Liberalization and private sector involvement in the water industry: a review of the economic literature

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Abstract

The theoretical and empirical literature on water supply and sewerage liberalization is reviewed in this paper in order to discuss the potential for market creation and private sector involvement in this sector. The analysis is framed in the "policy roadmap" developed by regulatory economics and discusses opportunities for competition in the market, unbundling, competition for the market and yardstick competition. A review of studies comparing privately and publicly managed water utilities is finally provided.

Keywords: Water supply and sewerage; liberalization; private sector involvement; water infrastructure; economic regulation

JEL classification: L51, L95, H54, L33

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Liberalization and private sector involvement in the water industry: how ideology could ruin a good idea[1]

ANTONIO MASSARUTTO

1. Introduction

Since Adam Smith, water supply and sewerage (WSS) has been considered unsuitable for market provision, due to high investment requirements, long economic life, natural monopoly conditions. Evidence of positive externalities arising from centralized supply, especially regarding public health and urban propriety, have soon made evident the link between water and urban development. Until recently, the very idea that WSS belongs to the category of "public utilities" instead than "urban infrastructure" would not be easily accepted.

In the last 20 years, however, this statement has been put into question. First of all, once most of its public good dimensions have been achieved, WSS started to be looked at as a service purchased by individuals, alike those supplied by other network industries; as for other utility industries, the baseline framework of state intervention has been criticized giving rise to a massive effort aimed at exploring the ways that could make competition and private sector initiative compatible with WSS.

Second, evidence of government failures and inefficiency in many publicly-managed water undertakings has created a favorable climate for considering private sector involvement and market-based finance (Shirley, 2002; Rivera, 1996). Particularly in developing countries, international lending institutions have often subordinated financial support to (some sort of) delegation to the private sector of managing and capital responsibilities (Bayliss, 2000). The strategy for achieving of Millennium Development Goals, with its compelling targets concerning water, is for a large part relying on private sector initiative (Winpenny et al., 2003).

Third, the increasing technical and managerial complexity of the value chain of water services calls in any case for a greater autonomy of professional water undertakings and the acquisition of a business-oriented mentality, whatever the ownership (Barraqué, 1992; Massarutto, 2006). This is also linked with the gradual substitution of traditional ways of financing investment in the WSS through the public budget, calling instead for self-sufficient user-based finance based on tariffs and prices (Serageldin, 1994).

For all of these reasons, involving the private sector in the water industry has become a popular idea. Concrete results, however, have hardly confirmed initial expectations, and have given origin to a vast and diversified opposition to privatization. Instead than increased efficiency, declining prices and better quality, private sector initiatives are often accompanied by severe impact on family budgets and evidence of unresolved market failures.

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Although a good deal resulting from an ideological prejudice in favor of the market and the lobbying of large multinational water companies, this position can also be understood with the objective difficulty to create genuinely efficient publicly-owned and publicly-managed systems in these countries and with the need to rely on private capital markets for gathering the necessary financial resources.

but also with a political and ideological stake claiming for public control over an essential service that should be regarded as a social right instead than a commodity (Hall, 2001; Castro et al., 2006). Both in Europe and in the US, government advisory panels and responsible authorities have recently expressed a more prudent attitude towards PSI, that continues indeed to be promoted; yet prevalent focus is now on private-public partnerships (PPP), outsourcing and risk-sharing mechanisms instead than full divestures and complete delegation to the private sector (Bakker, 2003a; Gee, 2004; WRc and Ecologic, 2003; National Research Council, 2002; The World Bank, 2004; Oecd, 2000).

The present paper aims at a critical review of the rise and fall of water privatization.

The analysis is first conducted on an *ex-ante* base, under the frame of the standard regulatory economics. Alternative options for creating competitive markets are examined.

In the final section, we move to an *ex-post* perspective and provide a survey of the applied literature assessing outcomes of WSS liberalization and comparative studies on private and public water management.

3. Alternative liberalization options: theoretical insight

3.3 - Competition in the market

The economic literature is quite unanimous in recognizing the limited scope for competition in the market, at least as far as WSS are provided through physical networks (Massarutto, 1993; Muraro and Valbonesi, 2003; Spulber e Sabbaghi, 1994; Cowan, 1997; Beecher, 2001; Rees, 1998).

Rather, the issue regards the possibility to supply water services *without* physical networks; in fact these are not everywhere indispensable (Massarutto and Paccagnan, 2006), especially in less developed countries (Brown, 2004; The World Bank, 1997). In rural areas, for example, self-supply on individual or community base is still diffused both for water supply (boreholes) and sewage treatment (septic tanks). In other cases, proximity to large facilities developed by industry or other uses (eg big touristic resorts) allows infrastructure to be shared by urban water users as well. At least, individual systems could be used as complements of the collective system: for example, individual rainwater collection or wastewater recycling may be used in order to serve low-quality water requirements such as for irrigation (Dixon et al., 1999; ; individual drinking water production equipment could be used at a household scale instead than requiring costly treatment of all water supplied by public networks; this could also be helpful in controlling contamination occurring in the pipelines after the drinking water treatment facility (Goodrich and Krishnan, 2003). Desalination is now a valid and cost-effective option at reasonably low scales, particularly for isolated communities (Lora et al., 2004; Voivontas et al., 1999).

All these options are attracting attention especially in rural and suburban areas (where network

supplies can be extended only at a high cost) and in developing countries. England and Wales have introduced a similar possibility through the so-called “inset appointments”: customers that are not already connected (eg new urban development) can constitute themselves as a collective entity choosing the preferred operator for managing their own WSS systems; this operator might then connect to the incumbent water company serving the same area (eg for bulk supply of for sewage collection) or ask for their own abstraction and discharge licences (Sawkins, 2001; Ofwat, 2000). In other countries, such as France, individual or community-based low-tech systems are being considered as a cost-effective solution for rural sanitation (Barraqué, 2005).

