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TABLEAU ÉCONOMIQUE AND QUESNAY'S VIEWS ON WEALTH POWER: AN INQUIRY INTO CONSISTENCY

BY

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I. INTRODUCTION

Loïc Charles and Philippe Steiner (2000) rightly draw our attention to Quesnay's neglected political views, namely the project of making France strong enough to confront England in economic and in military affairs.[1] Schematically, Quesnay insists more upon wealth than upon population, which makes for a difference with most of the economists of his time, and more upon the navy than upon the army. Walter Eltis (1999) carefully relates the "explanations'' of the *Tableau économique* contained in l'*Ami des Hommes* and the *Philosophie rurale* to the policy recommendations of Quesnay. He emphasizes the practical character of these different *Tableaux* in contrast with the abstract character of the first versions and of the *Formule*. He also gives a detailed account of the effects of different policies, namely the extension of *grande culture*, free trade of corn (which amounts to a higher price of corn), and tax reform. Gianni Vaggi (2001) insists on the modernization of agriculture as a decisive element of the power of a nation. Such preoccupations seem well in accordance with Quesnay's more general concern—that is, refounding the French monarchy on a natural order in which politics and economics can hardly be distinguished.

As a matter of fact, Quesnay pursued more or less the same apparent objectives as Colbert, *i.e.*, wealth and power for the French monarchy, but the means and the social philosophy he advocated make it impossible to confuse them: the physiocratic idea of a *royaume agricole* is completely foreign to Colbert and has something to do with a political philosophy far anterior to mercantilism (Beer 1939).[2] Political philosophy, however, does not motivate the present paper that aims at checking the coherence and consistency between Quesnay's political

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[1] I am very grateful to Walter Eltis for his remarks and suggestions. Of course, he is not responsible for remaining errors and insufficiencies.

[2] "At the head of his ideal society we see a single ruler, a pious king, who subjects himself to the law of nature. There are in his realm no legislators, no man-made laws, but a council of jurists interpreting the tenets of *ius naturale*, quite in the same manner as the Spiritual Lords and Canon lawyers in the Middle Ages interpreted, for the benefit of the Christian king, the laws of God'' (Beer 1939, p. 167).

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recommendations about a nation's power and his main economic propositions. Such an inquiry is necessary since Quesnay speaks in the name of science:

> Everything in this world is subject to the laws of nature: men are endowed with this intelligence required to understand and observe them; but the great number of factors involved demands that they should be grouped together in comprehensive patterns, which form the foundation of a very far-reaching and self-evident science, whose study is indispensable if we are to avoid mistakes in policy (1991, *Formule*, p. 214, Meek's translation, 1963, p. 154).

His theory of the production of wealth is presented as the basis of the *Maximes*. His views are not given as mere opinions founded either on experience or on the authority of great philosophers; they are circulated as scientific laws that should rule societies as physical laws effectively rule the physical world. Politics is anchored in science unless it is just the other way round. Taking into account that very remarkable specificity of Quesnay's thought, it is worth investigating how far the economics of the *Tableau* supports Quesnay's views on politics and military power.

According to Quesnay, wealth is the basis for a nation's power. But wealth is not a stock (and especially not a quantity of money) but a reproducible flow of net value. What is essential to preserve, and to increase if possible, is that *produit net*. This cannot be done but:

(1) by promoting the "right technique" in agriculture (*grande culture* with farmers and horses) at the expense of the wrong one (*petite culture* with sharecroppers and oxen);
(2) by implementing a free competition in order to get a "good price of corn," which means that a net value appears only in agriculture so that a unique land tax on the *produit net* guarantees both a good public finance and a prosperous agriculture;
(3) by favoring conspicuous consumption to the detriment of luxury in the way of ornamentation, *i.e.*, by orienting landlords' expenditures with respect to agriculture rather than to industry, which is supposed to favor the reproduction of the *produit net*.

In order to assess their logical coherence Quesnay's recommendations must be related to the main parameters of the *Tableau* and be submitted to a formal study (section 2). Short comments concerning the consistency of Quesnay's political recommendations with *Tableau*'s economics follow (section 3).

II. A FORMAL STUDY OF THE ECONOMICS OF THE *TABLEAU ÉCONOMIQUE*

Let us consider the *Tableau économique* in its latest version, the *Formule* of 1766, free from the formal difficulties met in the *zigzag*).[3]

[3] One of them is the role played by the advances of the *classe stérile* (see Cartelier 1998).

