Reading Comments - Environmental Economics II

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Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition, Rosen 1974

Summary

This theoretical paper is the foundational paper on hedonic prices analysis, which is very popular in many economic fields, including in urban economics when the analysis is run on real estate prices. Hedonic prices are "*implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them*". Differentiated products are goods that can be fully described by their vector of characteristics. The model at the basis of hedonic prices analysis is a model of competitive equilibrium, in a plane of as many dimensions as good characteristics $z = (z_1, z_2, \ldots, z_n)$, where buyers and sellers meet. Prices $p(z)$ are functions off all zi characteristics.

Consumers get utility from each zi characteristic, their utility function is strictly concave. The first order conditions of the utility maximization problem give $pi/px = (dU/dz)/(dU/dx)$. It is interesting to approach the problem by defining a bid function $\theta(z_1, \ldots, z_n, u, y)$ where $u = U(y - \theta, z_1, \ldots, z_n)$, which is the expenditure a consumer is willing to pay for an alternative z, given y and u and defines a series of indifference surfaces (equivalent to indifference curves in multiple dimensions). One can show that only if the price function p(z) is convex, higher income consumers consume more of each good. However, in general, no such claim can be made. Besides, Rosen emphasizes that in general, once must impose a lot of structure for the problem to have a solution, and even more for it to have a closed-form solution. Very interestingly, the model predicts market segmentation in terms of tastes (value function), as in Tiebout's (1956) implicit neighborhood market analysis. This suggests the potential role of hedonic analysis for spatial models.

Symmetrically, on the supply side, different firms have different cost functions, and therefore different offer functions $\phi(z_1, \ldots, z_n, \pi, \beta)$, which is the unit price firms are willing to accept to produce an alternative z for a given profit π and shift parameter β.

The observed $p(z)$ is the market clearing price function, enveloping a family of value functions theta and offer functions ϕ. The tangency of the value and offer functions lead to equilibrium, i.e. $Q_d(z) = Q_s(d)$ at $p(z)$. Rosen discusses several types of market equilibrium: short run equilibrium where z is fixed and only Q and p can change ; short run equilibrium where p is fixed and only Q and z can change; long-run equilibrium where Q, p and z can

all change. In the latter case, $p(z)$ is only a function of supply, because it is determined by minimum average cost of z.

In order to estimate the model, as the observed price is an equilibrium object such that the marginal demand price for zi is equal to the marginal supply price for zi, for all zi, and the price for each zi is not observed, one must run a two-step procedure. In a first step, p(z) is estimated using the usual hedonic method, and then compute the implicit marginal price $dp(z)/dzi$. In a second step, use the estimated implicit marginal price as the endogenous variable for each system of simultaneous equations (for each zi)

Finally, Rosen discusses how this approach can be used to investigate the welfare consequences of quality-standard regulations.

Criticisms and Questions

I do not understand the underlying reasoning behind "*also, as a general methodological point, it is demonstrated that conceptualizing the problem of product differentiation in terms of a few underlying characteristics instead of a large number of closely related generic goods leads to an analysis having much in common with the economics of spatial equilibrium and the theory of equalizing differences*".

Besides, the role of arbitrage activities (p37) in forcing p(z) to be linear, is unclear to me. More precisely, I don't understand why a linear price is problematic, as linear functions are both convex and concave. More generally, I would have appreciated more extensive discussion about the role of linearity vs nonlinearity. For example: how relevant empirically are linear vs nonlinear price functions? In which domain?

Finally, having seen Rosen (1974) cited many times in urban / housing economic papers, I was expecting this paper to be more explicitly about hedonic analysis in the real estate market context, and found it quite striking how much more general it is.