Flow Gap (FCF after interest – Dividends) against the value of debt taken each year by each individual company. The results in **Figures 8 and 10** show that there is a nearly perfect correlation between the two parameters, with the exception of the years 2001-2006 in England - this discrepancy can be explained by additional factors driving debt taking in that period. Before 2000, the companies stood to gain little from tax shields due to surplus capital allowances the companies built up in the 90s, which could be carried forward to reduce taxable profit to nearly 0 (A more in-depth analysis of this in Armitage 2012 p14). Therefore, it is likely that in the early 2000s the companies finally stood to gain from interest tax shields and therefore geared up above their cash flow requirements for capital structure reasons. As mentioned before, there were other considerations, such as acquisitions, but they wouldn't substantially change the evidence suggesting that the debt primarily funded the gap in cash flows as expected.

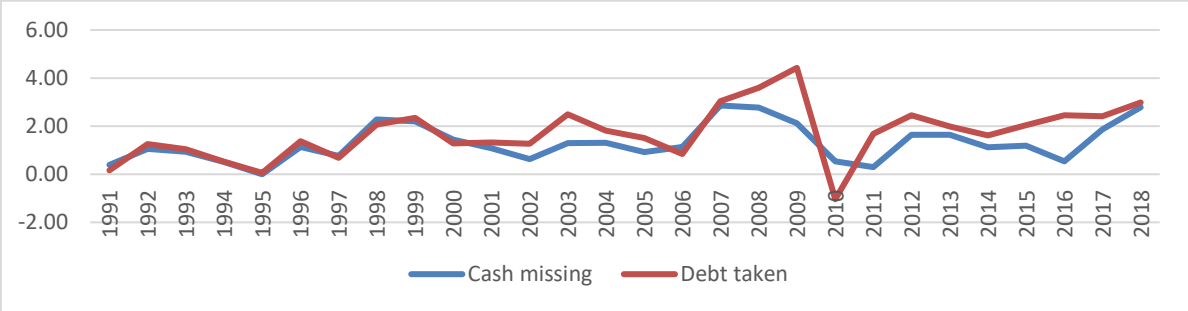

Figure 8 – England aggregate cash-flow gap vs debt taken in a given year (billion)

Dividends are one of the last decided Cash Flow items as they are approved towards the end of a financial year. As a result, most of the debt taken by the English companies likely directly funded their high dividend pay-outs, even if this reason hid behind 'the need to finance capital expenditures' in corporate announcements. To further validate this claim, **Figure 9** plots the relationship between dividends and debt taken in a given year in England & Wales. The results are striking – there is a clear, visible correlation between the two values.

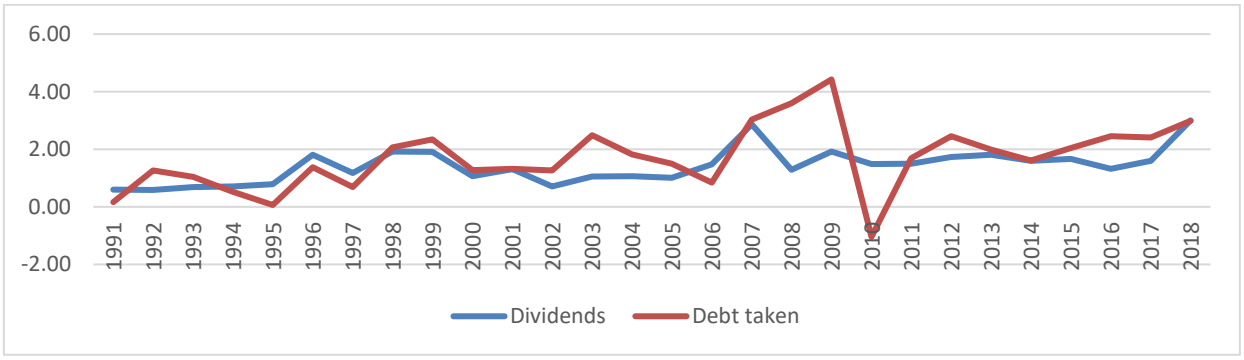

Figure 9 – Annual aggregate dividend payments vs debt taken in England (billion)

To make the point even clearer, selected graphs plotting dividends vs. debt taken for individual English companies can be found in **Figures A3-9 in Appendix IV** – the correlation for some companies is absolutely astonishing. As a result, there seems to be very strong relationship between debt and dividends. This debt burden is then carried forward and grows without ever stopping, as the privatised companies had a **negative cash balance in all but 1 year in the 30 years since privatisation**. The resulting growing interest payments seem to be then passed onto consumers, driving their bills up, which reaffirms our price regression results. Additional benefits from debt, such

as reduced tax expenses, seem to only further benefit the parent companies. The National Audit supports this statement – between 2010 and 2015 the companies gained over £1.2bn profit due to extraordinary factors, whilst **supposedly** passing on only 400m to customers through "incurring additional costs" (National Audit Office, 2015).

