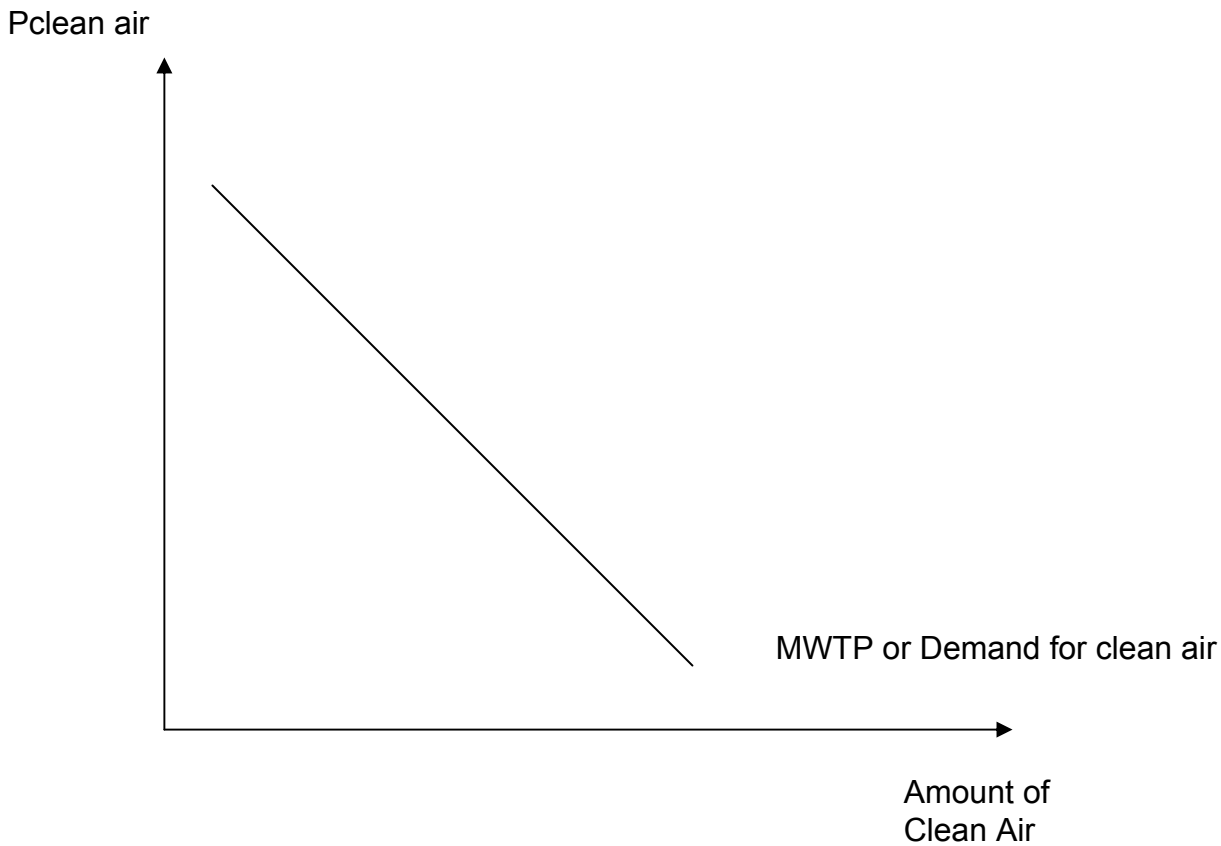
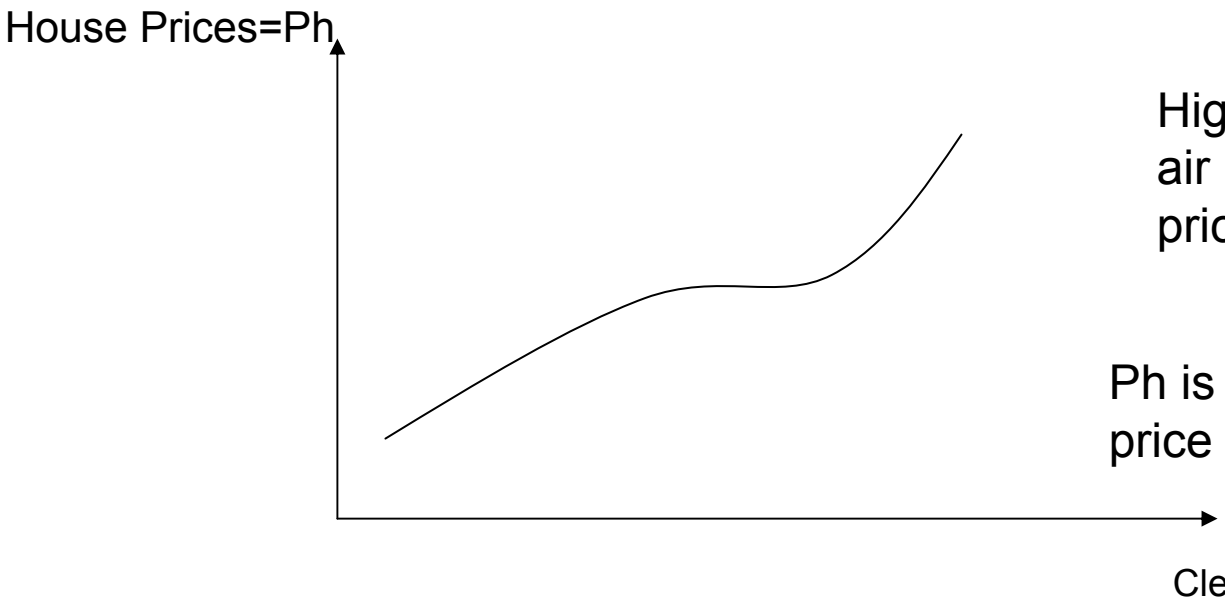
We want to estimate the MWTP for pollution. To keep this simple we are going to assume that we want to measure the demand for clean air.



