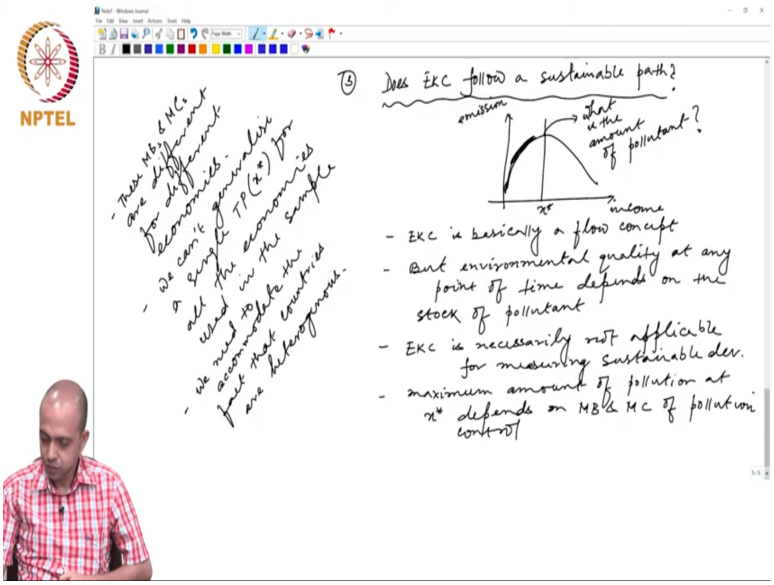
Environmental and Resource Economics
Professor. Sabuj Kumar Mandal
Department of Humanities and Social Sciences
Indian Institute of Technology Madras
Policy Implications of Environmental Kuznets Curve and Economics of Sustainable Development Part – 2

(Refer Slide Time: 00:20)



Thirdly, what we are going to discuss is this important question, does EKC follow sustainable path? Let us discuss this important question also. Income, emission. So, what EKC basically says as income increases, emission per capita will first increase, then it will reach to its peak and then it will come down.

So, that means basically EKC is basically a flow concept. As income increases pollution level, how the pollution level changes that is what is explained by EKC, which is very simple to understand. With change in income how emission level changes that is basically depicted by the EKC hypothesis.

And if that is the case, EKC is nothing but a flow concept. But environmental quality at any point of time, depends on the stock of pollutant. How much stock of CO2, what is the amount of NOx, what is the amount of SO2, is there on the air, is there on the atmosphere. That will determine the environmental quality at that point of time. If that is the case there is a mismatch

between EKC hypothesis and environment and sustainability. So, that means there is a mismatch between the EKC hypothesis and environmental quality and the sustainability.

So, that means EKC then EKC is necessarily not applicable for measuring sustainable development, is this clear? So, sustainable development means that environmental quality is not deteriorating over a period of time, that is sustainable development. Economy is growing, but environmental quality as it is, if not improving and how do you measure environmental quality by the stock of pollutant, at any particular point of time. But, EKC saying that how does environmental quality changes over a period of time, so it does not say anything about the stock.

That means when there is a turning point at x star level of income, I do not know what is the amount of, what is the amount of pollutant? At x star level of income, it is declining, but what is the amount of pollutant that is there in the environment? And the thing is this maximum amount of pollution, maximum amount of pollution at x star, depends on marginal benefit MB and MC marginal cost of pollution control, of pollution control.

And this MB and MC, these MBs marginal benefit and MCs are different, for different countries, for different economies, that means we cannot generalize a single x star. So, that means we cannot generalise a single turning point TP by this x star, for all the economies used in the sample.

This point we need to understand very clearly. See, in EKC we are combining different type of countries depending on their income level. In a particular sample we may use less developed country, developing country and developed countries and what we assume that all the countries will follow a single trajectory in their growth process, this is the trajectory.

A single trajectory and then they will achieve the peak at external level of income. How is it possible? Different countries may be there at different level of their economic development, depending on their socio political administrative structures. If that is the case depending on your level of income, depending on your level of population, depending on your test and preference of the population. Depending on your institutional quality, administrative structures, different

economy will prioritize different amount of pollution control, because marginal benefit and marginal cost of pollution control is different for different type of countries.

And if that is the case, this peak will be arrive at different level of income, for different type of countries. If that is the case how can we generalize that x star is the single point, unique turning point after which all the economies environmental quality will starts improving. That is quite unrealistic.

So, that means the sustainable development and this EKC paradigm, there is a mismatch. What is required is to estimate, this type of relationship by accommodating the fact that countries are actually are heterogeneous.

And that heterogeneity should be captured in the estimation procedure, by applying a random coefficient panel data model, which is not used largely in the empirical literature. So, one size does not fit all, one single growth trajectory is not applicable for all the economies. Different countries are different layer, level of their economic that we need to accommodate in the process of estimation. So, that is why EKC paradigm cannot be directly applicable in the context of sustainable development.

