

SEE ALSO *Education, USA; Inequality, Income; Morbidity and Mortality; Welfare Analysis; Welfare Economics*

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## PHYSIOCRACY

The term *physiocracy* means law or rule of nature. It derives from a collection of essays by François Quesnay edited by Pierre Samuel du Pont de Nemours and published in two volumes in 1767–1768 in which the name *Physiocratie* figures prominently. Quesnay was the uncrowned leader of what was perhaps the first school of thought in economics. The school was highly influential on economic policy matters in France in the period from 1756 to the beginning of the 1770s during the reign of Louis XV. Even more important, it had a decisive impact on the emerging new scientific field of political economy. The school's relatively small number of followers and their strict adherence to the teachings of Quesnay are presumably responsible for the school also being known as a "sect." The school's major members, apart from those already mentioned, were Abbé Nicolas Baudeau, Victor Riqueti, Marquis de Mirabeau, Le Mercier de la Rivière, and François Guillaume Le Trosne. On the natural law underpinnings of physiocratic thought, see Hanz Rieter (1983).

On the physiocrats' recommendation, in 1763 and 1764 the corn trade, both domestically and abroad, was liberalized in France. The second half of the 1760s saw substantial increases in the corn price, which the public took to have been caused by the liberalization policy. However, there is reason to think that the price increase was the result not so much of grain exports as a series of bad harvests. The experiment was terminated in 1770, and since its failure was blamed on the physiocrats, it comes as no surprise that their influence declined as quickly as it had risen (Weulersse 1910; Hecht 1958). In other countries the ideas of Quesnay and his followers remained important, at least for a while, including especially Germany and Russia.

Quesnay, a surgeon and medical doctor of the king and of Madame de Pompadour, the king's favorite, came

to economics rather late. In 1756 and 1757, in his early sixties, he published entries on *Fermiers* (tenant farmers) and *Grains* (corn) for the *Encyclopédie* edited by Denis Diderot and Jean d'Alembert. Yet his most important contribution to economics was the *Tableau économique*. Its first version, in 1758, was difficult to understand because of a confusing table with three columns and numerous zigzag lines joining them. Two further editions came out in 1759 (Quesnay 1972). In 1766 came the publication of a substantially revised and improved version of the *Tableau* in a work titled *Analyse de la formule arithmétique du Tableau économique de la distribution des dépenses annuelles d'une Nation agricole*. This latter version of the *Tableau* is the best known (Institut National d'Études Démographiques 1958; Quesnay 1972). It contains the first attempt to describe the intertwined processes of the production, distribution, exchange, and disposal of the riches of a nation in terms of a scheme with two large sectors of the economy—primary production and manufacture—and three social classes—the propertied class (landlords), the "productive class" (farmers), and the "sterile class" (artisans). The economy under consideration is supposed to generate a *surplus* of commodities over and above what is used up in production in terms of raw materials, tools, and means of subsistence or *produit net*. However, the surplus concerns only products of the primary sector of the economy, which explains why the people employed there are called "productive."

The idea at hand may be illustrated in the following way. To produce 1,000 bushels of corn, farmers need 200 bushels for seed, 200 bushels to support themselves and agricultural workers, 100 bushels to feed animals (horses, oxen), and 200 bushels as payment for plows bought from the manufacturing sector. The remaining 300 bushels constitute the net product. Its value in money will be paid as rent to the proprietors of the land (king, nobility, church) for the lease of their lands. The proprietors in turn will buy with money worth 150 bushels precisely that amount of corn from the productive class, and with the remaining money-rent worth another 150 bushels they will buy goods from the sterile class. The sterile class in turn will use the money to buy raw materials and means of subsistence for its artisans worth 150 bushels and transform them into manufactured goods and luxuries sold to the propertied class. The manufacturing sector is "sterile" because, while it uses part of the net product of the agricultural sector and transforms it into some other goods, it does not add to the (value of the) net product (Meek 1962; Pressman 1994).

An important aspect to be stressed is that while only the wealthy proprietors of land get the net product, their revenue is the only source from which the public administration, the army, investments in infrastructure, improvements in the conditions of production in agricul-

ture, and the like are financed. This is secured by levying a tax—an *impôt unique*—on the propertied classes, thus relieving the tenant farmers from burden.

The *Tableau* has frequently been interpreted as involving an analogy to William Harvey's (1578-1657) scheme of blood circulation. However, as Rieter (1990) has shown, there is reason to suppose that it involves an analogy with the mechanics of a particular type of clock.