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The three actions enumerated above correspond to the following parameters of Quesnay's economics:[4]

(1) λ: fraction of the territory cultivated with the best technique (*grande culture*)
(2) γ: fraction of *produit net* (that is the value of surplus product) going to the productive class
(3) α: fraction of *produit net* spent with respect to the productive class

General Framework

When economy complies with natural order, we have $\lambda = \gamma = 1$. In the different versions of the *Tableau*, $\alpha = 0.5$.

From the *Formule*, it is easy to derive the data relative to the "right technique,"[5] that of *grande culture*:

$$\begin{pmatrix} \frac{2}{5} & \frac{2}{5} \\ \frac{1}{2} & 0 \end{pmatrix} \Rightarrow \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \tag{1}$$

where the first column of the two matrices corresponds respectively to the inputs and the outputs of agriculture (the first row is for corn, the second for iron) and the second column to the inputs and outputs of industry.

We suppose that an inferior technique is available for the production of corn (*petite culture*) which is:

$$\begin{pmatrix} \frac{3}{10} & \frac{2}{10} \\ \frac{1}{4} & 0 \end{pmatrix} \Rightarrow \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix} \tag{2}$$

When used on all the territory, it gives half the corn production as compared to *grande culture*, with relatively more advances (but less in absolute value).

Constant returns are assumed. The technique effectively used for the production of corn is a linear combination of (1) with weight λ and (2) with weight $1 - \lambda$.

The global technique is thus:

[4] The *Tableau* is interpreted here as a special case of a classical system of prices. A classical system of prices is defined by a technique and a rule of distribution (or imputation) of the value of surplus product among sectors. For a justification of this point of view, see Cartelier (1991, 1998).

[5] Taking quantities produced by both sectors as *physical* units, it turns out that $\frac{2}{5}$ of corn output are used in corn production (2 billions out of 5) and others $\frac{2}{5}$ in iron production (2 other billions spent by *classe stérile* with respect of *classe productive*). Following the same reasoning, we find that $\frac{1}{2}$ of iron output is used in corn production (1 billion out of 2).

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$$\begin{pmatrix} \frac{3+\lambda}{10} & \frac{2}{5}q \\ \frac{1+\lambda}{4} & 0 \end{pmatrix} \Rightarrow \begin{pmatrix} \frac{1+\lambda}{2} & 0 \\ 0 & q \end{pmatrix} \tag{3}$$

Total quantity of corn produced is

$$\frac{1+\lambda}{2}.$$

When the "right" technique is used on the entire territory, it is equal to one. Quantity of iron q is not limited by the territory but by the quantity of input supplied by agriculture and/or by the quantity of iron consumed by the landlords.

The vector of surplus product is:

$$s = \begin{pmatrix} \frac{1+2\lambda}{5} - \frac{2}{5}q \\ q - \frac{1+\lambda}{4} \end{pmatrix} \tag{4}$$

In order to have $s \geqslant 0$ the quantity of iron produced must obey the following constraint:

$$\frac{1+2\lambda}{2} \geqslant q \geqslant \frac{1+\lambda}{4}.$$

Clearly, s, the vector of commodities available for any other use than inputs for production, depends on two factors: the percentage of land cultivated according to *grande culture* and the scale of production of industry. Coefficient λ, the extension of cultivation with farmers and horses as opposed to that with sharecroppers and oxen, and q, the quantity of iron, both partially reflect the choice of consumption by landlords. That choice is less a matter of individual preferences than a question of socially oriented behavior. Landlords, as the preeminent social group, may influence in a decisive way, according to Quesnay, the type of society. This seems the very sense of opposing conspicuous consumption to luxury in the way of ornamentation.

The *produit net*, y, in which consists wealth, is the scalar product $y = \langle \mathbf{p}, s \rangle$, where $\mathbf{p}$ is the price vector. The following system of equations expresses the logic of price determination:

$$\begin{aligned} p_1 &= \frac{3+\lambda}{10} p_1 + \frac{1+\lambda}{4} p_2 + \gamma y \\ p_2 q &= (1-\gamma) y + p_1 \frac{2}{5} q \end{aligned} , \tag{5}$$

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where y is defined by:

$$y \equiv \langle \mathbf{p}, s \rangle = (p_1 \;\; p_2) \begin{pmatrix} \frac{1+2\lambda}{5} - \frac{2}{5}q \\ q - \frac{1+\lambda}{4} \end{pmatrix} \tag{6}$$