However, these examples are not decisive since they do not affect the need to provide anyway a network supply for all the other uses, especially in urban areas. Their obvious limit is the need to take care of externalities that might arise in case of intense interdependence of water uses. In fact urban water systems are dominated by centralized network supply (Lorrain, 1995). With respect to this, the scope for competition in the market seems rather limited.

The geographical size of the market is limited by the high cost of transport and by the environmental unfriendliness of concentrating impacts in single points. Even if the most important segments are considered separately (transport, storage, distribution, sewage collection, sewage treatment) this continues to be true. In each market segment, most phases entail significant economies of scale that make it inefficient to duplicate facilities (Noll et al., 2000; Spulber and Sabbaghi, 1994).

Also to be excluded is the possibility of side competition, namely providing the same use functions through different goods and services that substitute for network water supply. This can be imagined only for a few water-related functions. Drinking water demand can be turned to bottled water, while many individual uses of water could very well be supplied collectively (eg swimming pools); in some cases, tankers could be a substitute for long-distance pipelines, etc. But again this is not a valid argument, since centralized pipeline supply would be required anyway for all other uses, that are in fact the bulk of domestic consumption.

The cost of WSS networks is for the most part sunk; a significant part of it (80-90%) is due to infrastructure, while water production and customer services are only a small part. This reduces the scope for third-party access only to those few situations in which water scarcity and externalities are a more important cost component than physical assets (Noll et al., 2000). Differentials in water production costs arguably depend on environmental and hydrological conditions, thus the efficiency gains from competition in this segment are likely to be modest.

Some authors have nonetheless explored the possibility to introduce third-party access at least for the joint use of storage facilities (Cowan, 1997). This provision is actually foreseen in England and Wales, though with a limited success so far; in any case, the eventual market would arguably regard two neighbour companies serving different territories instead than competing for supplying the same market.

A similar statement could be made with respect to the so called “water markets”. This idea, developed first in the US and especially in California, again makes some sense when considering the exchange of large quantities of water among neighbouring water companies (and similarly, WSS and other water uses, especially agriculture); this market regards in any case bulk supplies and not very much the competition within the core of the WSS, namely the provision of service to final customers (Dellapenna, 2001).

All these arguments support the conclusion that wherever a network system is required, a unique infrastructure is the most efficient solution, and potential for competition in this market is rather limited, including the option of unbundling and third-party access.

3.4 - Competition for the market

Competition for the market via competitive tendering has received the greatest attention in the literature (Muraro and Valbonesi, 2003) and is also the most diffused model in practical PSP experiences (Noll et al., 2000), even because of the support given to this model by international institutions (Lobina and Hall, 2003). Water concessions are expected to create value by boosting service coverage and quality, and by improving the efficiency of utility operations (Berg, 2000).

However, theoretical analysis reveals that this is true only at some conditions. The critical factors to be examined regard contract completeness, transactions costs, information asymmetries among participants and adequate number of candidate suppliers with similar ex-ante information on technology (Sappington and Stiglitz, 1987). Long-term relations in which parties are at risk of opportunistic behaviour of counterparts require very complex adaptation and sophisticated contractual arrangements (Williamson, 1976; Crocker and Masten, 1996).

The likelihood of these conditions to be satisfied in the WSS sector is limited, especially if we consider the industry as a whole (integrated responsibility over the 3 core functions described in par.2).

Theoretical contributions (Massarutto, 1993 and 2002; Cowan, 1997; Noll et al., 2000; Rees, 1998; Beecher, 2001) as well as empirical experience (WrC and Ecologic, 2002; Oecd, 2004; Pricewaterhouse&Coopers et al, 2004; Lobina and Hall, 2003) stress the critical importance of infrastructure life and related risk. Private firms have limited incentives to invest without appropriate guarantees that costs will be passed on tariffs and sunk costs will be relieved at the end of the contract. Once in place, on the other hand, these guarantees can stimulate over-investment in order to avoid the risk of service failures. The trade-off to be solved is evident: investment needs would either be postponed indefinitely in time, with the risk of collapse in the future and need for a new initial investment financed by the state; or, on the other hand, the operator will make pressures to justify unnecessary new investment and replacement, “gold plating” etc. (Kraemer, 1998; Rees, 1998).

This can be easily understood by recognizing that AMD contracts are exposed to significant transactions costs arising from information asymmetries and opportunistic behavior. Once the investment is sunk, responsible entities might be tempted to impede price increase over the marginal cost, thereby appropriating the “quasi-rents” and making it impossible for private companies to recover the fixed cost (Noll et al., 2000); on the other side, the company might easily capture regulatory decision and force technological and investment choices, particularly if it is vertically integrated along the value chain (Lobina and Hall, 2003).

In order to avoid this, renegotiation rules, penalties for incompliance, risk-sharing devices need to be foreseen in management contracts, thereby deviating from the theoretical “first best” represented by price-based tenders (Shirley, 2002; Beecher, 2001; Antonioli and Fazioli, 2002). Tenders for water contracts are likely to be more open-ended, with significant degrees of subjective evaluation and bargaining before and after the contract is released.

Less difficult is it when the object of the tender are simpler tasks such as building and operation of a facility for a given time, or operating a single element of the network (eg distribution or sewage treatment). Of course in order to make this alternative practicable, another subject (quite easily a public authority) should be responsible for the integrated planning and management of the whole system.

Empirical evidence shows in fact that the more the operating company faces market risks (tenders), the more it tends to refuse responsibility on AMD; vice-versa the latter is more easily accepted when market risks are reduced (eg. because contract terms are much longer, because incumbents are expected to have an advantage in the next bids, or because contractual clauses allow to recover investment costs anyway) (Lobina and Hall, 2006; Pricewaterhouse&Coopers et al., 2004).