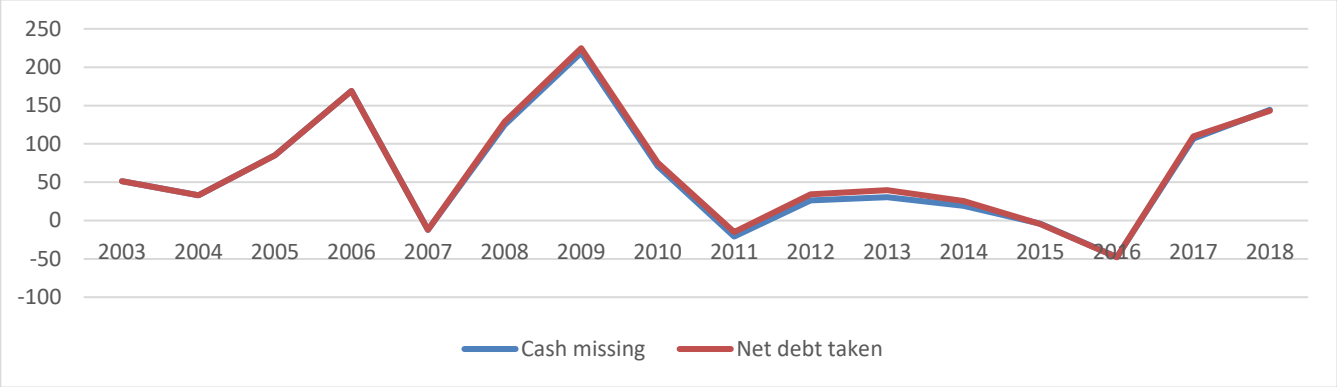

Figure 10 – Scotland cash-flow gap vs debt taken in a given year (millions)

When it comes to Scotland, there is a perfect correlation between debt taken and the cash flow gap, presenting evidence that debt taking has been the result of staggering capital investments. If true, debt has directly benefited consumers as it was used to finance necessary infrastructure upgrades. To verify, **Figure 11** shows that the correlation between debt and capital expenditures is nearly perfect.

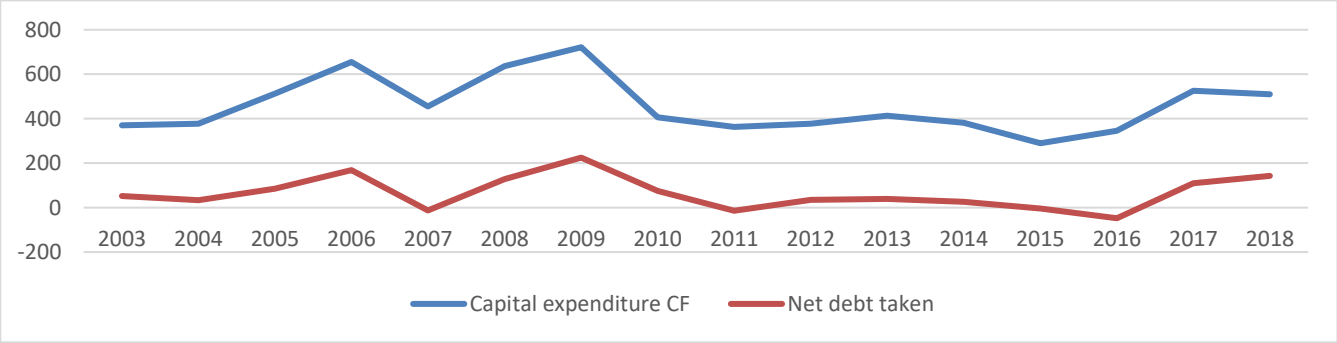

Figure 11 – Scotland capital expenditures vs debt taken in a given year (million)

An equivalent graph for England in **Figure 12** shows that the relationship is nowhere near as strong as in Scotland, thus further validating the hypothesis that the debt taking seems to have been driven by the 'investors' demand for dividends'.

