Appendix: utilities and governments

Utilities and intervention

Most utilities formed in the 18th and 19th centuries[1] and combined engineering and economic skills to commercially exploit findings developed in science laboratories or by tireless individuals. For instance, the history of British Gas starts with William Murdoch, a Scottish engineer who first lighted his own house with gas in 1792, and who, together with a colleague commercialised the product, selling gas plants to individual businesses and organisations[2]. The early utilities did not only face the normal and imaginable hurdles any new industry has to overcome. Acceptation of the new technology they often used, and of which the working and safety were difficult to grasp for a technically uneducated public was a major hurdle. Robert Caro[3] describes the reaction of farmers to the electrification of the Texas Hill County: "They were afraid of the wires. The idea of electricity - so unknown to them - terrified them. It was the same stuff as lightning; it sounded dangerous - what would happen to a child who put its hand on a wire? And what about their cows - their precious, irreplaceable few cows that represented so much of their total assets?" (Caro, 1990:524-5)

The early utility companies were private commercial firms but they soon attracted the attention of governments. Like in telephony where "after a brief period in which private companies were allowed to operate very restricted electric networks on a concessionary basis, most governments nationalised telegraph and telephone systems and placed responsibility for provision of these services under some form of administration" (Steinfeld, 1994:4).

[1] Although it lasted well until the second half of the 20th century to connect all remote areas in western countries to gas, water, telephone, electricity and public transportation.
[2] "A name that slips off the tongue; British Gas", *The Guardian*, 09-09-2000.
[3] The biographer of Lyndon Johnson. Johnson has spend most of the New Deal years working in and with the agencies of rural reconstruction.

These interventions were not in every utility nor in every country the exclusive domain of national governments. Interventions in the British gas industry were first executed by local authorities who saw a public benefit in the technology. The first city in the UK to do this with respect to gas was Manchester. The city simply bought the gas plant of the local police station and started using it for street lighting, thus improving safety in the streets[4]. In fact, local or regional beginnings and consolidation to national industries are a familiar pattern in the history of European utilities. National railway companies for instance usually have their origins in small local or regional rail companies connecting two or a few cities. These small companies were later consolidated into national companies. The development of German railroads is exemplary in this respect. It started with one line between Nürnberg and Fürth in 1835. Over the next decades similar initiatives sprung up all over the country. First all the regional companies became public companies owned by the Länder, a process completed by the turn of the century, and from the 1920s on the *Deutsche Reichsbahn* was founded, consolidating a number of regional companies, a development that was completed under the Hitler regime (Denkhaus and Schneider, 1997:80).

Although the exact motivations to intervene in specific utilities vary considerably according to national circumstances and peculiarities, governments have based interventions in utilities on a restricted number of social and economic arguments[5]. They are: universal service, general social and economic policy goals and market failure.

Universal service

"For all their faults of bureaucracy and unreliable service, the old public monopolies that offered electricity, gas, water and telecommunications services were fundamentally based on a public service mentality. Their overriding aim was to extend access to these vital basic utility services to everyone, everywhere: the so-called universal service" (Graham and Marvin, 1994:114).

[4] "A name that slips off the tongue; British Gas", *The Guardian*, 09-09-2000.

[5] Strategic reasons include the importance of utilities during (preparation of) wartime production, the control over information supply or the protection of utilities in times of social turmoil.

The main instrument to ensure universal service was the isolation of public utilities from the competition that might undermine their ability to "cross subsidise" uneconomic customers with the extra benefits earned by serving customers whose service was relatively cheap because they lived in areas of concentrated population, where the cost of extending or maintaining a network are low per customer (Graham and Marvin, 1994:114). Some force or regulation is necessary, because when unregulated, utilities do no out of themselves extend their service to uneconomic customers (compare Melody, 1998:36) and newly privatised companies are known to withdraw service from those customers when universal service obligations are lifted, as became poignantly clear during the deregulation of water companies in the UK in the 1990s when parasitic diseases emerged in the English countryside (Graham and Marvin, 1994:117). This also illustrates that bringing electricity, water and telephone to the countryside is not a luxury. Clean water is clearly a public health requirement. Electricity lightens the heavy burden of work on the farm and enables cooling of dairy products[6]. A telephone extension on a remote farm helps to keep in touch with relatives, but is far more important to call up a doctor in case of medical emergencies, or to call up a vet when the live stock falls ill.

