

## Exercise 7: Aggregate Production Function

Edward C. Prescott

February 14, 2002

There is a plant technology with labor services  $n$  and capital services  $k$  as inputs and a composite good  $y$  as its output. Any number (measure) of these plant technologies can be operated.

The function specifying the technology is

$$y \leq g(k,n) \leq A + B k^\alpha n^\beta$$

where  $A, B, \alpha, \beta \geq 0$  and  $\alpha + \beta < 1$ . Function  $g$  is continuous and increasing. Further  $g(k,n)=0$  if  $k \leq \underline{k} > 0$  or  $n \leq \underline{n} > 0$ .

- a. Define what is meant by an aggregate production function.
- b. For this economy, specify the program whose solution is the aggregate production function.
- c. Show that if aggregate capital  $K$  and aggregate labor  $N$  are sufficiently large that the aggregate production function is essentially neoclassical - that is, it displays constant returns to scale, is concave, is increasing in both its arguments and is continuous.
- d. Give an example, that is specify an explicit  $g$  function, where maximizing output entails having two different types of plants where a plant type is its  $(k,n)$ . The example must be such that output can not be maximized by operating only one type of plant.