Advanced Development Economics

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Assignment 2: Productivity

In this exercise we use firm-level panel data on Ghanaian manufacturing firms, observed over the 1991-1999 period, to analyse productivity. The data file, called productiondata.dta, contains the following variables:

firm = Firm identification number
year = Year
ly = ln real value of manufactured output
lk = ln real value of plant and machinery
le = ln number of employees
emp = number of employees
town = location indicator: 1=accra, 2=takoradi, 3=kumasi, 4=cape coast
industry = industry indicator: 1=food, 2=wood, 3=textile, 4=garments, 5=furniture, 6=metal
exports = dummy variable = 1 if the firm exports, zero otherwise
anyfor = dummy variable = 1 if there's any foreign ownership, zero otherwise
fmage = firm age (years)
wave = survey wave, equal to year-1990

All financial variables are expressed in constant 1991 Ghanaian Cedis. The exchange rate to the USD in 1991 was 368. All variables in the file are labelled. For background information on the Ghanaian manufacturing data, see

http://www.csae.ox.ac.uk/datasets/Ghana-rped/GDdocs.html

Brief background

It is often claimed that, in developing countries, there are considerable technology differences across firms of differing size. On the one hand, small firms are often thought less productive than large firms, so that a fixed set of resources are better used in large firms. On the other hand, small firms tend to use more labour intensive technologies so that promoting small-scale enterprises is seen as a means of creating jobs. Other central policy issues refer to the roles of exports and ownership as determinants of productivity. In this exercise your task is to carefully analyse these issues.

To do:

a) Familiarise yourself with the data. Summarise and briefly discuss the data for log of output, log of capital, employment, log employment, ownership and exports.

b) Create the following measure of labour productivity:
lyl = ln output – ln labour.

Then answer the following questions:

i) Do firms that export have higher labour productivity than firms that don't?

ii) Do firms with some foreign ownership have higher labour productivity than firms without foreign ownership?

iii) Does firm size appear correlated with labour productivity?

c) Show histograms for labour productivity for the last year of the panel (1999), distinguishing between different size groups as follows:

micro: emp ≤ 5
small: $5 <$ emp ≤ 24
medium: $24 <$ emp ≤ 99
large: emp > 99

Compare your results to the graph shown in the top left panel of Figure 2 in Van Viesebroeck (2005). Comment on similarities and differences.

d) Consider the following Cobb-Douglas production function:

$$y_{it} = \beta_0 + \beta_1 k_{it} + \beta_2 e_{it} + a_{it} + u_{it}, \qquad [1]$$

where β_0, β_1, β_2 are parameters, *i* and *t* denote firm and time, respectively, and:

y_{it} = natural logarithm of real output,
k_{it} = natural logarithm of the real value of physical capital,
e_{it} = natural logarithm of the number of employees,
a_{it} = natural logarithm of total factor productivity,
u_{it} = measurement error in y_{it}.

Suppose you want to assess if it is true that "a fixed set of resources are better used by large than by small firms". Explain how estimation of the parameters β_1 and β_2 will be informative for this purpose.

e) In the data, there are several variables that can be used to model differences in total factor productivity, a_{it} . Include in the model firm age, dummies for exports, foreign ownership, sector, location, and a time trend. Then estimate the production function using OLS, and answer the following questions:

i) Do exporters have higher total factor productivity than non-exporters, on average?

ii) Do firms with some foreign ownership have higher total factor productivity than firms without foreign ownership, on average?

iii) Are old firms more productive than young firms?

iv) Analyze the growth in productivity over the sample period.

v) Does average productivity vary across firms in different sectors?

vi) Does average productivity vary across firms in different locations?

vii) Are returns to scale constant? Explain how you might estimate the model *imposing* constant returns to scale on the data.

f) Do you think the estimated coefficients obtained in (e) are biased? If so, why, and how might you go about addressing the problem? Note: Just discuss the issues here – there is no need to run additional regressions.