General social and economic policy goals

Utilities were used as a policy tool for achieving general social and economic policy goals in the years of the depression in the 1930s and later during the stagflation of the 1970s. So for instance the decision to bring electricity to rural areas, an element of the New Deal politics in the US, cut both ways. It gave farmers the means to improve their production and to produce cheaper, while and at the same time creating work through the organisations that built and managed the new infrastructures like the *Rural Electrification Agency* or the *Tennessee Valley Authority*. Utilities thus became part of macroeconomic policy, and even if their role as creator of employment was limited when the building of infrastructures was done, the pricing of utilities, because they were basic needs, became an integral part of income policy

[6] Robert Caro elaborates on the importance of electrification of the American countryside in Lyndon Johnson's biography. Johnson was chairman of the Rural Electrification Agency during the New deal years and Caro does a magnificent job describing the harshness of agricultural life without electric appliances (Caro, 1990).

in many countries. During the stagflation public utilities also offered jobs, and tariff setting was related to income policy.

By the time the neo liberal revolution was transforming social economic policies in Europe and the US in the 1980s active utility price politics and using utilities for wider social and economic policy became known as the "capture" of public enterprises by politicians and trade unionists. It was then seen as a major problem causing overstaffing and over expensive utility production (Denkhaus and Schneider, 1997:72). Yet, it should not be forgotten that this capture was once an answer to problems. Price regulation was a reaction to the excessive profit taking of utilities, and imposing universal service obligations a reaction to the tendency to serve only economic customers or deliver deficient service to all customers (Steinfeld, 1994:5). Further, using utilities as instrument for social and economic policymaking is a sensible strategy within the larger framework of Keynesian macro economic policy[7].

Core problem: market failure and its implications

The fact that large economies of scale can be reaped in the production of utility services made intervention an interesting option where governments wanted more people connected to a certain service, or, where governments were already responsible for a certain utility, they wanted the advantages of scale to decrease government expenditure. In the 1930s the Dutch government sought the forced incorporation of a number of large city telephone companies into the national PTT with an explicit reference to economies of scale and the benefits for the national budget[8]. The fact that technical infrastructures can be an effective tool to distort competition led politicians to intervening in the free market. Without a clear theory to guide their actions governments experimented on a large scale. For instance, in the 1920s, as a member of the Railroad Commission of Louisiana, Huey Long, the later

[7] Nor should it be forgotten that both price caps and universal service obligations remain important aspects of the current deregulation frameworks, and that liberalisation and deregulation can be viewed as just another way to use utilities in reaching macro economic political goals, albeit neo liberal goals this time.

[8] In its report the State Commission said: "it attracted the attention of the Commission that the telephone service in the Netherlands, contrary to earlier intentions, as a consequence of the existence of separate telephone companies in Amsterdam, The Hague and Rotterdam, does not have the unity that is shown in other countries and that would certainly lead to larger economies of scale". In: Staatscommissie voor de verlaging van de rijksuitgaven , 1982, *Rapport van de Staatscommissie voor de verlaging van de rijksuitgaven.* p. 387.

famous governor, tried to declare the pipelines of the Standard Oil Company common carriers, and to make regulating access to them a government task because Standard Oil was using the access to pipelines to cut off smaller (and Louisiana based) companies (Williams, 1981:126-7 and 134-5).

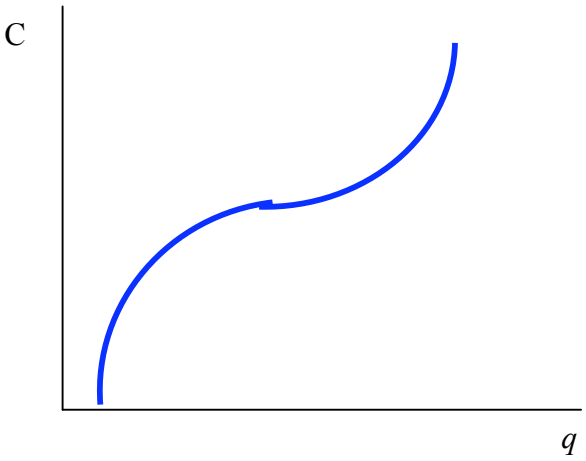
This latter problem, large economies of scale (where a single producer is the most efficient producer) combined with technology leading to distortion of competition is the defining microeconomic feature of utilities, and the most enduring reason to intervene. The other arguments, the strategic importance of utilities, their social importance, and their possible use as policy tool are more ideological or politically expedient. As Melody says: "The special public utility classification is based primarily on economic and technological characteristics, although the precise meaning in any country must be derived from the law." (Melody, 1997:15). To explain the nature and the inherent problems of network-based utilities first the working "normal" industries will be explained, and then the working of utilities.

