

# Modes of Production Handout

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J. Bradford DeLong

Neoclassical economists like to make the heroic and not very well-justified assumption that at the broadest level the income paid to a factor of production--labor, capital, or natural resources--roughly corresponds to that factor's marginal contribution to increasing output. This means that we can write a simple equation for the growth rate of total production  $y$  in terms of the growth rates of labor  $l$ , of capital  $k$ , of natural resources  $r$ ; of the income shares  $s_l$ ,  $s_k$ , and  $s_r$  of labor, capital, and resources, and a residual factor  $a$  that captures technological inventions and innovations, improvements in business, sociological, and political organization, and other improvements in efficiency:

$$y = (s_l)l + (s_k)k + (s_r)r + a$$

Over any long enough period the growth rates of output and capital will be very close. And for the world as a whole the growth of resource stocks  $r$  is zero--they contribute only as better technology enables better access to them. So we can transform our equation and solve it for  $a$ --what we economists call the rate of total factor productivity growth:

$$a = (1-(s_k))y - (s_l)l$$

And then if we are willing to make heroic and unjustified assumptions about the level of worldwide economic activity we can arrive at this accompanying made-up table for an assumed capital share  $s_k=0.3$  and an assumed resources share  $s_r=0.2$ .

These are made-up numbers—I would not care to defend a single one of them. And this table is at an inappropriate level of aggregation, for such a global bird's-eye view misses some crucial and vitally important distinctions. Much of the increase in  $a$  across 1650 is the result of processes confined to the North Atlantic: the commercial revolution. All of the acceleration in  $a$  across 1800 is due to a fundamental sea-change in that quarter of the world economy that was the North Atlantic—the industrial revolution--and only in the North Atlantic. It is the twentieth century, not the nineteenth, was to see the spread of industrialization away from its origin points and across the globe.

Nevertheless, this table teaches a very important lesson: economies in the long ago were very different from our economy of

Rough World Averages		
Year	Population	Income
-8000	5	\$500
0	170	\$500
1500	500	\$500
1800	750	\$600
1900	1500	\$1200
2007	6300	\$7000

  

Period	Real GDP Growth	TFP Growth (1)
-8000-0	0.04%	0.01%
0-1500	0.07%	0.02%
1500-1800	0.2%	0.09%
1800-1900	1.38%	0.89%
1900-2007	3.38%	2%

(1)  $\alpha=0.3$ ;  $\beta=0.2$

Malthusian stagnation

Toward a human world?

Where is the innovation?

Production function parameters

today. For one thing, for 95% of the time since the invention of agriculture economies were *Malthusian*: improvements in productivity and technology showed up not as increases in average standards of living but as increases in population levels at a roughly constant standard of living. For a second, in the long-long ago the pace of invention and innovation can most optimistically be described as *glacial*—two hundred years to achieve the pace of relative change that we see in twelve months. For a third, arithmetic tells you that in the long-long ago the overwhelming majority of those who are or become well-off have either held on to what their parents bequeathed them or proven successful in zero- or negative-sum redistributive struggles—rather than having found or placed themselves at a key chokepoint of positive-sum productive processes.

Thus the key question in understanding the economies of long-long ago. Were they people with motivations like us living in economies that worked more-or-less as ours does, and was the glacial pace of growth and the Malthusian structure the result of the disabilities they labored under? Or was there something very different—and from our perspective very wrong—with the stuff of the economic mechanism itself?

What are the possible positions on this Gordian knot of issues?

How could we figure out which position is most probably correct?