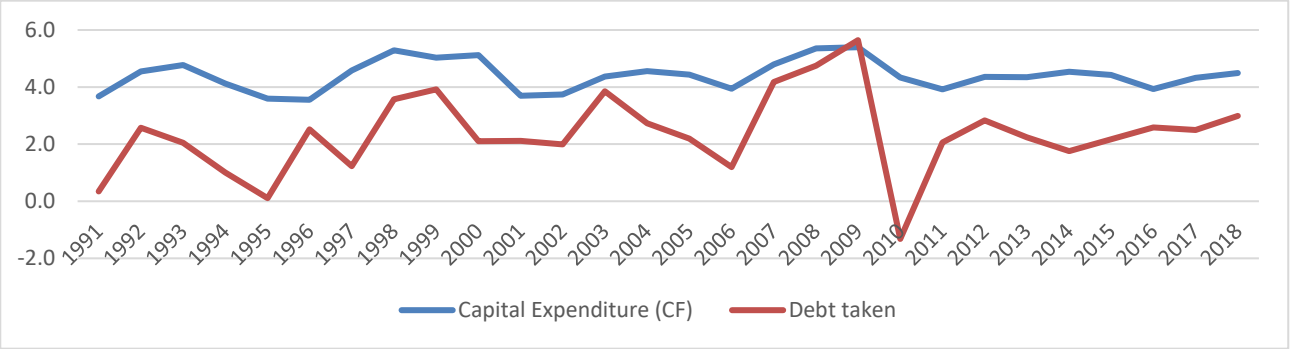

Figure 12 – England aggregate capital expenditures vs debt taken in a given year (billions)

Evidence strongly suggests that the rapidly growing debt levels of the English water companies were not the result of increasing or even excessively high investments and costs. In fact, the analysis shows that the problem lies in significant cash outflows in the form of dividends. Following this in-depth analysis of drivers to price variation, **we conclude that Ofwat's attribution of bill increases to rising costs and investments is not reflected in financial data, thus discrediting the second hypothesis**.

Conclusion

The goal of this paper was to investigate claims by the regulator Ofwat to establish reasons behind real price increases in the privatised English water industry. After extensive analysis, enough evidence was gathered to reject both claims made by Ofwat, who presented high costs and investments as key drivers to higher bills. The main takeaways can be summarised as follows:

- Customers in England seem to be losing from the industry being in private hands when benchmarked to public-owned Scottish Water. The efficiency and quality of the English industry is on par with Scotland, investments are lower, yet costs to consumers are much higher
- Econometric evidence strongly suggests that the real price increases in England can mainly be attributed to growing debt levels, while in Scotland bills seem to have a strong correlation with overall financial expenditure

- There seems to be a significant discrepancy between usages of debt between the industries. In Scotland, debt depends on costs and capital expenditures. In England the same doesn't hold, as the companies could have afforded to finance all their operations and investments without taking on any debt at all. Instead, evidence suggests their debt taking was driven by overly high dividends, which exceeded their cash balances in all but one year since privatisation. The cost of the constantly growing debt is then passed on directly to consumers in the form of higher bills.

What can be inferred from the analysis is that **without those dividends, the companies likely wouldn't have had to take on this much debt**. As a result, interest payments could have been much lower, leading to lower pressure on bills. In fact, English customers seem to lose out on all fronts as even the key argument used by proponents of privatisation, "massive capital investments," looks bleak when compared with **Scottish Water which invested on average 35% more than the 10 English companies in the last 16 years.** As literature and Scotland's example show, the government seems fully capable of managing the water industry "just as efficiently, but at lower cost to consumers" (albeit this statement requires further research).

In the course of this paper, not only have we showed that Ofwat's explanations for price increases seem unrepresentative of the truth, but also that the reality looks far worse – increasing bills seem to be the implication of large dividend pay-outs, which have been disproportionate to the industry's financial capabilities. As a result, I believe English customers have been misled with a fog of statements about 'high private sector investments' and should be made aware of this other, until now, hidden issue driving bills higher. It is very easy to impress the public by stating a massive, £140bn investment figure, however, what's crucially missing is context: The number translates bleakly into an average of slightly more than 200£ per household per year vs an average of 270£ in Scotland.