However, there is not a market for clean air where we could observe the quantity demanded at different prices. This is an important issue, since clean air is not a private good there are no markets because the market system does not work for goods like this one (we covered this when we talk about the different types of goods: public, common, natural monopolies and private).

The hedonic price approach consists into observing market transactions and obtaining an implicit price of environmental goods.

In our specific case of clean air, if we could graph the relationship between clean air and the price of houses (keeping all the other factors that affect house prices constant at some level) we will expect the following:



Higher levels of clean air increase house prices.

Ph is known as the hedonic price function

The line in the previous graph is the hedonic price function. It gives us the relationship between house prices and pollution level. This is useful information but it is not enough to obtain the demand. So far, all I know if the effect of clean air on house prices. What I want to know if how much are people willing to pay for an extra unit of clean air at different levels of clean air.

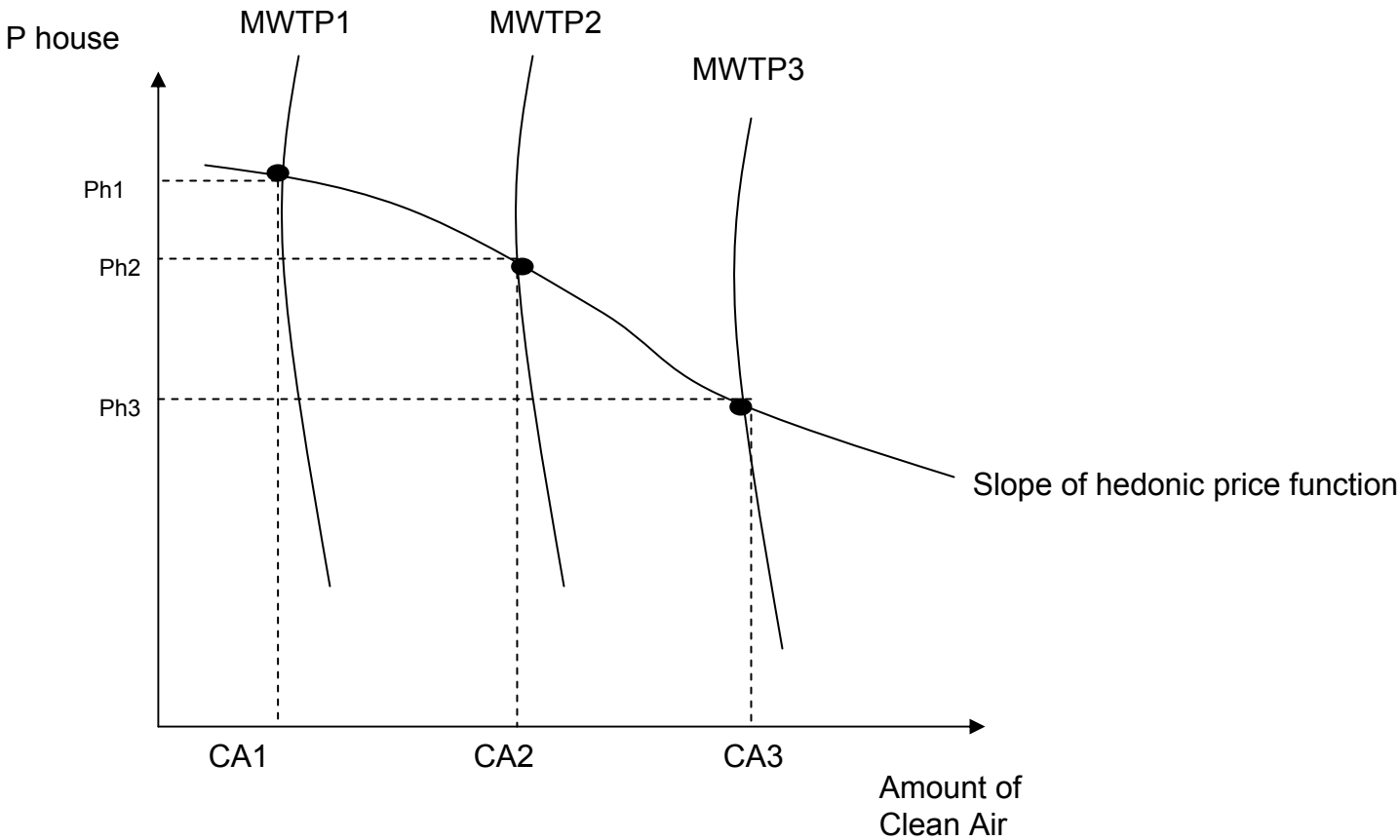
To go there, it will be helpful to obtain the slope of the hedonic price function:

$$\text{Slope of Ph} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in the price of the house}}{\text{change in the level of clean air}}$$

The slope of the hedonic price function is going to tell us the amount of money that the consumer is willing to pay for one more unit of clean air. This is similar to the demand curve but not exactly. Why?