All practiced contractual solutions (eg the French affermage contract, the various forms of project finance or mixed public-private companies, the various forms of asset-ownership public companies)

provide a clear limitation or at least definition of the risk that the private company is assuming. An indirect demonstration of this is provided by the recent record of competitive tenders issued in Italy. Object of the tender was typically a 30 years commitment over an asset management and development plan previously defined by the competent public authority. In the last two years, nearly all tenders have remained desert, and this is due with evidence to the extreme vagueness and imprecision of ex-ante information and to the impossibility for tenderers to evaluate concrete risks and remuneration, while the commitment of local authorities to future price increases was judged as scarcely attendible (Drusiani et al, 2004; Antonioli, 2006). This can be achieved, for example, by maintaining asset ownership – and related responsibility in the long run – in the hands of the public, and foreseeing appropriate and transparent solutions for transferring sunk investments sustained during the contract lifetime from the incumbent to the new operator (Boitani and Petretto, 2002). Similar arrangements are particularly important in the phases of expansion of the asset base, and relatively less important when maintenance, adaptation and renewal are at stake (Kraemer, 1998).

Another way of reducing risk is to participate to a mixed venture company instead than tendering for the contract: a solution that has become particularly popular in Italy (Drusiani et al., 2004). This PPP variant has in fact some advantages both for the public and the private company, since it allows the public to gain from the exploitation of the service and maintain a hold over the whole system, while the private partner is more guaranteed about the commitment of public sector to maintaining the company viable and acquire a further advantage in the next bid.

Delegation of investment-related risks requires in turn a much longer time horizon, protection of incumbent from competition and arrangements for passing unexpected costs onto tariffs. Intermediate solutions include certain maximum investment levels to be guaranteed by the operator in exchange for contract duration and guaranteed margins over operational costs. The public sector can later on adopt other arrangements for PSI in that particular phase (such as DBFO), while pursuing autonomous strategies for operation. However, this allows the operator to acquire a significant – and growing – contractual power arising from the control of relevant information concerning technology and the state of the assets (Garcia and Thomas, 2003).

A second critical hypotheses of efficient competitive tendering is likely to be violated then, namely the one on equal ex-ante information. The cost of water services, while being easily standardized in each of its individual components, can hardly be overall predicted on a standardized base, due to the relevance of site-specific variables. It is likely that the incumbent operator will accumulate during time a significant information monopoly protecting it against potential new entrants, especially if the tender is, as we argued, open-ended and subject to ex-post bargaining.

International experience provides clear evidence that incumbent replacement occurs only in exceptional cases, and is in any case likely only when the contract covers simple activities for short periods. Competition does occur especially when a first-time contracting out is at hand, but incumbents' position becomes stronger in the following bids (Massarutto, 2002; Lobina and Hall, 2003). Although, evidence from France is interesting: competitive tendering has been made obligatory by 1997 law, after a long time in which private companies have enjoyed direct renegotiation of contracts, price setting etc, what arguably has allowed extra-profits and monopoly rents. Some effects of competition have indeed occurred, with an average 10% of cases in which a new entrant replaces the incumbent and a 10.5% price reduction on contract renewals (Gea-Engref, 2005).

Private companies can further reduce the risk of being replaced by adopting vertically integrated models, internalizing a significant part of the value chain. In this way, the company can accept higher risks in the pure operation, provided that margins are obtained in the other activities along the value chain. An eventual replacement is less risky, provided that the company has been able to introduce during the contract duration as much patented technology as possible; the eventual new operator will continue to use the same technology, particularly if contract clauses oblige it to rebuy it from the incumbent (Prost et al., 1999).

Therefore, an important aspect to be considered in order to evaluate delegated contracts is the transparency of economic transfers between the operating company acquiring the contract and the supply chain, as well as the adoption of flexible technological solutions that do not lock the system into a definite technological choice. The real capacity of the responsible entity to have a control on this is however questionable, and the likelihood of regulatory capture greater, as many examples show (Elnaboulsi, 2001).

Again, empirical evidence confirms that market-oriented water companies tend towards vertical integration wherever the delegated model prevails; vice-versa, where monopoly prevails, either in the form of public management or privatized monopoly, the tendency to purchase inputs from the market and outsource is greater (Kraemer, 1998; Finger et al., 2006). For example in Germany and in Italy the procurement markets are quite competitive and dynamic, favoring the development of specialized companies (eg for construction, equipment, engineering, components production, as well as operational activities such as meter reading, billing etc).

The explanation of this trade-off between competition for the primary market and procurement can hardly be explained by transactions costs between service operation and the production of inputs, that do not seem particularly important, being water technology quite mature (Beecher, 2001; Rees, 1998); although efficiency in procurement is directly linked with knowledge and technical capabilities of the operator, therefore limiting the possibility to consider the operating company as a "pure procurement company" (Prost et al., 1999).

An alternative explanation can be based on economies of scale (Amato and Conti, 2006). Local monopolies are not necessarily reaching a scale that is optimal for all phases. Especially if historical, institutional and political reasons force local monopolies to small scales, the probability that they will acquire inputs from the market will be higher. An indirect demonstration of this is provided by England and Wales, where the size of monopolist water companies is higher and their propensity to internalize activities (eg engineering services) is also higher than in Italy, Germany or the Netherlands.

A third explanation considers the allocation of economic risks under the different management models (Massarutto, 2006). Vertical integration helps private operators to reduce the risk of participating to tenders, since they can recover economic margins through the sale of goods and services produced by the parent company; moreover, they can raise information barriers against potential new entrants or even against regulators, through the use of proprietary technology that would bind the next operator.

Concerning the last critical factor (adequate number of competing candidates), no systematic studies are available to our knowledge analyzing the degree of concentration of the WSS industry and the likelihood of effective competition. Although the number of WSS operators in the world is quite high, only a few of them have an effective capability to compete globally, or even outside the regional market.

In fact, the degree of competitiveness in the market for tenders is seemingly not very high (Finger and Allouche, 2001). Most local water companies are in fact not showing interest in tendering outside the area they already serve, or if they do this rarely takes the form of participation to tenders and more often takes the form of participation in minority capital, supply of technical services and know-how (Vaccà, 2002; Ninni, 2006). The number of exceptions is quite limited, and includes the French multinationals, a handful of US companies and no more than a tenth of companies from other EU countries. Although no systematic and statistically significant surveys are available, anecdotal experience from tenders shows that the number of participants is usually very small (Lobina and Hall, 2003; Drusiani et al., 2004; Antonioli, 2006). In case WSS is integrated with other utilities, especially energy, some larger spectrum of interested participants to tenders is documented, dragged by the latter services (Ninni, 2006; Drusiani et al., 2004). More lively is the market for specialized activities along the value chain, from DBFO for assets and facilities to outsourcing of operational functions (WRc and Ecologic, 2003).

