

- (c) Although in principle ACMS could have worked in terms of this marginal productivity condition for capital, in practice data on the capital stock  $K$  and its rental rate are either not available or are of doubtful quality. Data on labor  $L$  and the wage  $w$  are, by contrast, available and of good quality, since these variables are readily observable and easily measured. Thus ACMS chose the marginal productivity condition for labor as the basis for their empirical work.

## Examination Questions

Some of the following questions assume the provision of appropriate computer output.

1. Consider the Cobb-Douglas production function

$$Q = \gamma K^\beta L^\alpha.$$

- (a) Derive an expression for the marginal product of labor as a function of  $Q$  and  $L$ .
- (b) Let the real wage be denoted  $w/p$  and the value of output  $V = pQ$ . According to the marginal productivity theory of income distribution, what relationship should hold between  $V$  and the nominal wage  $w$ ?
- (c) Show how this relationship can be transformed into a regression model relating the value of output per worker  $V/L$  to the wage  $w$ . Be explicit in indicating how the coefficient(s) of your regression model relate to the parameters of the production function you started with. Does the underlying theory lead to any testable restriction on the regression model? What is this restriction?
- (d) Consider the attached estimation output for this regression.
- i. Test the restriction you have cited above.
  - ii. In view of the fact that the regression you have derived could also be obtained from the CES production function, test the hypothesis that these data can be adequately described by a Leontief technology. Use the  $p$ -value approach.
2. In the previous question you derived a regression relationship relating  $V/L$  to  $w$ .
- (a) Show how, from the same marginal productivity condition, you could have instead derived a relationship with a *dependent* variable in terms of  $w$  and an *explanatory* variable in terms  $V/L$ .
- (b) Since the two relationships you've derived are mathematically equivalent, why did ACMS choose to estimate the first form rather than the second?
3. Why did ACMS use as the basis for their work the marginal productivity condition for labor rather than that for capital?