The demand function is the marginal willingness to pay for a good at different levels (for instance how much you are willing to pay for a second beer, third beer, and so on). We need to know the MWTP for clean air at many different levels of clean air for each consumer.

If, I graph the slope of the hedonic price function I will obtain the marginal willingness to pay for clean for each consumers AT THE AMOUNT OF CLEAN AIR THAT THE TRANSACTION TOOK PLACE



For instance in previous figure, all I know is how much consumer 1 is willing to pay for an extra unit of clean air when the amount of clean air is CA1. In other words, I only observe one point of the MWTP for each consumer.

The way I am solve this problem is by assuming that the point on the previous graph are representation of the same consumer BUT with the only difference is in some characteristics (such as education, marital status, income, etc.), other than that it is the same consumer.

Now, I can statistically estimate the demand of the “consumer”.

Note that the Ph’s in the previous graph represent the consumer’s MWTP for that unit of pollution, which are implied in the hedonic price function.

Consider the following example about house prices and pollution. Remember we are interested on finding out the demand for pollution.

We have data for 10,000 transaction and the consumer. First observations of the data set look as follows:

Area (square meters)	Bathrooms		1/2 Bathrooms	rooms	Size (sq meters)	Size (sq. meters)	Gender	Education	Dependents	Price US dollars
Parking	number of	Pollution (NOx pphm)	number of	number of	Lot	Construction		Years of	Number of	House
0.00	1	1538	1	3	60.86	80.90	F	6	0	36,354.54
0.00	0	1053	1	3	72.00	72.96	M	7	0	33,106.46
11.74	1	800	0	1	90.00	33.26	M	3	3	13,462.25
11.74	0	800	0	1	90.00	33.01	M	4	0	13,959.73
11.74	1	660	0	1	90.00	33.01	F	2	0	13,697.11
11.74	0	631	0	1	90.00	33.01	F	5	0	13,379.31
11.74	1	627	0	1	90.00	33.01	M	4	0	13,813.08
0.00	1	588	0	1	96.00	35.70	M	3	1	12,932.45
0.00	0	567	0	1	800.00	39.91	M	4	2	13,373.10
20.69	1	562	1	3	72.00	72.95	M	4	0	33,149.53

Each row represents a different consumer and a market transaction.

The estimation of the demand will follow the following steps:

1) Estimate hedonic price function
2) Obtain the implicit Ph's
3) Estimate the relationship between Ph's and pollution level.

The first step consists on obtaining the hedonic price function for air pollution and house prices. In order to do this, I have to run a regression with the house price as the dependent variable and the house characteristics as the independent variables

$$HouseValue = \alpha + \phi ParkingArea + \eta LotSize + ... + \lambda AirPollution + \text{error term}$$

The three dots in the equation denote all the other variables such as number of bathrooms, etc.

Once I run this regression, I will obtain an estimate of the parameters (greek letters). You should be able to interpret each parameter.

Imagine that I obtained the following for pollution: $\lambda = -5$

What I know now is the change in house prices when pollution increases by one unit.

The second step is to estimate the Ph's of the slope of the hedonic price function. We want to have one Ph's for each transaction (or consumer), that is one Ph for each row. This is done by setting the value of our explanatory variables of the previous equations at their mean we multiply them by their respective estimated coefficients and in order to get different value for each row we multiply the amount of pollution times the estimated parameter for pollution (lambda in this case)

$$P_h \text{ for row i} = \alpha + \phi MeanValueofParkingArea + \eta MeanValueofLotSize + ... + \lambda \text{Air Pollution for row i}$$

Note that the only thing that I do not know of this equation is Ph for row i, all the variable and parameters in the left-hand side of the equation are known to me. The mean value of the parking area I can get it by obtaining the average of the values in the first column, the average of the fifth column is the mean lot size, etc. The parameters (greek letters) were estimated in the previous step.

The last step is to estimate the slope of the demand function. We will run a regression between the Phs (which is the MWTP for pollution at different levels of pollution for different consumers) and the quantity of pollution observed for each consumer, their income level and other socio-demographic characteristics.

$$Ph \text{ for row i} = \pi + \beta \text{Pollution for row i} + \kappa \text{Income level of row i} + \varpi \text{Number of dependents for row i} + \ldots + \text{error term}$$

In this case all the variable are known to me the things that I do not know are the parameters (greek letter). Once I estimate the previous regression and obtain a value for β, I can graph the demand for pollution.