The X-Factor

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The X-Factor

a.) The rate at which inflation adjusted prices must decline.

b.) A measure of productivity.

c.) The X-Factor gives price caps their self adjusting character.

Issues Involved with Setting the X-Factor

"Literature provides very little guidance on how to determine the X-Factor."

Jeffery L. Berstein, National Bureau of Economic Research

"But in order for this self adjustment (the X-Factor) to be beneficial, the procedure for the setting and resetting of X must be correct."

Erwin Diewert, University of British Columbia

Two Possible Methods of Determining the X-Factor

Indexing

A method of measuring the difference between aggregate rates of growth of outputs and inputs. Output growth cannot be attributed to input growth.

Econometrics

The analysis of economic systems containing supply and demand data using statistical models. This method uses the information about the structure of the production process derived from estimates of parameters of the production or the cost function.

Indexing

Total Factor Productivity (TFP)

The *real output* produced by the firm or industry over a period of time divided by the *real input* used by the same set of production units over the same time period.

Definitions:

Real Output and Inputs: A value expressed in money that adjusts for the effect of inflation

TFP Continued

A variable which accounts for effects in total output not caused by inputs. For example, a year with unusually good weather will tend to have higher output, because bad weather hinders agricultural output. A variable like weather does not directly relate to unit inputs, so weather is considered a total-factor productivity variable.

How to Measure TFP

In order to measure the TFP growth of a firm or an aggregate of firms, it is necessary to have accurate price and quantity information on all of the outputs (primary and intermediate) produced by the set of production units for the two time periods under consideration as well as accurate price and quantity information on all of the inputs utilized.

Information Needed to Determine TFP: Intermediate Inputs

Information on all the intermediate inputs utilized by the production unit for each time period in the sample along with the average price paid for each of the inputs.

Intermediate Inputs Defined: Goods and services, other than fixed assets, used as inputs into the production process of an establishment that are produced elsewhere in the economy or are imported. They may be either transformed or used up by the production process. Land, labour, and capital are primary inputs and are not included among intermediate inputs.

Three Types of Intermediate Inputs

1.) Materials

2.) Labor

3.) Leased capital

Primary Inputs

Information on the outputs produced by the production unit for each time period in the sample along with the average price received by the production unit in each period for each of the outputs.

Labor Inputs -

- **Number of Employees**
- **Number of Hours Worked**

Primary Inputs Continued

Reproducible Capital Inputs: When a firm purchases a durable capital input, it is not appropriate to allocate the entire purchase price as a cost to the initial period when the asset was purchased.

It is necessary to distribute this initial purchase cost across the useful life of the asset. Use depreciation for distribution of the initial cost over the life of the asset.

Primary Inputs Continued

Inventories: The depreciation rate for inventories is close to zero. Therefore, most productivity studies neglect the user cost of inventories.

Land: Not usually used as a factor of production because it is thought that the quantity of land in use remains roughly constant across time and hence it can be treated as a fixed, unchanging factor in the analysis of production.

Resources: Depletion of forests, mines and oil wells, coal, etc.

Other Possible Primary Outputs

Knowledge Capital and Innovation: Very difficult to measure knowledge and changes in knowledge (Innovation), as this information is imbedded in capital equipment and accompanying manuals, in patents or unpublished notes or imbedded in the heads of the workers. Some areas of consideration when collecting information on the following slide:

Knowledge Capital and Innovation Continued…

1.) Stocks of patents

2.) Research and development expenditures

3.) Education and training programs

4.) Trade fairs and professional meetings

5.) Availability of universities and research labs

6.) Availability of mail service

7.) Availability of internet service

8.) Ease of access to business consultants who can inform of best practices and best practices technology

9.) Participation in local community business associations, clubs and societies

Other Possible Primary Outputs Continued…

Infrastructure Capital: Companies that operate in regions that are large and have good infrastructure facilities will have easier access to knowledge stocks, which will in turn, lead to higher rates of productivity growth. Some areas of consideration when collecting information on the following slide:

Infrastructure Capital Continued…

1.) Roads
2.) Airports
3.) Harbors
4.) Water Supply
5.) Electricity Supply
6.) Sewage Disposal
7.) Garbage Disposal
8.) Telephone / Communications

Rroblems With the TFP (Index) Economic Models of Productivity

With TFP, it is difficult to provide a meaningful definition of real output or real input due to the heterogeneity, (complexity) of outputs produced and inputs utilized by a typical production unit.

i.) Underestimates of X would be undetectable without rate hearings.

ii.) Overestimates of X would call for emergency waivers until a more liberal cap could occur.

Rroblems With the Econmetric Economic Models of Productivity

i. Difficult to characterize technology and there are no convincing evidence that it works.

ii. Defining cost functions is extreemly difficult.

Alternative Method to Indexing or Econometrics

In lieu of recognizing a specific method, a regulator could ignore them under the rationalization that there is nothing unique, optimal or mechanical about where they should be initially set.

The very fact that the rate will need to be re-set in a future proceeding impinges on the initial decision. Future re-setting will correct any initial error in setting X.

Issues in Ignoring Indexes or Econometrics

Implies a greater scope for bargaining than at any other time under rate of return regulatory schemes

Moral hazard – In a situation in which one party in a transaction has more information than another, moral hazard may occur if a party that is insulated from risk has more information about its actions and intentions than the party paying for the negative consequences of the risk. More broadly, moral hazard occurs when the party with more information about its actions or intentions has a tendency or incentive to behave inappropriately from the perspective of the party with less information.

Michigan Specific Examples of Productivity Improvement

1.) Continuous Improvement
2.) Performance Excellence Process
3.) Workforce Reduction Plans
4.) Employee Curtailments
5.) Restructuring Benefit Plans
    a. Eliminating defined benefit pension plans
    b. Moving toward defined contribution plans
6.) Closed Loop Management

Questions / Discussion

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