Multiplier Effect

The *multiplier effect* refers to the effect on national income and product of an exogenous increase in demand.

For example, suppose that investment demand increases by one. Firms then produce to meet this demand. That the national product has increased means that the national income has increased. Consequently consumption demand increases, and firms then produce to meet this demand.

Thus the national income and product rises by *more* than the increase in investment. The multiplier effect is *greater* than one.

The Multiplier Process

The multiplier process is a continuing chain:

demand up $\Rightarrow$ product up $\Rightarrow$ income up
$\Rightarrow$ demand up $\Rightarrow$ product up $\Rightarrow$ income up
$\Rightarrow$ demand up $\Rightarrow$ product up $\Rightarrow$ income up
$\Rightarrow$ demand up $\Rightarrow$ etc.

Autonomous Versus Induced Demand

The initial exogenous increase in demand is an *autonomous* increase.

The subsequent increase in consumption demand is an *induced* increase.

Multiplier Formula

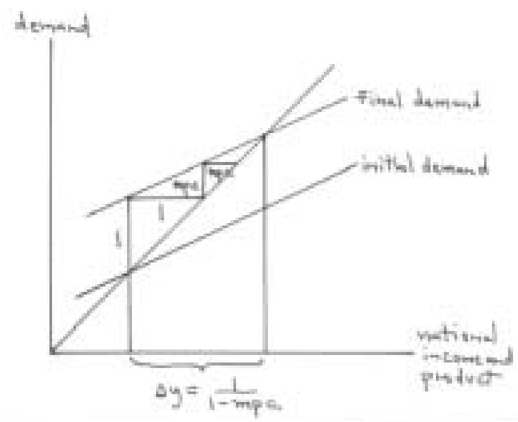
We calculate the total increase in national income and product.

In the multiplier process,

demand up 1 $\Rightarrow$ product up 1 $\Rightarrow$ income up 1
$\Rightarrow$ demand up mpc $\Rightarrow$ product up mpc $\Rightarrow$ income up mpc
$\Rightarrow$ demand up mpc^2 $\Rightarrow$ product up mpc^2 $\Rightarrow$ income up mpc^2
$\Rightarrow$ demand up mpc^3 $\Rightarrow$ etc.

Figure 1 shows the multiplier process.

Figure 1: Multiplier



Evaluation

The total increase in the national income and product is

$$\begin{aligned}\Delta y &= 1 + mpc + mpc^2 + mpc^3 + \cdots \\ &= \frac{1}{1 - mpc}.\end{aligned}$$

Since $0 < mpc < 1$, therefore $\Delta y > 1$; the multiplier effect is greater than one.

Calculus Derivation

In the model

$$c\left[y(i)\right] + i + g = y(i),$$

the expression $y(i)$ emphasizes that the solution y depends on i.

Differentiation

Differentiating with respect to i gives

$$\frac{\mathrm{d}c}{\mathrm{d}y}\frac{\mathrm{d}y}{\mathrm{d}i} + 1 + 0 = \frac{\mathrm{d}y}{\mathrm{d}i}.$$

The first expression invokes the chain rule.

Rearranging gives

$$\left(1 - \frac{\mathrm{d}c}{\mathrm{d}y}\right)\frac{\mathrm{d}y}{\mathrm{d}i} = 1,$$

so the multiplier

$$\frac{\mathrm{d}y}{\mathrm{d}i} = \frac{1}{1 - \frac{\mathrm{d}c}{\mathrm{d}y}}.$$