The *Tableau* contains the first description of an economic system in a state of "simple reproduction," to use Karl Marx's concept, or more precisely, of a large kingdom in a state with the highest level of agriculture. Year after year the economy could continue to reproduce itself at the same level, without expansion or contraction, provided there is neither technical progress nor regress and the agricultural and manufacturing products exchange for one another in the market as implied by the *Tableau*. In fact Quesnay assumed that the "fundamental price" of a product, a concept that anticipates Adam Smith's concept of "natural price," covers all physical real costs of production (materials used up, means of subsistence in the support of labourers) and reflects in addition the rule according to which the social surplus product is distributed among different claimants (Vaggi 1987, 1998). The *Tableau*, however, was only a first step in the physiocrats' analysis. Concerned with first identifying and then putting to use the potential for growth of the French economy among competing nation states, the physiocrats embarked on an analysis of capital accumulation, the modernization of French agriculture, and more generally the role of technical, organizational, and educational innovations. Hence with the inception of systematic economic thought at the time of the transition from feudalism to capitalism in France, the problem of the dynamism of the economic system immediately made an appearance. The physiocrats opted especially in favor of productivity-enhancing measures in agriculture and against sterile luxury consumption. Therefore the *Tableau* contained not only an ex-post analysis (national income accounting, input-output) and ex-ante analysis (circular flow and a much disputed discussion of development and growth) but also a manual for economic and social policy; see especially Quesnay's thirty "maximes générales du gouvernement d'un Royaume agricole" (Du Pont de Nemours, vol. 1, pp. 99ff.).

The physiocrats were criticized by, among others, Achille-Nicolas Isnard (1781), who argued that the impression they generated that only agriculture was productive was closely related to the system of prices underlying their schema. These prices were such that the entire net product was indeed appropriated by the landowners. Other rules of distribution would immediately reveal the peculiarity of the physiocratic doctrine and the untenability of its proponents' concept of productivity. Smith was

full of praise for Quesnay and his disciples and for a while tinkered with the idea of dedicating *The Wealth of Nations* (1776) to Quesnay. However, he too found the particular form of the physiocratic concept of productivity difficult to sustain and explicitly reckoned manufactures to those industries in which "productive" labor is performed. "Unproductive" labor is now essentially identified with services that generate products that cannot be accumulated. Marx considered the physiocrats "the true fathers of modern political economy" (Marx 1963, p. 44) and dubbed the *Tableau* "an extremely brilliant conception" (Marx 1956, p. 344). He developed his own schemes of simple and extended reproduction taking it as a starting point (Gehrke and Kurz 1995). Wassily Leontief (1941) saw his own input-output analysis as following in the direct lineage of the *Tableau*. For an attempt to locate the *Tableau* in the prehistory of input-output analysis, see Heinz D. Kurz and Neri Salvadori (2000). Piero Sraffa (1960) saw his return to the classical viewpoint in the theory of value and distribution as rooted in the *Tableau*.

**SEE ALSO** *Input-Output Matrix; Laissez-faire; Leontief; Wassily; Liberalization, Trade; Marx, Karl; Quesnay, Francois; Smith, Adam; Surplus*

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## PIAGET, JEAN 1896–1980

Considered by many to be the founder of modern developmental psychology, the Swiss psychologist Jean Piaget devoted his researches to children's distinctive ways of knowing and to the process of developmental change leading toward adult thought. He charted a sequence of stages in children's intellectual development whose manifestations encompass domains ranging from logical reasoning to emotional development. Trained in biology and philosophy, Piaget extrapolated from his studies of mollusks in their natural habitat to a conception of the development of intelligence in children as a progressive adaptation, tending toward ever greater equilibrium, with its reciprocal aspects of the "assimilation" of new information to existing concepts and the "accommodation" (i.e., modification) of the concepts to the new information. He viewed the development of intelligence, in turn, as the

foundation of a "genetic epistemology," a theory of knowledge that conceived the development of ideas as part of their essence. On the basis of his observations of children's cognitive development and his claim that children's own action catalyzes that development, Piaget altered the face of psychology and education.

### BASIC CONCEPTS: DEVELOPMENTAL STAGES

Piaget became convinced that children exhibit a distinctive type of thinking, as opposed to simply flawed adult thought, when, as a young associate working on intelligence testing in the laboratory of Alfred Binet (1857–1911), he noticed that when children answered items incorrectly, they tended to give the same wrong answer. He inferred that the children must have approached the problems methodically, only the method differed from that of adults. After altering the testing methods to include the exploration of children's answers and devising many probes of his own, he set about determining the intellectual organization of what he eventually conceived as four broad stages of development, each embodying a progression toward increasingly flexible, systematic, and complex thought: sensorimotor, preoperational, concrete-operational, and formal operational.

During the *sensorimotor* period, extending from birth to approximately eighteen months, intelligence manifests in action. Action develops within the period from reflexive movement to means-ends behavior that comes, by the last of six substages, to incorporate tool use, foresight, and detours ([1936] 1952). The advent of *representational intelligence* in the sixth substage manifests in additional ways, including deduction based upon remembered events, the imitation of events witnessed previously, symbolic play, and language. Thought now progresses to some degree independently of what is seen or otherwise directly experienced. For example, an eighteen-month-old child who sees a toy hidden in a box, then sees the box moved under a cloth, and then finds the box empty, will spontaneously search under the cloth for the missing toy, evidently having inferred that the toy left the box when the box was under the cloth (an instance of deduction). Children at this age might also imitate a funny face someone made the day before (an instance of deferred imitation) or slide a leaf along the countertop as though the leaf were a car (an instance of symbolic play). Although any of these representational activities might occur in the absence of language, language, which also depends upon conceptual connections, normally begins at around the same time.

These symptoms of nascent representational thought mark the beginning of Piaget's second broad stage, of *pre-operational* or *intuitive* intelligence, which extends roughly