We conclude that the way the privatized industry operated over the last 30 years may no longer be sustainable. The industry's Debt/Capital ratio stands above 70%, and some companies are on the verge of receiving a junk investment rating. Problems of the industry are visualised by **Thames Water**. The company is now owned by a consortium of Private Equity and financial investors, having previously been in the hands of the infamous Macquarie Group since 2006. Shockingly, Macquarie borrowed more than £2.8bn to finance purchase, and later supposedly repaid £2bn of the debt through new loans raised by Thames Water through a subsidiary in Cayman Islands, effectively transferring the purchase costs to customers (BBC, 2017). Furthermore, in those 10 years, **debt increased 2.3x times** (from £4bn to £10bn), **dividends** averaged **270m per year**, yet between 2011 and 2015 **they paid no tax** (Bayliss & Hall, 2017)**.**

In 2015, Thames announced a massive 'super-sewer' investment project. However, putting it on its balance sheet would have led to a junk investment rating, something the regulator does not allow as part of its (surprisingly) **only** regulatory requirements on capital structure (in my opinion a key regulation issue). The government had to step in with help and an exception was made to finance the project by yet another investor consortium with a murky, unclear structure (unreadable network of holding companies, most located in tax-havens). The entire cost of the project must thus come entirely from increased customer bills. This is certainly not what people want from monopolist providers of a public good.

The crucial way to think about this debate is to consider what will happen 10 years from now. Even if it could be argued that English companies offer customers better quality today, at the current pace of Scottish Water investments, this difference will disappear in no time. Once those industries are on par in every quality metric, then the Scottish model will be superior given the lack of 2bn per year spent on dividends. For this reason alone nationalisation should not be disregarded, but rather considered rationally. Instead of focusing this debate on two extreme scenarios – full privatisation vs full nationalisation - perhaps there is a middle ground in which partial

nationalisation takes place. This would provide an interesting benchmarking opportunity to see whether companies taken into the public hands would outperform those that remain private. Water is not a commercial product, it is something we all need to survive, and it is our moral responsibility to provide it at lowest possible costs – no one should ever have to ration water, nor should anyone ever worry about not being able to pay their bill.

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Appendix I – Cash Flow Tables

All data in £billions (2017-2018 prices). Sources: Armitage 2011, company reports, author's calculations

England	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Operating Cash Flow	3.4	3.8	4.2	5.0	5.2	5.0	5.6	5.5	5.9	6.0	5.3	5.2	5.2	5.4	5.5
Capital Expenditure (CF)	3.7	4.6	4.8	4.1	3.6	3.6	4.6	5.3	5.0	5.1	3.7	3.7	4.4	4.6	4.4
FCF before interest	0.7	-0.6	0.1	1.1	2.0	1.7	1.4	0.1	0.5	0.4	1.7	1.4	1.0	1.0	1.6
FCF after interest	0.5	-1.0	-0.5	0.4	1.5	1.2	0.7	-0.6	-0.5	-0.6	0.4	0.1	-0.4	-0.4	0.1
Dividends	1.3	1.2	1.3	1.4	1.5	3.3	2.1	3.3	3.2	1.7	2.1	1.1	1.6	1.6	1.5
Cash missing	**0.8**	**2.2**	**1.8**	**1.0**	**0.0**	**2.1**	**1.4**	**3.9**	**3.7**	**2.4**	**1.7**	**1.0**	**2.0**	**2.0**	**1.4**
Debt taken	0.3	2.6	2.0	1.0	0.1	2.5	1.2	3.6	3.9	2.1	2.1	2.0	3.8	2.7	2.2

England (continued)	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**SUM**	**Aver-age**
Operating Cash Flow	6.2	6.3	6.6	6.7	7.0	6.5	6.0	6.3	6.5	6.7	6.3	6.3	5.8		
Capital Expenditure (CF)	3.9	4.8	5.4	5.4	4.3	3.8	4.3	4.4	4.5	4.5	4.0	4.3	4.4		
FCF before interest	2.1	1.5	-0.4	1.3	3.3	3.3	2.2	2.1	2.6	2.5	2.6	2.2	2.0		**1.5**
FCF after interest	0.5	0.0	-1.9	-0.2	1.2	1.5	0.1	0.2	0.5	0.5	0.8	-0.3	0.2		**0.1**
Dividends	2.1	3.9	1.7	2.5	1.9	1.8	2.0	2.0	1.7	1.8	1.4	1.7	3.0	**55.8**	**2.0**
Cash missing	**1.6**	**3.9**	**3.6**	**2.7**	**0.7**	**0.4**	**1.9**	**1.8**	**1.2**	**1.3**	**0.6**	**1.9**	**2.8**	**51.7**	**1.8**
Debt taken	1.2	4.2	4.8	5.6	-1.3	2.1	2.8	2.2	1.8	2.2	2.6	2.5	3.0		