Normal products

What is the exact problem with industries like telecommunications, energy railroads? Consider first the cost of 'normal' producers (e.g. consumer goods like cars, watches, chewing gum etc). The total production cost will increase with the number of produced goods, but not in a linear mode. Because of economies of scale the cost will first rise slower after some time - for instance because a firm may negotiate better prices for raw materials when it buys larger volumes. These better prices will be reflected in lower cost. There comes however a moment where economies of scale turn into *dis*economies of scale: extending production beyond this point implies that cost will increase progressively, e.g. because organisation cost increase and because stopgap solutions for production problems will be less efficient. Figure A-1 gives the curve of a "normal" cost function [9].

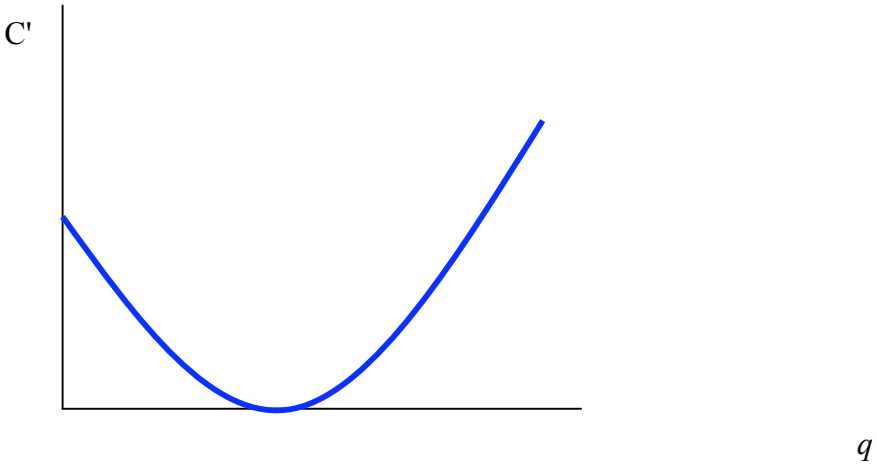
[9] And can be approximated mathematically as: TC = (q-a)3 + FC, where TC = total cost, FC = fixed cost, q = production volume and a represents the production volume where economies of scale turn into diseconomies of scale.

Figure A-1: Normal cost function.



This results in the following marginal cost curve (C') which represents the cost increment incurred for the production of each extra product[10]:

Figure A-2: Marginal cost curve.



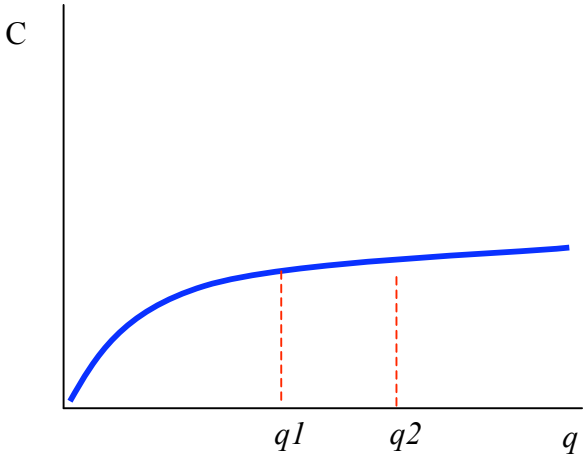
[10] This can be approximated mathematically as: C' = 3(q-a)2

The lesson from this graph is clear: extending production will first lead to a decrease, and then lead to an increase of production cost. Hence, there is a point where smaller producers are cheaper and can compete with larger producers on the basis of production price. The important consequence is that the cost structure does not stand in the way of healthy competition.

Network operators

Now consider the cost of network operators. These are mostly fixed or sunk, while only a very small amount of cost varies with production. The reason is that a high initial investment has to be made in an infrastructure before an effective product or service can be offered. There has to be an infrastructure of a certain size and quality, and that requires a sunk investment. Once this investment has been made new subscribers can be added at low cost. This results in a curve that first increases sharply for a short period (the period in which the initial or sunk investment is made) but then rises only slightly, and in a decreasing mode when only low (and increasingly lower) variable cost are made to extend the service (this refers to the short term in which the size of the production capacity - the network - is constant)[11].

Figure A-3: Cost curve of network.