To sum up, the applied literature suggests that competition for the market is easy to practice in the water service as far as simpler activities for shorter periods are concerned. This limits the use of the instrument in its pure form to operation only; while an involvement of the private partner in asset management also would require special risk-sharing arrangements that deviate quite a lot from the pure model suggested by the theory and create the opportunity of other unwelcome consequences (eg higher risk of regulatory capture and corruption). Integrated services, with substantial responsibility over long run management, renewal and development are less suitable for this kind of solutions, at least in absence of clear mechanisms for alleviating, confining and adequately compensating the risk for the private enterprise.

In the latter case, the biggest difficulties are to be expected in the writing down of a complete contract, what will result in the need to renegotiate the contract very often. In this "bilateral" deal, it is highly probable that the company will exploit its information monopoly; depending on price regulation and on the facility of rising prices, this would likely result either in systematic cost inflation and price increase, or in service failure and underinvestment.

Not surprisingly, therefore, the concrete practice of competitive tenders in the water sector deviates quite a lot from the theoretical model of competition for the market. Instead than regarding price-based simple and well defined activities for a short period, WSS bids are more frequently close to the model of beauty contests: individual qualifications of bidders are ranked higher, evaluation of proposals is discretional, dimensions to be evaluated very high etc.

3.5 - Regulated monopoly: yardstick competition and benchmarking

For the above reasons, competition for the market is suitable for certain WSS market segments but cannot be easily applied to the integrated WSS system as a whole. According to our policy roadmap, the next step is to verify the possibility to introduce incentive regulation on those phases that remain unsuitable for competition.

With a very few exceptions (Cowen, 1998), the absolute majority of studies conclude that this is an unfeasible option for WSS given the natural policy conditions and the extremely high social importance. Privatized monopolies are therefore an option only if an appropriate regulatory system is set up, and this has the effective power to force water utilities to pursue the general interest.

If regulation provides appropriate incentives, this model is expected to generate various beneficial effects in terms of efficiency (Rees, 1998; Beecher, 2001; Cowan, 1993; Littlechild, 1986): permanent incentive to reduce costs, encouragement of private investment (guaranteed by the minimum market risk) and further pressure to efficiency guaranteed by the threaten of takeovers, provided that capital markets are efficient enough.

However, if the regulator suffers from information asymmetries and the regulatory regime is not optimal, these advantages are overwhelmed by regulatory capture; costs are simply transferred on consumers and not reduced, while in case of price cuts investment and service quality would be reduced.

Quality regulation is also required, since incentive regulation is keen to foster cost reduction at the expenses of service quality (Noll et al., 2000).

But the more questionable point regards long-term viability, particularly if it is considered together with private capital market expectations (Bakker, 2003). The full privatization of assets is in fact not necessarily a welcome gift for the companies if it is accompanied by a permanent responsibility to maintain them in order to fulfil service obligations. In order to ensure adequate financial resources for asset renewal and maintenance, the corporate cash flow should be equal to the depreciation and capital

cost; but since private capital markets have a time horizon that is usually far lower than the depreciation schedule, this determines the necessity to depreciate in shorter periods or pay a higher risk premium. This difficulty has become evident in the British water industry, as far as replacement needs have started to appear. Cooper and Currie (1999) argue that the correct risk premium should be 6,6% over the risk-free activities, higher than the 4,75% assumed by Ofwat. Some companies are therefore slowing down their investment programs; in some cases they even attempted to step back from total asset ownership and return them to the public sector (Saal and Parker, 2004).

Massarutto (2006b) has provided estimates from the case of two Italian Regions, showing the substantial increase in water prices if the long-run full cost would be considered (i.e. including the true depreciation of assets) together with a market rate of return.

For all of these reasons, the ultimate performance of regulated monopolies depends on the quality of regulation and its effective power, which is not only a matter of formal powers but also of the quality of available information. Incentives to cost reduction require at least that the regulator has a fair knowledge of the production function and good comparative datasets; parametric models and benchmarks.

Three major obstacles are discussed in the literature.

First of all the cost function of the water industry is characterized by some important site-specific variables (Merrett, 1997; Amato and Conti, 2005); these are sometimes quite easy to measure (eg density, climate, quality of raw water and required treatment, pumping costs), sometimes not (eg vulnerability of resources, opportunity of long distance transfers, levels of environmental protection to be achieved, regional features). For this reason, while some parts of the value chain are quite suitable for yardstick competition and benchmarking (especially distribution), other are so only as far as operational costs are considered (sewage treatment, drinking water treatment) and still others are unsuitable even for this (eg raw water production when this entails surface water development, distance transfers, storage systems).

The search for econometric cost functions for benchmarking purposes has been tried in many cases, with limited success. In the theoretical literature, a number of studies has provided some interesting insights but no conclusive and reliable formulas (Antonioli and Filippini, 2005; Fauquert and Guerin-Schneider, 2005). At a more applied level, the Italian government has issued a model based on 8 explanatory variables and many dummies, whose significance has been repeatedly criticized (Massarutto, 1998). In England and Wales, relatively better econometric results have been documented for the benchmarking formulas developed by Ofwat; this is probably due to the larger territorial size of concerned management units and on the fact that formulas are considering separately operational costs, asset management and procurement (Amato and Conti, 2005). The French approach is based instead on performance and partial productivity indicators, and its practice is still only explorative (Guerin-Schneider and Nalkha, 2000). The same approach has some practical experience in Germany (Ecologic, 1997 and 1999) and in the Netherlands (van Dijk, 2003).

In any case, the limited statistical significance and the difficulty to come up with meaningful parameters suggests to limit this benchmarks to providing information and not as standard values to be automatically implemented in price-cap formulas (Massarutto, 1998).