Scotland	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Aver-age
Operating Cash flow	0.70	0.71	0.81	0.88	0.83	0.84	0.83	0.66	0.69	0.63	0.64	0.59	0.50	0.59	0.61	0.53	0.69
CAPEX	0.57	0.57	0.75	0.93	0.63	0.84	0.92	0.52	0.44	0.44	0.46	0.42	0.31	0.36	0.54	0.51	0.58
FCF before interest	0.14	0.16	0.08	-0.04	0.22	0.03	-0.08	0.16	0.27	0.20	0.19	0.19	0.22	0.26	0.09	0.05	0.13
Interest	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.25	0.24	0.23	0.22	0.21	0.21	0.21	0.20	0.19	0.21
Cash missing	0.08	0.05	0.12	0.24	-0.02	0.16	0.28	0.09	-0.03	0.03	0.03	0.02	0.00	-0.05	0.11	0.14	0.08
Net debt taken	0.08	0.05	0.12	0.24	-0.02	0.17	0.29	0.10	-0.02	0.04	0.04	0.03	-0.01	-0.05	0.11	0.14	0.08

Appendix II – Supplementary charts

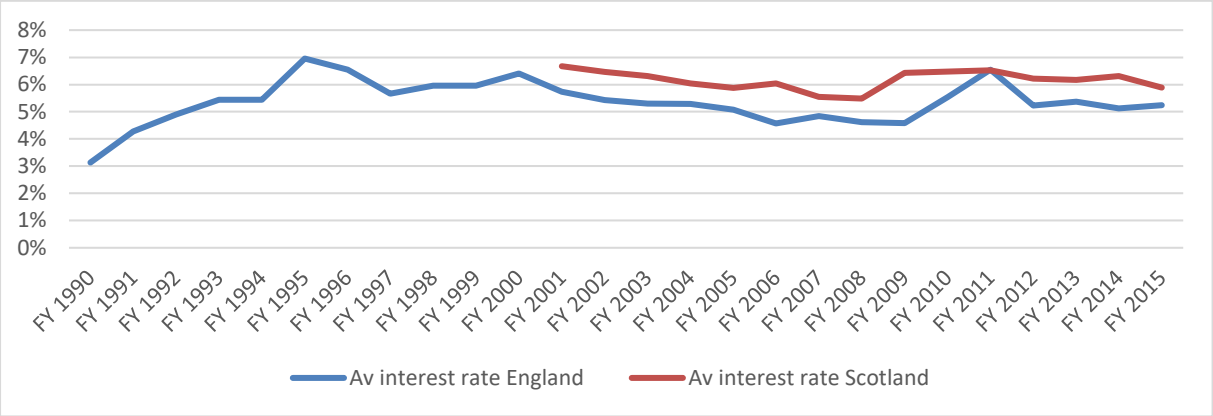


Figure A1 – Real interest rates (rough approximation)

