Table 5. Output per Worker in Agriculture, 1300–1800

<table>
<thead>
<tr>
<th></th>
<th>1300</th>
<th>1400</th>
<th>1500</th>
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<th>1700</th>
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</tr>
</tbody>
</table>

England in 1500 = 100.
Source: Allen, 2000, p. 20.

Labor Productivity in European Agriculture, 1300–1800. Finally, I will examine a recent attempt to measure labor productivity in agriculture in medieval and early modern Europe. Robert Allen’s study begins with estimates of population and its division into agricultural, rural non-agricultural, and urban components. Data on real wages and agricultural prices are then used to derive estimates of agricultural consumption, and these are adjusted for international trade to arrive at agricultural production. Putting the agricultural production data together with the agricultural labor force data yields the estimates of agricultural labor productivity that are presented in Table 5, which sets the level of agricultural output per worker in England in 1500 equal to 100. The estimates are clearly subject to a wide margin of error. Nevertheless, the broad picture looks plausible, with output per worker in agriculture declining in Italy and Spain after 1500 and with England and the Netherlands showing a dramatic improvement.

[See also Total Factor Productivity.]

BIBLIOGRAPHY


Stephen N. Broadberry

LABOR SURPLUS MODELS. A labor surplus model is a class of model for analyzing developing countries as dual economies with a modern capitalist sector and a traditional pre-capitalist sector. The pre-capitalist sector is seen as having a large pool ("unlimited supplies") of labor from which the capitalist sector may draw at constant cost. While these models are often described as finding their inspiration in the old classical economists and Karl Marx (1818–1883), the Lewis model (1954) and its extensions are technically more neoclassical than truly classical.

The model developed by Sir W. Arthur Lewis (1915–1991) was elaborated upon and formalized by many others, most notably John Fei and Gustav Ranis (1964), with important theoretical contributions from Amartya Sen (1966) and Stephen Marglin (1976). Questions have been raised as to the historical relevance of the neoclassical labor surplus models (Arrighi, 1973; Williamson, 1985). Alternative models of a more truly "classical" and Marxian flavor may be more helpful in understanding issues of surplus labor in capitalist and pre-capitalist economies.

In the Lewis model, the economy is divided into two sectors, a traditional pre-capitalist sector and a modern capitalist sector. Lewis emphasized that this sectoral distinction is not identical to that between manufacturing and agriculture, as there may be both traditional (craft) manufactures and capitalist agriculture. The traditional sector is characterized by a large pool of labor, available to the modern sector at a constant (subsistence) wage. The wage is exogenous and above the marginal product of labor in the traditional sector. Thus the labor supply in the modern sector is infinitely elastic. Lewis stated that the marginal product of labor in the traditional sector could be small, zero, or even negative; but whereas he also emphasized that this was not an assumption of fundamental
importance, later developers and critics of the model devoted considerable attention to this assumption.

For Lewis, the supply of labor is considered "unlimited" as long as the labor supply exceeds labor demand at the subsistence wage rate. The demand for labor in the modern sector is determined by the stock of capital. Under such conditions, labor shortage is never a constraint on the expansion of the modern sector. As demand is also not a constraint on expansion in the Lewis model, the modern sector hires labor out of the traditional sector, and output increases. Profits in the modern sector rise and are reinvested, fueling capital accumulation. This is how successful "development" is defined. Eventually, the marginal product of labor and the wage will become equal in both the traditional and modern sector, and dualism comes to an end. With the equalization of the wage in the two sectors, the presumption is that the wage will now be "neo-classically," that is, "market" determined.

A number of criticisms have been made of the Lewis model (see, e.g., Leeson, 1979; Bharadwaj, 1979). First, it has been argued that the model assumes that employment transfer proceeds at the same rate as capital accumulation in the modern sector, and that this will not be the case if there is labor-saving technological change in that sector. Lewis did recognize that there are two forces working in opposite directions—capital accumulation increasing employment and technical advance, which may reduce employment—though he rejected the argument that the latter would outweigh the former on empirical grounds in his original article. Second, a number of critics have asserted that the situation in many developing countries is precisely the opposite of what Lewis assumed: There is significant unemployment and underemployment in urban areas and full employment in rural areas. A defense of Lewis might point out that the traditional/modern distinction is not the same as the rural/urban distinction, and that what appears as full employment in some areas is disguised unemployment—people are working, but their transfer from the traditional to the modern sector will not reduce output in the traditional sector, or will only reduce output there by the amount that the individual is consuming. Third, it has been noted that Lewis assumes away the problem of the creation of a capitalist or entrepreneurial class in developing countries, whereas in fact this is one of the main obstacles to development. Fourth, critics have argued that real and nominal wages in the modern sector do not appear to behave in the way they are pictured in the Lewis model—both are able to rise quite rapidly—and the relationship of wages and employment also differs in that rates rise even in an atmosphere of significant unemployment. Fifth, Lewis's assumption that the sectors are homogeneous has been criticized with arguments developed that each sector can be quite heterogeneous, generating conflicts that affect the accumulation process. Finally, the assumption that "perfect competition" holds in the capitalist sector has been attacked both for ignoring the way in which monopoly characteristics had been inherited from the colonial era and for the neo-classical implications for the analysis of investment, allocation, and factor payments.

The Lewis model has also been criticized on historical grounds. Jeffrey Williamson argues that the early British experience does not confirm the model, while Giovanni Arrighi has attacked the model that the model applies to southern Africa. One of the primary challenges of colonial capitalism was getting the indigenous populations to work as wage laborers or grow cash crops when they still had possession of means of production for producing the means of subsistence. In addition to forced labor and land alienation, the requirement that taxes be paid in colonial currency was one of the most important means of pressuring Africans to work on plantations and in mines or to grow cash crops.

[See also Economic Development.]

BIBLIOGRAPHY


Mathew Fornai

LABOR TIME. Labor time typically refers only to those hours of work performed in exchange for pay or profit (the case of the self-employed). The very substantial number of hours of household work, for example, and of work for charity tend to be ignored. Three factors determine the length of the working year: the number of hours worked per day, the number of working days per week, and the length of vacations. Over the very long run, working hours followed an inverse U-shape, rising to a peak in the middle of the nineteenth century before declining sharply over the last 150 years.