A second difficulty arises from the already cited tendency of the private water industry to integrate vertically (along the value chain) and horizontally (towards new territories and/or other markets; multi-utilities, etc) (Finger and Allouche, 2001). This raises information barriers that impede a proper evaluation of the appropriateness of prices charged for infra-group transactions, on one side; and of the criteria adopted for spreading the fixed costs on the concerned businesses (Beecher, 2001; Noll et al., 2000). Without an adequate unbundling, it might be very difficult then to protect customers of the regulated business against the risk of indirectly cross-subsidizing company's strategies in the more competitive ones.

In England and Wales Ofwat has imposed a clear unbundling between the regulated business, entrusted to the Water Service Company (WSC), and the other businesses, developed by the Holding company that also owns the WSC. Infra-group transactions are subject to regulatory scrutiny and should be made transparent.

In other countries, publicly-owned enterprises are not subject to particular regulations, but are in turn prohibited to expand towards other markets (eg. Netherlands); while in Germany, to the contrary, water companies owned by municipalities are quite free to engage in other businesses, even considering that they are often integrated with energy and other utilities; expansion and integration is considered instead as a welcome strategy since it allows water companies to better spread fixed costs onto new activities (Clausen and Rothgang, 2002). In Italy, after a period of substantial deregulation in which locally-owned utilities have been left free to expand following a similar model to the German ones, recent legislation has attempted to impede or at least to limit this by requiring that public companies cannot contemporarily operate on the market and obtain direct contracts from the owner municipalities, though with many exceptions that protect those that are quoted on stock exchange (Robotti, 2002; De Vincenti, 2005).

While allowing a more precise evaluation of cost appropriateness, unbundling could in turn produce unfortunate effects, for example impede the exploitation of synergies and economies of scope, that are particularly evident for small-medium multiutilities, that could therefore better absorb fixed costs and eventually engage in businesses that generate positive externalities on the local community (Massarutto, 2003b).

A third difficulty, more specific to actual WSS development, is related to the dynamic phase of the investment cycle. This is especially pushed by the demanding environmental protection requirements imposed by the WFD (Pricewaterhouse&Coopers et al., 2004).

The appropriateness of technological choices is not easy to assess, face to the multiple alternatives existing for achieving the same objectives. This could become even more dangerous, given that the companies, being tightly regulated on operational expenditure, might be tempted to inflate capital requirements, that are less tightly capped or not capped at all.

In England and Wales, for example, order to find a compromise, Ofwat has adopted a price cap formula that includes cost pass through of new investment. Price dynamics is regulated according to a diminishing factor X corresponding to expected efficiency gains and another one with opposite sign, K, intended to provide financial resource for new investment. Every 5 years, water companies present a proposal for capital requirements deriving from regulatory requirements, maintenance and replacement needs. This dynamics can be further corrected during each regulatory period in case of unexpected events (Cowan, 1994). There is some evidence from the regulatory reviews completed so far that Ofwat, while improving sensibly its capacity to cap operational expenditure has not be able to do the same for capital expenditure (Summerton, 1998; Helm and Rajah, 1994; Andrews and Zabel, 1999; Amato and Conti, 2003). In the first regulatory periods the investment agenda was dominated by the need to comply with the European Wastewater Directive, and was thus less negotiable; but as soon as more discretional investment started to be proposed (in order to implement Environment Agency catchment plans or in order to renovate ageing assets), Ofwat has simply tried to curb this expenditure down by reducing the K factor, without entering too much into the merit. The loser in this tug of war between companies and regulator is apparently the level of investment, that experienced a substantial fall in the last two reviews. This has led some water companies into financial difficulties with the consequent request for being unburdened of ownership and consequent long-term responsibility. Using the Welsh case as an example, Bakker (2003) argues about the long term financial unsustainability of full privatization of assets and the likely emerging of new communitarian ownership and risk-bearing models.

A similar trend can be detected in Italy, where the (partial) privatization of local multiutilities is sometimes corresponded by the creation of entirely public asset-ownership companies, whose capital

can later be opened to some institutional investors or eventually to citizens themselves through participatory governance (Drusiani et al., 2004). Also in Germany there are some experiences in the same direction. User cooperatives, instead than publicly or privately owned commercial companies have been proposed on a theoretical base (Morse, 2000; Massarutto and Paccagnan, 2006) and known some interesting experiences for example in the Welsh case (Thomas, 2000 and 2001), in Wittenbach, Germany (Saladin, 2003) and in Latin America (Nickson, 2000).

4. - Private and public water management systems: empirical surveys

As the previous discussion suggests, discussing "private" and "public" water management systems is quite an inappropriate way of framing the discussion. All systems entail a mixture of public and private, there are many different ways for involving the private sector that can be modelled on the theoretical archetypes discussed in section 2.1 but in fact deviate quite a lot from them. As we have argued, what should be understood in order to derive implications is the structure of regulatory institutions, the way risks and rents are shared between actors, the system of incentives and penalties, the capacity of regulators to extract information from operators and so on.

Available studies can be divided in three categories: econometric studies analyzing panels of private and publicly owned water systems; those analysing the impact of regulatory reforms in particular national contexts, and finally those based on individual case-studies.

Studies belonging to the first group show overall a "no contest" between public and private. This is especially true if comparison is not limited to costs and profitability but also includes service quality, investment and general interest dimensions (Renzetti and Dupont, 2003). While recognizing that the empirical work may be weak, because of the lack of reliable data, it is argued, however, that a number of other factors may be much more influential in this respect, which are generally associated with the details of the public-private partnerships, in respect of the structure of incentives and risk sharing. Among these:

- the regulatory environment in which firms must operate;
- size of the utilities, territorial density, hydrological characteristics and other site-specific features
- horizontal integration and possibility to share fixed costs with other services
- tasks that are actually delegated to the private sector and concrete arrangements for sharing risk.

