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Tiered Pricing and Cost Functions: Are Equity, Cost Recovery and Economic Efficiency Compatible Goals?

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Market Report	Yr Ago	4 Wks Ago	4/16/10
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight.	$88.77	$ *	$99.96
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.. . . .	117.44	127.58	128.29
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	100.88	105.72	115.78
Choice Boxed Beef, 600-750 lb. Carcass.	145.37	153.69	166.77
Western Corn Belt Base Hog Price Carcass, Negotiated.	59.20	67.92	80.10
Feeder Pigs, National Direct 50 lbs, FOB.	65.17	*	*
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean.	60.94	73.66	82.82
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct.	92.00	*	*
National Carcass Lamb Cutout, FOB.	249.27	273.07	288.98
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	4.92	3.77	3.96
Corn, No. 2, Yellow Omaha, bu.	3.67	3.58	3.53
Soybeans, No. 1, Yellow Omaha, bu.	10.28	9.46	9.79
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	5.50	5.63	5.61
Oats, No. 2, Heavy Minneapolis, MN , bu.	1.86	2.24	2.15
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	190.00	135.00	135.00
Alfalfa, Large Rounds, Good Platte Valley, ton.	77.50	87.50	92.50
Grass Hay, Large Rounds, Premium Nebraska, ton.	85.00	*	*
Dried Distillers Grains, 10% Moisture, Nebraska Average.	130.00	95.00	103.50
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	49.00	34.00	35.50

*No Market

Suppliers of water and energy are frequently natural monopolies, with their pricing regulated by governmental agencies. Pricing schemes are evaluated by the efficiency of the resource allocation they lead to, the capacity of the utilities to capture their costs and the distributional effects of the policies, in particular, impacts on the poor. One pricing approach has been average cost pricing, which guarantees cost recovery and allows utilities to provide their product at relatively low prices. However, average cost pricing leads to economically inefficient consumption levels, when sources of water and energy are limited and increasing the supply is costly. An alternative approach is increasing block rates (hereafter, IBR or tiered pricing), where individuals pay a low rate for an initial consumption block and a higher rate as they increase use beyond that block. An example of IBR is shown in Figure 1 (on next page), which shows a rate structure for residential water use. With the rates in Figure 1, a household would be charged $0.46 and $0.71 per hundred gallons for consumption below and above 21,000 gallons per month, respectively.

Increasing block rates are frequently used by regulated utilities in the United States and worldwide. An Organization for Economic Cooperation and Development (OECD) study of water rates in developed countries shows frequent use of increasing block rates (OECD, 1999). Concerns about conservation have led to a widespread shift in pricing patterns; while only four percent of public water suppliers in the United States used IBR in 1982, over 30 percent did by 1997 (OECD, 1999). Over the same period, the use of decreasing block rates fell from 60 to 34 percent of public water suppliers. Advocates of IBR argue that it can improve equity by offering the poor a subsidized rate on consumption. Others argue that tiered pricing will encourage over consumption if the subsidized block is too large. For example, a study of water utilities by the Asian Development Bank (1993) found that the average size of the subsidized block is almost 300 percent of basic needs. Thus, if IBR pricing is not properly designed, it could lead to consumption in excess of basic needs or economically efficient levels. This might not be a concern if there is a large volume of inexpensive water or energy that is consistently available. However, when considering the use of a scarce resource such as water this result needs to be considered, as inefficient economic outcomes may lead to non-sustainable consumption patterns.

In a recent research paper, we examine the question "when can tiered pricing be used to simultaneously improve equity, achieve economic efficiency and retain revenue neutrality?" We show that under certain conditions, a regulated utility can achieve all of these goals. However, the feasibility depends on the underlying cost structure and the demand function for water or energy. Utilities with a diverse set of suppliers, and without extremely poor customers are best able to achieve these joint goals. This result is important, because it implies that those utilities with various inputs (i.e., electricity providers that utilize coal, natural gas and hydropower; or water providers that have sources from multiple rivers and groundwater aquifers) are better able to use tiered pricing to improve equity than those that rely on a single input source.

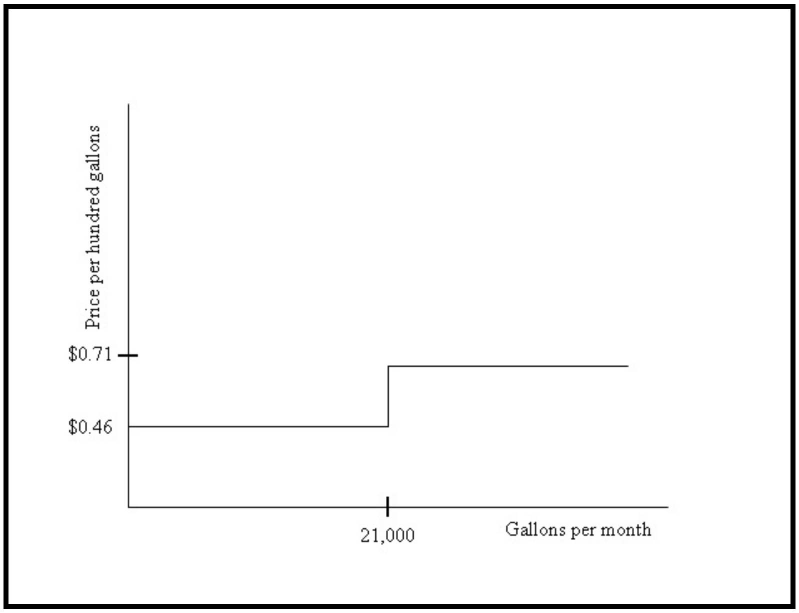

Figure 1. Rates for Residential Water Use: Example of Increasing Block Rates

We demonstrate how shifts in parameters of the benefit or supply functions affect the design of a tiered pricing rate structure. To measure equity, we used the Gini coefficient. The Gini coefficient measures how far a distribution is from being equal, and it is always between zero and one. It is frequently used to measure income distribution. For example, a Gini coefficient of zero for income means that income is equally distributed among all people. A Gini coefficient of one means that one person has all the wealth while everyone else has nothing. Recent numbers from the United Nations show that the Gini coefficient of income in Mexico is 0.46, Turkey is 0.44, the United States is 0.41, Italy is 0.36 and Sweden and Japan are 0.25.

In our research we use the Gini coefficient to measure improvements in equity, after a switch from marginal cost pricing to increasing block rates. Using a numerical simulation, we find that a switch from marginal to average cost pricing can reduce the Gini coefficient by 50 percent. The improvement in equity achieved via a switch from marginal cost pricing to increasing block rates is in the range of 30-90 percent, depending on the number of suppliers of water/energy and the demand for the products. Larger improvements in equity occur when there are many low cost sources of the product, or when overall demand is relatively high. Increasing the rebate associated with IBR unambiguously improves equity, but the size of the rebate is limited by the options that are revenue neutral for the company.

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ADB (1993), "Water Utilities Handbook: Asian and Pacific Region," Technical Report, Asian Development Bank, Manila, Philippines.

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