Lecture Note 9

Early marginalists

Jules Dupuit (Arsène Jules Étienne Juvenel Dupuit, 1804 – 66) was born in Piemonte when it was under French control, and the family emigrated to France. He was led to a closer study of demand through the work on public projects, and he is considered as the initiator of both cost-benefit analysis and marginal cost pricing.

Demand was already known, not only from Cournot but also from Karl Heinrich Rau (1792 – 1870), who considered the stability questions concerning intersection of supply and demand, publishing a note on this topic in 1841, seemingly without knowledge of Cournot's work. Little attention was paid to Rau, who was mentioned only by Mangoldt (see below).

The important contribution of Dupuit (in 1844), who again didn't know Cournot or Rau, was the connection of demand to *utility*. He first introduced demand as function $y = f(x)$ with y the quantity and x the price, subject to two 'laws' – law 1 says that demand slopes downwards, and law 2 says that a given fall in price induces larger increases in quantity the lower the price, by Dupuit attributed to the distribution of income, since at low prices larger groups of individuals are involved som that the reactions become larger.

Given this demand curve, Dupuit could refute the proposal by Say that the market price of a good measures the utility of each unit consumed. Instead, it must measure the utility of *last* unit. Summing over the successive demand prices as one moves upward, one obtains the area under the demand curve as a measure of the *total utility*, what today is known as the (approximate) consumers' surplus. Dupuit subsequently extended this analysis to public works, noticing that the benefits of such projects could not be measured by their costs, one would need to consider the area under the demand curve.

The analysis of marginal utility could also be applied to taxes. The first result obtained was that a tax results in a loss in consumers' surplus which is larger that the tax revenue, giving rise to a deadweight loss. The second result estimated this loss as the square of the tax rate: If the tax rate is t, then this area can be approximated by the area of a triangle with height t and basis equal to the reduction Δy in demand, which has the size

$$\Delta y = \frac{t}{\alpha},$$

where α is the (numerical) slope of the demand function as we usually draw it, with

quantity at the horizontal axis, so that $\frac{1}{\alpha} = f'(x)$. Writing $f'(x) = k$, we get Dupuit's formula

$$\Delta U = kt^2$$

for the deadweight loss. The third result is the Laffer-curve type relationship between tax rate and tax revenue, which is a consequence of the quadratic deadweight loss which eventually swallows up the revenue.

Still another application of the connection between demand and utility was price discrimination (of the type known nowadays as third-degree, where the consumer groups can be separated), which he considered in connection with designing a ticket system for railways. Dupuit was aware that the possibility of charging different prices might actually increase total welfare when it led to increased output, results which were obtained only in 1920s by other authors.

Hans von Mangoldt (1824 – 68) followed up on Rau in 1863 considering shifts in the demand curve and allowed for demand curves with increasing segments (explained by conspicuous consumption or fear of price changes). Moreover, he investigated the supply curve in detail, specifying its form as a consequence of assumptions on cost conditions. He also considered cases of joint production and joint demand. Unfortunately, his work was forgotten until rediscovered by Edgeworth in 1894.

Fleeming Jenkin (1833 – 85) used supply and demand curves extensively in detailed considerations of market equilibria, applied to trade unions and to welfare effects of taxes. His work, published in 1870, contained most of what was later published by Marshall and was later considered as his contributions. Marshall himself admitted that he had seen Jenkin's work in 1870, long before his own work was published, but insisted that he had lectured on the topic as early as 1863. Due to the authority of Marshall, Jenkin was almost totally forgotten.

Hermann Heinrich Gossen (1810 – 58) was similarly neglected by his contemporaries. His main achievement was to introduce the individual into the analysis of demand, introducing a function which gives the subjective enjoyment of goods, considered as a sum of enjoyments for each good (separable utility). The details of his analysis, such as Gossen's first law on diminishing marginal utility, and Gossen's second law, saying that the marginal utility divided by price is the same for all goods, were rediscovered only later but are now fundamental parts of microeconomics.