A handful of studies provide evidence of superior performance of private companies in terms of pure cost efficiency (Raffiee et al., 2001), while other studies show the opposite (Bhattacharyya et al., 1994); in the majority of cases, however, results are ambiguous; interestingly enough, public management systems exhibit a far higher variability of results, while private operation is more concentrated around mean values.

As we expected, a more meaningful difference in performance is related to regulatory efficiency rather than ownership. For example Wallsten and Kosec (2005), using a sample of all systems serving more than 100.000 inhabitants in the US, find that no meaningful differences can be found between private and public ownership; significant differences are instead found between counties that do or do not effectuate benchmarking and comparative competition.

In the European context, similar studies have been conducted on the French experience. For example Boyer and Garcia, 2004 compare prices and performance of direct municipal management and delegated private management. In particular, they estimate relative cost efficiency of both, arguing that no significant differences exist. Moreover, they show that the cost factor is not the sole determinant of the price of water services in the public management mode but that more factors related

to the asymmetry of information between the municipality and the private operator (e.g. quality of service, contract variables) are at play in the delegated management model. This and other similar studies (Carpentier et al., 2004; Menard and Saussier, 2002) also show that the decisive aspect regards the nature and governance of transactions, shifting attention to contracts rather than to mere ownership.

More numerous are studies in the second group, showing the impact of regulatory reforms in given contexts at national level or considering individual case studies. In particular the British case has been deeply analyzed, even because of the better quality of data and the cultural shock represented by 1989 privatization.

Many studies have concentrated on the financial performance of privatized water companies, showing a substantial increase in profitability but arguing that this results from price increases more than from productivity gains.

Performance of privatized water undertakings do not show evidence of *absolute efficiency advantage* or Pareto improvements (Dore et al., 2003). While there is evidence of productivity gains with respect to operational costs and especially labour costs, this can be offset by higher cost of capital (Cooper and Currie, 1999), substantial increase in profit and prices (Florio, 2004). A similar conclusion is reached by Saal and Parker (2004), finding evidence that labour productivity has improved in England and Wales after privatization, but this is not the case for total factor productivity (TFP) (which takes into account other factors of production such as capital, materials and fuel usage); the factors? explaining the (slight) increases in TFP are in turn clearly linked with the tightening of regulation in 1995, thus confirming the hypothesis that effective regulation is more important than ownership in fostering economic efficiency of water companies. Effectiveness of regulation is regarded as the most important efficiency driver, with little evidence of regulatory capture (Saal and Parker, 2004; Sawkins, 1995).

In turn, there is also little evidence concerning effects on service quality. Many studies report a significant and rapid increase of compliance rates (in the case of effluent discharges they raised in a few years from 15 to above 90%); a similar positive remark concerns the rapid implementation of European water directives, face to the difficulties met by other European countries (Summerton, 1998). On the other hand, these results are clearly linked to the effectiveness of regulation and to the substantial cost pass-through of new investment; without this allowance, that shifts costs on consumers, the propensity of water companies to invest is far lower as well as its promptness to accept extra environmental quality requirements.

It is quite difficult without a careful case-study analysis to assess whether the price increase is due to the elimination of subsidies from the public budget and increasing cost recovery records; to improved service performance, better maintenance, new investment driven by environmental regulation (particularly for sewerage); or, instead, to an increase of overall costs and, particularly, capital costs and transactions costs. Taxation should also be carefully considered, since privatization often involves the introduction of VAT and corporate tax, while concessions might sometimes include royalties and fees. This information is usually unavailable from general databases.

Also important is to consider a long period of time before deciding on the effects of privatization on prices. Even if private sector participation induces tariff reductions, these are often only temporary and destined to be more that offset by successive increases. Furthermore, price reductions associated with PSP need to be put in perspective if rates charged by public undertakings had been increased substantially to make forthcoming privatizations more appealing to potential investors or to facilitate the public perception of the privatization as a political success. It is therefore essential to pay attention to the dynamic nature of pricing processes (Lobina and Hall, 2003).

Another factor that is neglected in most empirical analyses regards the allocation of risk (and thus perspectives for costs and price increases in the long run, especially concerned with responsibilities on replacement investment). Lobina and Hall, 2003, based on anecdotal evidence derived from a number

of case studies suggest that risk allocation in privatized water concessions departs in practice from what laid out in theory since they normally include clauses and pricing models that shift away risk from the private sector, placing it for the most part on local taxpayers and consumers. This is obtained for example by guaranteeing fixed rate of returns, limiting investment responsibility to a certain fixed amount, indexing tariffs to international currencies etc. Evidence from European countries also show that the preferred PSP arrangement in the water sector is DBFO and project finance with respect to pure concessions; private companies thus accept responsibility on the performance of definite segments and not for the system as a whole, while financial risks are shifted to the responsible entity or at least shared (WRc and Ecologic, 2003).

In the literature based on individual case studies, evidence is again mixed (also betraying sometimes the ideological and political stake of researchers).

In a first phase, interest has been captured by developing countries, in coincidence with the massive programs sponsored by the World Bank and the World Water Forums. For example Berg, 2000 cites Buenos Aires (Argentina), where a concession was awarded to Aguas Argentinas in 1993, as an example that illustrates the benefits of water concessions. Operations and service improved rapidly, there was a tenfold increase in capital investment, and 1 million new consumers gained access to the system in the next five years. Benefits to new users may however be overstated in the analysis of a concession, by ignoring the fact that some already had acceptable service from alternative sources (through private wells, or small providers). Noll et al. (2000) provide similar statements on 5 capital cities in the developing world, while enlightening some critical but arguably remediable regulatory flaws. Similar conclusions arise from many international surveys effectuated under the sponsorship of the Oecd and the World Bank (Oecd and World Bank, 2002).

Evidence of opposite sign arises, in turn, by many other studies and have contributed to a developing political attitudes against PSP, especially when transnational companies are involved (Lobina and Hall, 2003). Increasing water prices, little or no evidence of service improvements, underinvestment and corruption cases are often reported in the frame of this literature.