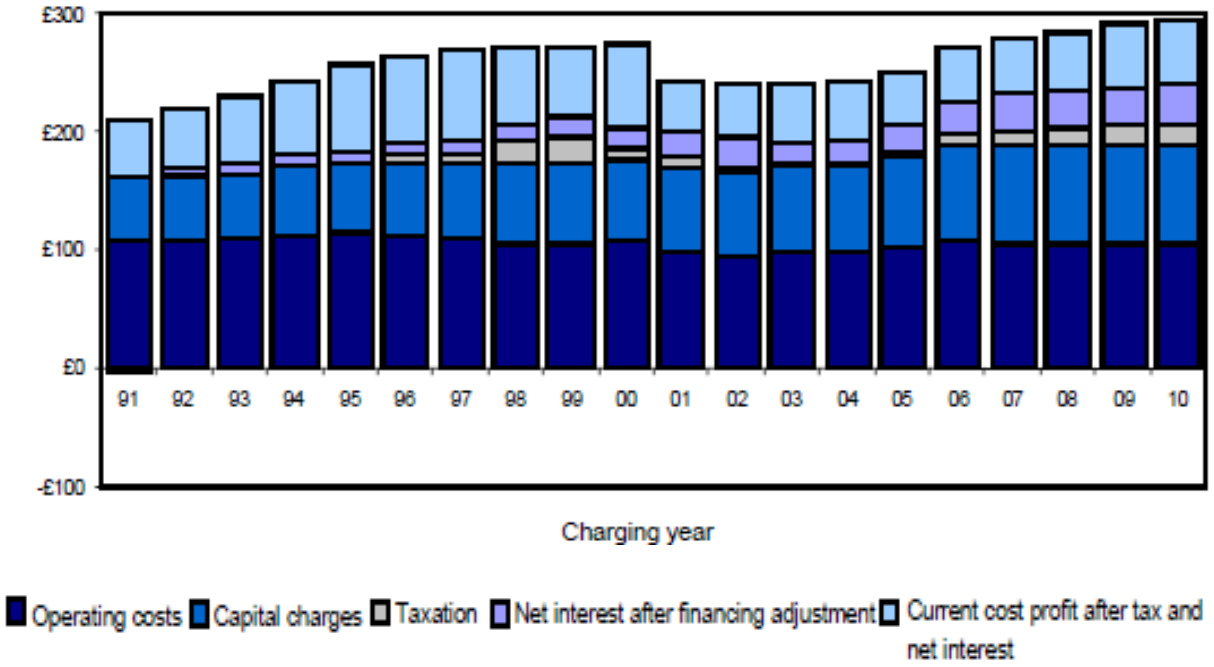


Figure A2 – Ofwat, decomposition of bills into component parts

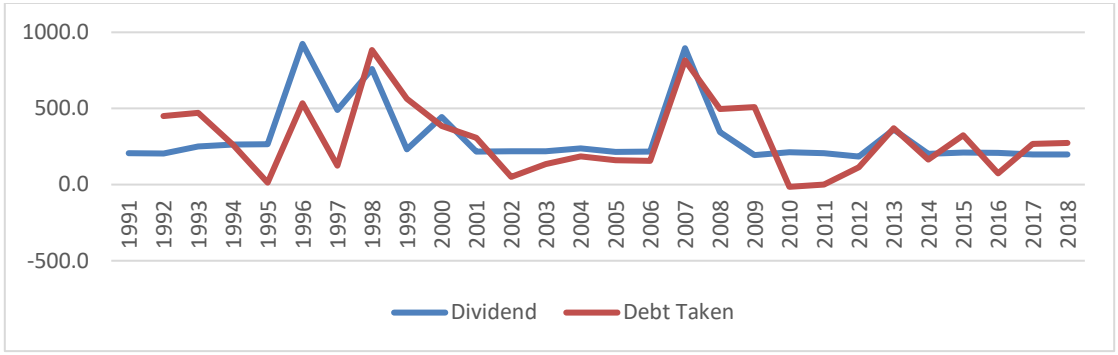


Figure A3 – Severn Trent debt taken vs dividend in a given year (millions)

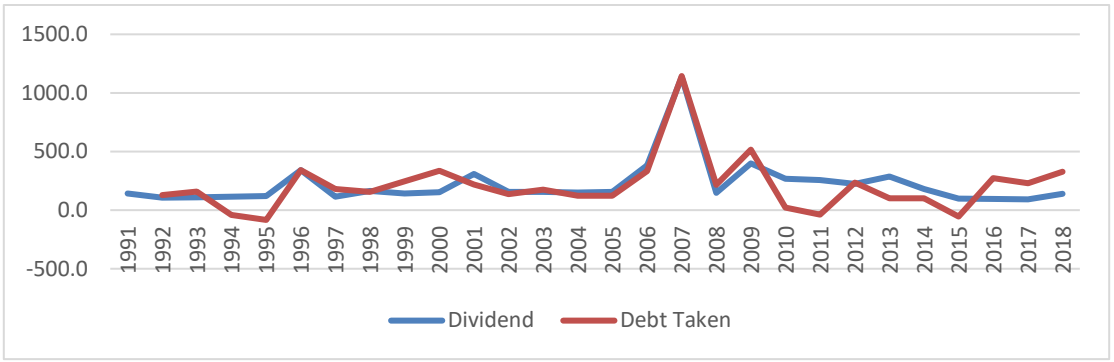


Figure A4 – Yorkshire Water debt taken vs dividend in a given year (millions)

