**Firm Behavior**

Consider a firm with a technology where , , and

The price of is (Price).

The price of is (Rent).

The price of is (Wage).

Therefore, the profit of the firm can be expressed as

In economics, we assume that firms maximize profits. In order to maximize , we should solve

Recall that

So the profit maximization conditions become

Thus, the firm chooses given to maximize . This is known as the assumption of competitiveness: Prices are given and Quantities are chosen.

Example: Suppose that Then

Note that

because

In a similar fashion

and this gives us

if the firm is profit maximizing.

**Technology and Income Distribution**

First note that

This means

In words

Now divide both sides by to see

In words,

According to the profit maximization

Multiply both sides by to see

Note, however,

The end result is that

In a similar vein,

Example: Suppose that . Then

Remark: This result means that the estimation of Cobb and Douglas predicts the income distribution in the US is and The real income distribution in the US at the time was and

Now let us why MP/AP is so important. Let us first see that MP/AP is actually “the elasticity”. In general, for any couple of variables , the elasticity of is

Now apply this definition of elasticity to output and labor and ask how would 1% increase in employment ( would affect output ():

Of course, this calculation also implies that

This derivation can also be applied to the CES technology, which includes perfect substitutes, perfect complements, and Cobb-Douglas as special cases.

Recall that

according to the CES technology where In that case, the labor share can still be calculated by the elasticity formula. To use this, we need the :

This is only the marginal productivity. Labor share is

In real life, labor Share is decreasing. Moreover is increasing. Finally, most of the estimates for is around -2. All these information suggests that must increase faster than . (Why? Otherwise, labor share would decrease.) But what is an increase in ? It gives the same effect as “higher number of workers” (Inspect the CES technology above). So the fast increase in reduces the elasticity because the “bargaining power of workers go down if there are many workers” given labor and capital are complements, .