Evidence of absolutely inefficient WSS management from the public is provided by Estache and Kouassi, 2002, on a sample of African utilities; Shirley et al., 2000, in turn report significant improvements in the water supply system in Santiago through a regulatory reform aimed at increasing efficiency within the public sector, thus providing an argument against the necessity to privatize.

Once again, it seems that a reasonable conclusion from this bulk of studies is that privatization per se is not a welfare-improving solution unless appropriate regulatory tools are put in place; however, the effectiveness of regulation is inversely proportional to the degree of interest for the private sector, especially in situations characterized by higher risks. Most available studies in fact regard developing countries, where WSS systems need still to be constructed or radically improved, economic conditions affect people’s willingness and capacity to pay etc.

The transferability of these results is probably limited, given that local government and regulatory capabilities are supposedly much higher, technical capabilities in the public administration more developed, country risks far lower and water pricing less problematic. However, some general lessons can be transferred as well, and are substantially confirmed by a number of recent surveys conducted within the European Framework Research Programme (van Dijk and Finger, 2006; Lobina and Hall, 2006; Castro et al., 2005; Pricewaterhouse&Coopers et al., 2004; Kallis and Coccossis, 2001).

Regulatory capture has been argued and documented also in many European case studies (Lobina and Hall, 2003); contract structures that shift a significant degree of risk (especially for capital expenditure) on public authorities and/or consumers are also dominant (Pricewaterhouse&Coopers et al., 2004). Also in the European context it could be argued that efficiency records in the public sector have a great degree of variability, ranging from the very bad to the very good.

Evaluation is more complicated once long-term performance is considered. Impact of privatization

and regulatory reform on investment is therefore a crucial point. Surprisingly enough, only a few studies have focused on this topic. Particularly in the British and Welsh case, there is some evidence that water companies have significantly under-invested in replacement and maintenance (Buckland and Zabel, 1998; Bakker, 2003).

Recent studies on Italian case have pointed out that performance evaluation is made complicate by the need to clarify financial flows occurring between companies and owner municipalities in terms of lease fees, royalties etc. Many privatized (or corporatized) utilities in fact have capitalized the discounted cash flow of future margins but left some significant investment responsibilities on municipalities or on their asset ownership companies (Drusiani et al., 2004).

Other studies have analyzed company strategies after privatization. A (slight) tendency towards vertical integration and diversification has been reported in the UK in the first phase (Thomas, 2000). Mergers and acquisitions in the last 5 years show instead a slowdown or even a reversal of the previous trend towards horizontal integration. Most municipally-owned multiutilities, once privatized, have seemingly concentrated their efforts on deregulated markets (gas and energy above all) and reduced their engagement in the water sector just to the local market of the parent municipality. Among the privatized water companies, only a few have later engaged in expansion strategies in the WSS market; an enlargement of the range of activity in the domestic captive market is instead evident (Vaccà, 2003; Finger and Allouche, 2001).

Finally, an issue that has not received due attention in the empirical literature regards transactions costs originated by regulatory reform. If regulation, in its different forms, is the key for ensuring WSS performance under PSP, regulatory costs are obviously to be considered. Evidence from England and Wales, for example, shows that regulatory tasks have enormously increased after privatization, while size and scope of government agencies dealing with water regulation, both on quality and economic side, are much larger now than before 1989 (Summerton, 1998). In the frame of delegation and concession contracts, intermediation, advising and consulting costs are reported to be significant in most experiences in developing countries (Noll et al., 2000).

A more comprehensive consideration of transactions costs has been provided by Lobina and Hall, 2003. Their analysis starts with the consideration that some components of economic risk are present only under PSP (for example, political commitment, market and regulatory risks). This determines a first source of transactions costs, reflected in the higher risk premium required by private investors. Secondly, transactions costs arise from legal requirements and from procedures necessary to enact competitive tendering; since greater efficiency is expected only if tenders are repeated quite often, contracts are laid down in a very specific and detailed way. Thirdly, we have to consider enforcement of contracts, what not only requires costly regulatory systems but also entails considerable costs for legal issues, litigation, renegotiation, termination of contracts etc. Finally, corruption is seen as a potential source of transactions costs: it might allow inefficient choices made by the operator (eg in order to favour suppliers being part of the same group, or fostering unnecessary expenditure and gold plating); this last argument seems less decisive, since it could be easily reversed against direct public management as well.

5. Conclusions and open research questions

According to recent economic literature, liberalization and private sector involvement have had overall beneficial outcomes on privatized companies and on the economy as a whole (Shleifer, 1998; Megginson and Netter, 2001); however, moving to the more specific field of network industries this statement starts to become more questionable, since market failures need to be carefully considered, and evaluation of outcomes deserves a careful consideration of all socially relevant aspects on top of

company performance (Newbery, 2004; Trebing, 2004). The water industry certainly represents such a case. Hence it is not surprising that the literature reviewed in this article is overall not conclusive with respect to the superiority of alternative management models for WSS. To complicate things further, it appears clearly that ideological biases of researchers is here stronger than ever: water is a very hot issue, not only because it is an essential service, but also because it raises symbolic and ethical issues.

From a theoretical point of view, evidence of market failures remains substantial (table 2). Although some possibilities to introduce competition exist, the WSS remains for a large part a natural monopoly. Competition in the market is reduced to the cases in which network systems are not in place; in some cases water markets can be created for resource appropriation and bulk supply, but definitely not for the access to final consumers. Competition for the market is well suited for operation and procurement, but less for delegating integrated responsibility over investment and asset management. Yardstick competition and regulated monopoly require a sophisticated regulatory system, that is nonetheless constrained by fundamental information asymmetries.

Table 1 – Transactions in the WSS value chain and related market failures

Markets	Description	Regulatory issues / market failures
I	Transactions between the WSS operator and public entities holding the responsibility for service provision	Incomplete contracts and information asymmetries Transactions costs Sunk costs
II	Transactions between the WSS operator and suppliers of inputs along the value chain	Vertical integration Cost of capital for long-run undertakings Principal-agent relations in procurement
III	Transactions between WSS operator and entities holding the property rights on natural resources	Externalities Long-run sustainability of water management systems Transactions costs in the trade of water rights
IV	Transactions between WSS operators and final consumers	Natural monopoly Public good dimensions (eg health issues) Accessibility and affordability issues Resilience and flexibility

From an empirical point of view, evidence is contradictory and shows both cases of success and failure of the private sector in the WSS industry. Public management compares successfully, although evidence of public sector failures are also quite well documented.