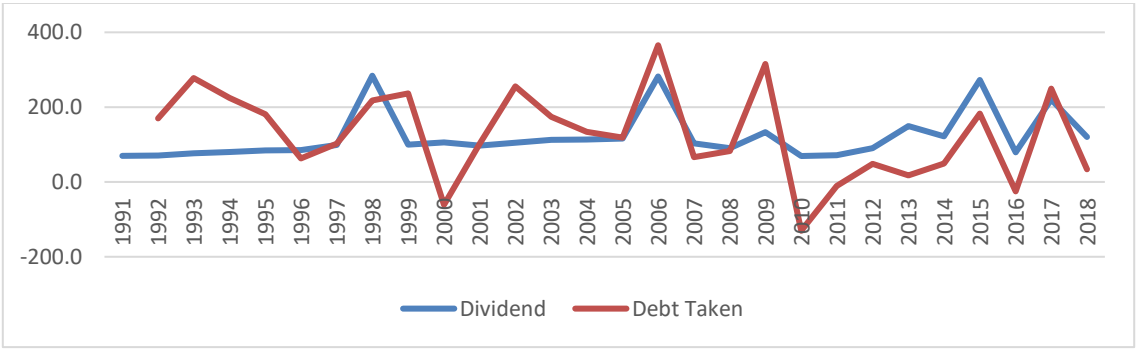
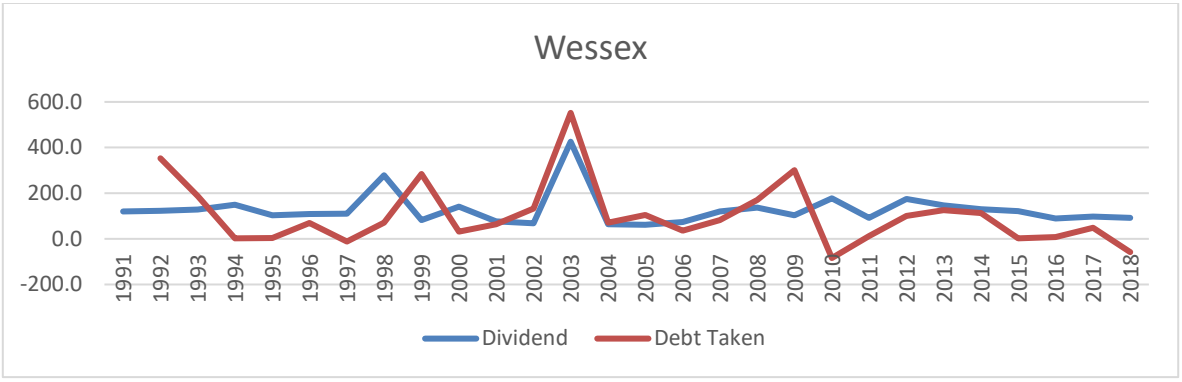
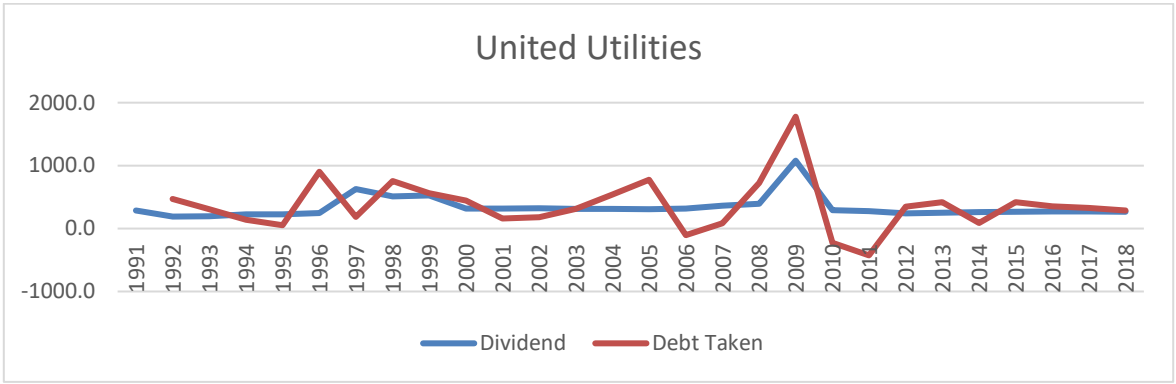
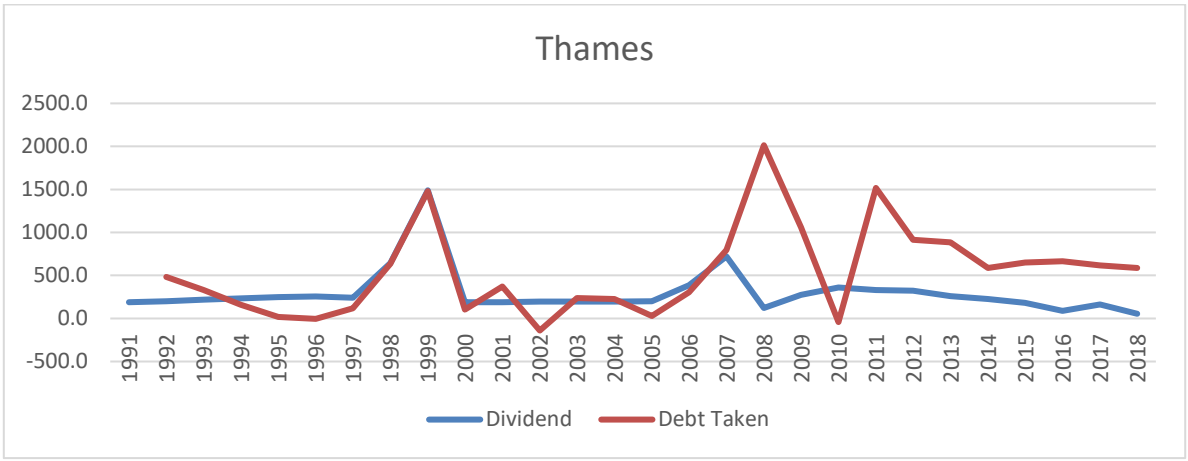
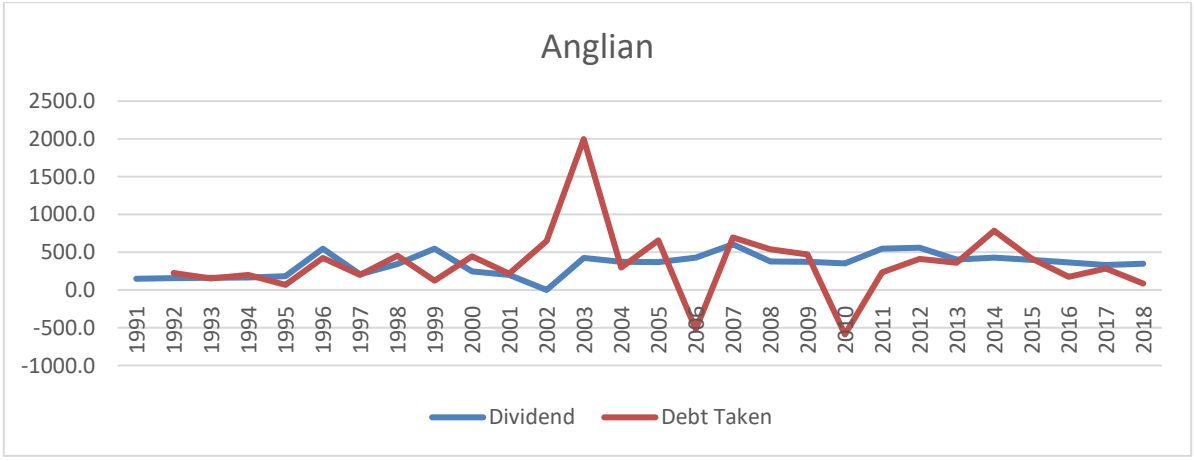