Secondly, what is the guarantee that the amount of pollution that the economies will experience at x star. It may so happen that it may well cross the absorptive capacity of the environment. That means, once you achieve this level of maximum pollution, it may be beyond the absorptive capacity of the environment. That means the harm the economy may make to the environment, may become irreversible at this level of per capita income. There is no guarantee that at x star economy will always come back to its initial situation, that means environmental quality will improve.

Improvement is in environmental quality is possible till the things are reversible in nature. But, once you cross the carrying capacity of the environment, the carrying capacity of the nature, it may so happen that things become irreversible. At this level of income, the amount of pollution that the economies generate that is irreversible in nature. That means the environmental damage has now become irreparable. What is the implication then? The implication is then we cannot

blindly rely on this EKC paradigm and thinking that growth will automatically take care of all sorts of environmental problem.

There is no mention about the time also, at x star level of income environmental quality will start improving. But, how much time it will take that is not there, there is no mention about the time. If we recall the turning point is achieved at 3000 to 10000 US dollar and that is measured at 1985 constant price.

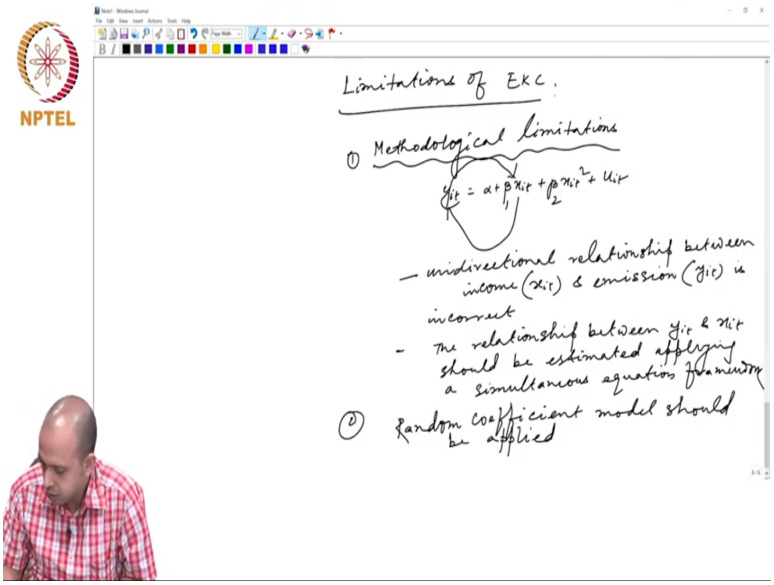
Today even in 2021, there are many countries in the world whose per capita income is still less than 3000 USD. You can go back and check the per capita income of countries in 2021 and you will see that there are countries for which this per capita income is well below the range 3000 to 10000 USD per annum.

So, that means it may take a huge amount, a long time horizon, by which this economy may experience this declining portion of the EKC, by which the environmental quality may improve and by the time you actually come to this x star, the hub that you make for the environment that becomes irreparable.

You have no other option to repair the environmental damage. So, that means these are basically, these are basically the concerns, these are basically the implications of applying EKC paradigm for making developmental policies in general and environmental policy making in particular. We need to keep all these points in mind.

Policy makers must keep all these points in mind, whether EKC is valid for all type of indicators, whether EKC is a permanent phenomenon, whether EKC follow a sustainable development path or not. These things we must keep in mind while formulating policies. Then lastly, lastly we need to discuss certain limitations of the EKC hypothesis. We will discuss certain limitations.

(Refer Slide Time: 15:28)



From the policy implications itself we understood certain limitation. For example, EKC is not valid for all type of pollutants, that is one limitation and then there are certain methodological limitations. So, what are the methodological limitations? When we estimate EKC, we specify this type of functional form beta 1 xit, plus beta 2 xit square plus Uit. Here we assume the direction of causation is actually unidirectional, that means it is xi that causes Yi. It is income that causes environmental quality, but it may also happen if you recall our initial lecture, where we discussed about economic environment inter linkages.

We said that the moment you disturb the environment, the environment will also give a feedback that in turn will reshape the behavior of the economic agents. That means it is possible that environmental quality will also give a feedback on the air quality or environmental quality will give a feedback on income per capita. For an example, when global warming and climate change happens, the economic activities what were available in fifteen-twenty years back, may not be feasible once global environment or climate change happens.