Although public undertakings are more likely to be x-inefficient, direct public management can improve its efficiency via outsourcing and by adopting innovative organizational systems, for example involving citizens in the ownership and governance of water utilities. Local public monopoly, in turn, favors competitive markets for procurement along the value chain (market II), while delegation via tenders has historically favored oligopolistic concentration and vertical integration.

Despite this inconclusiveness, some general results seem sufficiently robust and provide foundations for policy recommendations, as well as indications of questions that deserve more careful investigation by future research.

First of all, in most countries water prices are increasing. The coincidence between privatization and price increase is evident, yet the causal link is not straightforward: privatization is not only regarding management and operation, but also the way of financing. Price increases can depend on cost recovery strategies or on the need to finance new investment required by environmental and health protection policy, and could easily outweigh the productivity gains arising from competition and private sector. Separating these effects is a tricky but necessary step, without which comparisons would easily be biased.

Criticism about “profit” being the cause of this increase is simply misplaced. On the other hand, being such a capital-intensive industry, total cost of WSS is highly sensitive to the cost of capital and

the way assets are depreciated. The economic life of many water assets is very long and can last over a century, a time that is hardly compatible with private sector accounting. Significant cost reductions can be achieved if publicly-based financial systems can provide cheap money (eg via ear-marked taxation), while pubic ownership of infrastructure allows depreciation schedules that are more coherent with the true economic life. This advantage has to be traded off with the superior incentives to operational efficiency, with no straightforward results, since capital costs can easily over-compensate savings in operational costs. This is particularly true if the private sector is asked to bear economic risks via fixed-price contracts and tight quality regulation enforcement.

Second, the quality of regulatory systems and the way they achieve a coherent allocation of economic risks is a more decisive factor than the management model. Under each model – delegation, regulated monopoly, direct public management – and their many variants and hybrids, concrete regulatory decisions determine the set of incentives transmitted to each actor and the way risks – particularly, operational and investment risks – are allocated among water companies' shareholders and workers, customers, taxpayers, next generations via pricing rules, obligations, penalties as well as soft regulatory instruments. A careful understanding of the institutional settings and the explicit and implicit mechanisms for allocating economic risks is required. Even more, it is important to understand that a key specificity of the WSS industry lies in the fact that the most important demand drivers do not originate from the consumers market (IV) but rather from environmental and water resources policy (III), as a key ingredient of sustainable development. Institutional settings framing water resources policy and the way they interact with WSS are therefore a key aspect to be understood in each context; the same liberalization model and the same arrangements for economic regulation can have rather different outcomes.

Third, fears that private sector involvement as such could reduce performance or have unwelcome consequences on poor households do not seem well grounded. Public service obligations can be imposed and enforced either under public or private management, and again effectiveness and credibility of quality regulation (environment, health, safety etc) seems more important; on the other hand, guarantee of essential service levels could be as well easily imposed and enforced, for example if sanctions against clients' default do not include disconnections for those who don't pay. Contrary to the common wisdom diffused by many ideologically-oriented studies, private sector can improve significantly quality performance, even because regulators and the public opinion are far less forgiving towards private entities than public undertakings; while impact on the poor is a matter of tariff structure and cross-subsidies, that in principle can be implemented whatever the management model

Fourth, different competitive models have rather different consequences on the vertical structure of the value chain. Delegation via competitive tendering favors vertical integration and suits for large corporate multinational companies; the resulting market structure is more concentrated. Vice-versa, local monopolies, while creatung some scope for (at least partial) involvement of the private sector in the managing company, also favors vertical disintegration and more competitive procurement markets with possibly a greater role for specialized SME rather than large conglomerates. Once again a comparative assessment of this trade-off is not straightforward.

Fifth, given the multiple market failures that hamper the performance of privatized water utilities, an option to be considered could be to look for alternative ways to improve public sector performance instead. Many alternative solutions are reported from the recent experience, such as user cooperatives, participatory governance systems, extended outsourcing, legal privatization. The option to create or maintain eligible customers willing to opt out from the collective service could also represent an interesting case. These innovative experiences are still analyzed only on an anecdotal base and deserve a more careful analysis in the future.

Sixth, the relevance of the long term for WSS requires that analysis pays due attention to long term performance of both public and privatized water systems. Most available studies instead concentrate on short term evaluation and therefore fail to consider the outcomes of different models and solution

on capital accumulation and investment.

Finally, public-private partnerships are increasingly regarded as more appropriate ways of involving the private sector than full divesture and delegation. One obvious reason for this is that they allow to share the economic risk – especially capital risks – and provides a source of reciprocal reassurance and compromise between financial viability and imposition of burdens in the general interest. Also, PPPs allow to involve the private sector in a selective way in order to complement those skills and capabilities that the public sector is lacking; political support is thus likely to be higher than in the case of full privatization. However, PPPs introduce new regulatory problems, arising from the risk of a conflict of interest among public representatives (both representing consumers' and shareholders) with a potential diminution of regulatory effectiveness.

All these considerations should suggest to be careful while attempting to apply to WSS the same liberalization solutions that have revealed more or less successful in other industries such as electricity, gas or telecommunications. On the other hand, in many cases private sector involvement and recourse to the private capital markets is not a matter of choice but of necessity, since the public sector might very well lack the necessary resources and capabilities. This is paramount in developing countries, where the challenge of achieving the Millennium Development Goals is still long behind; but also in developed countries, where the central issue is, more frequently, the renewal of ageing infrastructure and its update face to the new and demanding environmental regulations. There is still a lot of work to be done by economists in order to help policymakers understand the different problems arising from different ways of managing water and learn how to involve the private sector in the most beneficial way for the community.

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