

EE312 Macroeconomic Theory
Semester 1/2014
Homework I

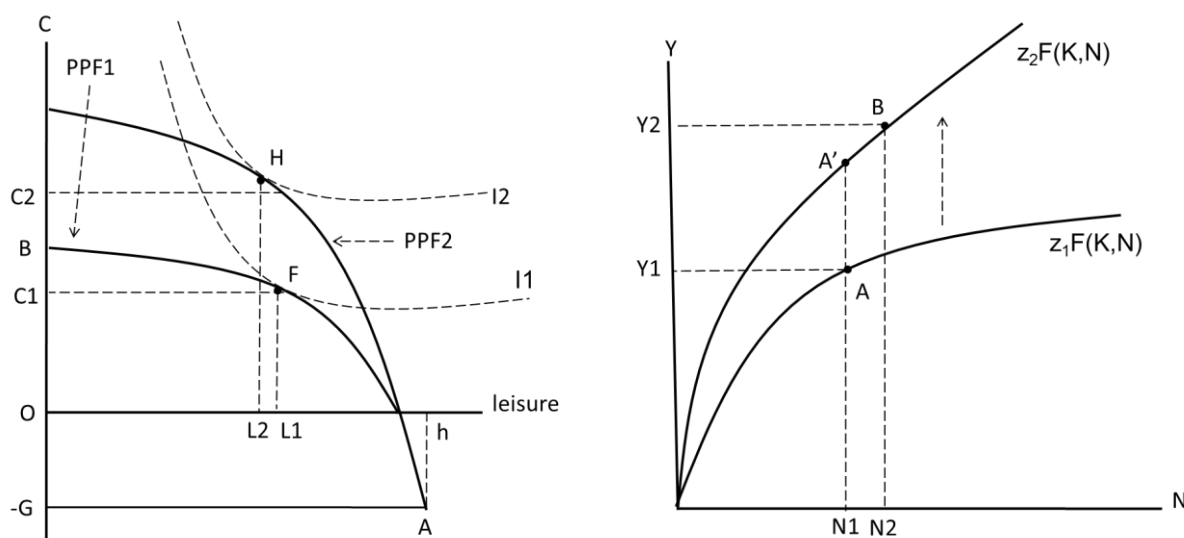
Question: Assume that total factor productivity increases (a positive productivity shock) in the **Closed-Economy, One-Period Macroeconomic Model**. Analyze the effects of the productivity increase on aggregate output, consumption, employment and the real wage.

- Explain the chain of effects among variables correctly.
- Describe your analysis in words and use diagrams as needed.

Submission date: Friday 19 September 2014, 13:00hr.

Answer:

The initial competitive equilibrium is at point F where the firm's Production Possibility Frontier, PPF1, touches the consumer's highest indifference curve I1. At A, the firm maximizes profit and the consumer maximizes utility at the real wage rate equal to the slope of the PPF ($MRT_{C,L}$) and I1 ($MRS_{C,L}$). The optimal consumption bundle for the consumer is consumption goods equal to c_1 and leisure equal to L_1 . So the consumer's working time (and labor supply) is $h - L_1$.



The increase in total factor productivity (z) from z_1 to z_2 causes the production function to rotate upwards from $Y_1 = z_1F(K, N^d)$ to $Y_2 = z_2F(K, N^d)$, given capital (K) and labor (N^d) inputs. The slope of the production function at A increases to A' at the initial level of labor input. The marginal product of labor (MP_N) is higher, inducing more demand for labor by the firm which offers a higher real wage ($MP_N = w$).

The upward rotation of the production function causes the PPF1 to shift upwards to PPF2. The competitive equilibrium changes from F to H. The real wage increases as the slope of PPF2 at H is steeper than the slope at F.

The increase in the real wage has the substitution effect and income effect. **The substitution effect** causes the consumer to increase consumption goods and reduce leisure (because the cost of leisure has become higher). **The income effect** causes the consumer to increase both consumption goods and leisure (both are normal goods). In short, consumption goods will increase from C1 on PPF1 to C2 on PPF2, but the change in leisure (and labor supply) is unclear.

Here we assume **a stronger substitution effect**. So leisure decreases from L1 to L2 and labor supply increases from $(h - L1)$ to $(h - L2)$. Employment increases from N1 to N2 and, through the production function, output increases from Y1 to Y2. The real wage is still higher at the new competitive equilibrium as the slope of the production function at C is still steeper than at A.

In conclusion, the increase in total factor productivity results in higher consumption, lower leisure, higher employment, higher output and income and a higher real wage (assuming the stronger substitution effect).

Note: students may assume a stronger income effect or equal substitution and income effects.