Figure A5 – South West Water debt taken vs dividend in a given year (millions)


Wessex
600.0
400.0
200.0
0.0
-200.0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Dividend
Debt Taken


United Utilities
2000.0
1000.0
0.0
-1000.0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Dividend
Debt Taken


Thames
2500.0
2000.0
1500.0
1000.0
500.0
0.0
-500.0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Dividend
Debt Taken


Anglian
2500.0
2000.0
1500.0
1000.0
500.0
0.0
-500.0
-1000.0
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018
Dividend
Debt Taken

Appendix III – Leakage figures

Company	Leakage thousand liter / per day	Pipes in km	Leakage per km (thousand liter)
Thames	695,000	31,448.0	**22.1**
United Utilities	462,650	42,838.0	**10.8**
Scottish Water	495,000	48,700.0	**10.2**
Yorkshire	300,000	31,578.9	**9.5**
Severn Trent	443,000	47,127.7	**9.4**
England Average			**9.3**
Northumbrian	137,000	17,125.0	**8.0**
Southern	88,700	13,859.4	**6.4**
Dwr Cymru	173,000	27,460.3	**6.3**
South West	83,000	13,387.1	**6.2**
Wessex	67,700	11,877.2	**5.7**
Anglian	183,000	38,125.0	**4.8**