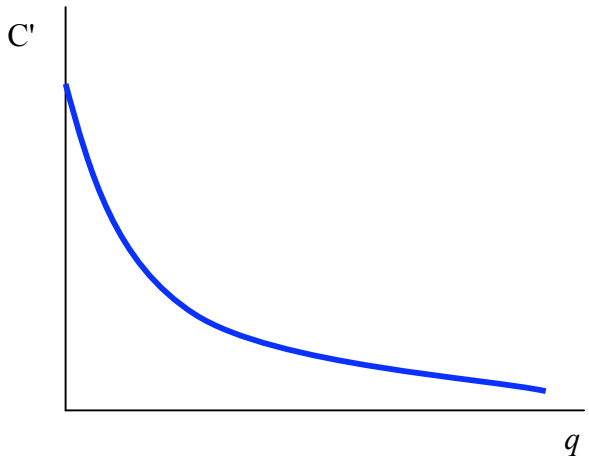


One could wonder why the variable cost decline; is it reasonable to assume that the variable cost at *q2* are indeed lower than at *q1*? Taking again a telecommunications operator as an example: what variable cost have to be made for a new customer? If

[11] Mathematically this is a logarithm, so the cost function of a network can be approximated as: TC = log(q)

each customer is entitled to some basic "terminal equipment" (a telephone set and a plug to connect to the network) and a telephone book, and each customer will be billed regularly then there are good reasons to assume that variable cost do indeed decrease, because of economies of scale. The hardware will be bought from a supplier that can produce cheaper at larger quantities, and the telephone operator may be able to negotiate a discount when it buys more units, creating two reasons why the cost for the terminal equipment can go down with an increase in subscribers. The cost for billing and administration will also be subject to economies of scale, as will be the cost for the telephone book. Depicting the marginal cost points out the problem for competition. The marginal cost curve is hyperbole shaped[12]:

Figure A-4: Marginal cost curve of network.



Now it is clear why competition is distorted on markets with large sunk or fixed cost relative to variable cost: the costs of extending production continue to decrease. Hence the size fetish of telephone companies, as *The Economist* expressed it pointedly[13]. When there is no point where extending production would lead to an increase in cost (so a point where *dis*economies of scale commence) large size is *always* a benefit. Ultimately one producer is the "normal" or "natural" situation for the market because the larger producer would always be able to outperform smaller

[12] This conforms the fact that the differential of a logarithmic function is C' = 1/q
[13] "Ornamental empires", *The Economist* 24-04-1997

more expensive producers (compare: Wolf, 1990:23). A small producer or new upstart could never successfully challenge a larger producer on cost price because small is always more expensive. Competition would thus have to take place on the basis of special product characteristics of the more expensive products, such as style, product image or the brand image of the producer. Given the homogeneous nature of the products of most network producers (gas, electricity, telecommunications, water) there is very little space for competition based on product differentiation. The only exception is the energy sector where some customers indicate a willingness to pay slightly more for "green energy", electricity from sustainable or renewable resources (Farhar, 1999:2). But generally the market fails, and not intervening in the normal course of the market would "naturally" lead to monopoly.

The network structure creates a second peculiarity: the value of the network for the individual user increases with an increase of other users. A telephone network that connects only two people is of less value for every subscriber than a telephone network that connects two million people, since in the latter case more people can be called up. This leads, in microeconomic terms, to an upward shift of the demand curve (Economides, 1996:6). The larger the network, the larger this positive externality (the utility for its users). This also causes an inherent tendency towards monopoly: one large network has a larger positive externality than a number of smaller ones, even if the number of subscribers (in the case of a telephone network) is the same.

The utility problem

The combination of large economies of scale and large externalities creates the utility problem. Milton Friedman puts it as follows: "there is unfortunately no good solution for technical monopoly. There is only a choice among three evils: private unregulated monopoly, private monopoly regulated by the state, and government operation" (Friedman, 1962:8). Unregulated private monopoly is market failure *avant la lettre*. From the perspective of operating cost the monopolist might be the most efficient solution, the monopolist himself seeks to maximise his profit by restricting his production, which in the end hurts consumers. Further, nothing prevents him from asking excessively high prices. The European solution for market

failure was, until the late 1970s, government production[14] (Denkhaus and Schneider, 1997:66-7). The problem of market failure evaporated once there was not a market at all. This interventionist option fared well in the postwar Keynesian consensus which the neo conservative revolution of the 1980s ended.

[14] Hood (1994:39) expresses doubt as to whether market failure fully explains government production by pointing out that nationalised banks, steel and shipbuilding industries are a form of government production *without* inherent market failure. However, while market failure explains government production, not all government production can be (or necessarily needs to be) explained by market failure. Redressing capture by trade unions to protect employment is a far better explanation for the nationalisation of steel and shipbuilding as it existed in e.g. the UK.