For example, in the context of agriculture, certain crops which you are possible to be produced may no longer be advisable for cultivation, after the temperature level goes beyond the threshold. So, that is means what you will produce, what he will eat, how what he will buy, all this economic decision may very well be impacted by the environmental quality. And once that

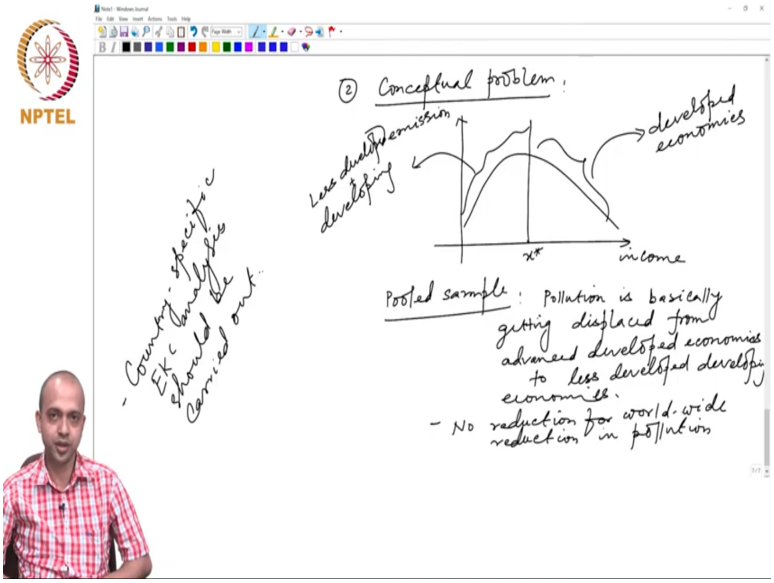
decision of the economic agents changes, obviously that will lead to change in your income per capita as well. So, that means the EKC estimation empirical researchers generally they assume a unidirectional relationship between xit and Yit is not correct.

Unidirectional relationship between income, which is xit and emission, which is Yit is incorrect. So, the relationship between Yit and xit should be estimated applying a simultaneous equation framework. That is one methodological limitation of this EKC. Secondly, as we have discussed earlier that combining different type of countries and making a pooled sample for estimating EKC is also incorrect, because different countries may follow different type of growth trajectories.

So random coefficient model should be applied. Why this is so? Because, if you look at here we are seeing Yit equals to beta 1 xit. So, that means we assume the responsiveness of environmental quality with respect to income is beta 1 for all the economies, but that may not be the case. Indian economy may respond to the income quite differently than the Chinese economy. Chinese economies environmental quality Yit may respond quite differently on income than that is from Taiwan's economy so on and so forth.

Then how can we assume that it is beta 1 for all the economies, rather this beta 1 coefficient should also change from one country to another, from one economy to another and if we need to accommodate that fact, then we need to apply a random coefficient model. So, this is the methodological limitation.

(Refer Slide Time: 22:46)



Then secondly there is a conceptual demonstration, so that means conceptual problem, income and this is emission, the relationship is this. So, when we use a pooled sample, what will happen? Generally developed nations they have stringent environmental regulation compared to the developing nation. They have more stricter environmental regulation compared to the developing nation.

If that is the case it is quite understandable that this upward sloping portion of the EKC will be constituted by what type of countries, less developed and developing and this downward sloping portion will be constituted by developed countries, it is quite understandable. So, when we use a pooled sample for estimating the environmental Kuznets curve, which is quite obvious that the upward sloping portion of the EKC will be constituted by less developed and developing economies, because of their lower preference for environmental quality and the falling portion would be constituted by developed economies.

That means in this pooled sample what is happening pollution is basically getting displaced from less developed and developing, developed economies to less developed, developing economies. So, it is only a displacement of pollution, worldwide there is no reduction in pollution, no reduction for worldwide reduction in pollution.

The amount of pollution which is reduced in developed nation, that is simply displaced getting displaced to developing economies. If you use this type of pooled sample, so that means what is required country specific estimation of EKC. That means country specific EKC analysis should be carried out and if from the country specific studies if we found out, yes with advancement in income, with the increase in income environmental quality is improving for most of the economies. Then only we will say that worldwide there is a reduction in pollution, we can rely on EKC paradigm.

So, combining all the economies and fitting one type of curve, one relationship for all the economies gives less inference, less insights for policy making. Since, it only indicates that upward sloping portion of the relationship is constituted by the developing and less developed countries and falling portion is constituted by developed countries. So, that means pollution is basically moving from one nation to another.

What we need actually currently specific EKC analysis, from there we need to find out whether with increased level of income pollution, whether pollution is actually coming down for most of the economies or not. If that happens then only we will say that environmental Kuznets curve paradigm is actually a reliable paradigm for policy making.

So, that means from this entire analysis one thing is very clear, environmental Kuznets curve is not an universal phenomenon, rather it is highly context specific and if that is the case growth with accountability is actually the need of the hour, that means it gives, EKC paradigm actually gives room for discussion on sustainable development, since it cannot ensure sustainability, since EKC paradigm does not ensure sustainability, we need to have growth with accountability, we need to ensure that our developmental path is sustainable, for that we need to discuss what exactly is sustainable development.

What are the indicators of sustainable development? How to measure sustainable development? And that will discuss in our next class, in detail we will discuss about sustainable development. Thank you very much.