The basic property of this system is rather counter-intuitive. The value of y is not known, except by solving (5), which in turn depends on the way y is distributed between agriculture and industry. The metaphor of a cake whose magnitude depends on the way it is shared clearly shows how it is difficult to spontaneously come to this view. To my knowledge, no commentator has been aware of this strange property of Quesnay's economics before the revival of classical theory, due to Sraffa and others. The failure to recognize that fundamental feature of the theory of prices which supports the *Tableau* is certainly responsible for a major shortcoming in interpreting Quesnay's economics: namely, the belief that any sector's ability to generate net value would depend on characteristics specific to that sector. A quick look at (5) shows that such a belief is ill-founded. The imputation of specific levels of productivity to different sectors comes from nothing but an assumption about the economy *as a whole* (γ concerns agriculture and industry as well). Productivity of agriculture, be it exclusive or not, *has nothing to do with the intrinsic properties of agriculture* (fertility of land, for instance), but with a global view about the entire economy.[6] This point has to be kept in mind in order to understand some *a priori* strange results below.

Assuming constant returns is not sufficient to determine prices independently of the quantities produced (or independently of "demand") if $\gamma < 1$, *i.e.*, if industry captures a part of the value of surplus product. In this case there is an interdependence between the relative price and the level of production of industry as shown by (5). Moreover, system (5) has only one degree of freedom (the sum of the two equations gives (6)). We can choose either equation of the system (5). Let us select the second one,

$$p_2 q = (1-\gamma)y + p_1 \frac{2}{5} q. \tag{7}$$

Equation (7) recalls that industry sales ($p_2 q$) minus costs (inputs bought to productive class: $p_1 \frac{2}{5} q$) equals the net revenue of industry $(1-\gamma)y$. Solving (7) gives:

$$\frac{p_1}{p_2} = p = \frac{5}{4} \frac{4\gamma q + (1-\gamma)(1+\lambda)}{2\gamma q + (1-\gamma)(1+2\lambda)} \tag{8}$$

[6] The price theory lying behind the *Tableau* is a member of a larger family. Petty, Cantillon, Smith, and Ricardo are other members characterized by different assumptions about net value's distribution: respectively) proportional to the number of workers, the quantity of land and the value of the means of production advanced (capital). The only very successful price system in the history of economic analysis is Ricardo's prices of production theory, taken again by Dmitriev, Bortkiewicz and Sraffa.

if p_2 is taken as *numéraire*. For $\gamma = 1$ we have $p = \frac{5}{2}$, the solution of the *Formule*, whereas for $\gamma = 0$ we have either $p = \frac{5}{4}$ if $\lambda = 0$ or $p = \frac{5}{6}$ if $\lambda = 1$.

Value of surplus product—that is *produit net*—is, according to (6) and (8):[7]

$$y = \frac{q(1 + 3\lambda)}{4\gamma q + 2(1 - \gamma)(1 + 2\lambda)}. \tag{9}$$

For $\gamma = 1$ and $\lambda = 1$ we have $y = 1$, *i.e.*, 2 billions, the solution of the *Formule*, whereas for $\gamma < 1$, y depends on q. But, as the following equation makes clear, there is another dependence through the expenditure of *produit net*. The quantity of iron is ruled by:

$$q = (1 - \alpha)y + \frac{1 + \lambda}{4} \tag{10}$$

Equation (10) states that gross product of industry is equal to sales, which are the sum of the fraction of *produit net* spent with respect the sterile class plus the inputs paid by the productive class. We have to solve simultaneously (9) and (10), which gives the following equation in q:

$$8\gamma q^2 + (2(1 + \lambda) - \gamma(6 + 10\lambda) + 2\alpha(1 + 3\lambda))q - (1 + 2\lambda)(1 + \lambda)(1 - \gamma) = 0. \tag{11}$$

We have three parameters to study simultaneously. For the sake of convenience, we shall take $\lambda = 1$ and postpone the study of the influence of λ, which is rather straightforward, until other formal properties have been established.

For $\lambda = 1$, (11) reduces to $8\gamma q^2 + (4 - 16\gamma + 8\alpha)q - 6(1 - \gamma) = 0$. The positive (and economically meaningful) solution is:[8]

$$q = \frac{1}{8\gamma}(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1)}). \tag{12}$$

The quantity of iron depends on the distribution of net value between agriculture and industry and on the composition of landlords' expenditures. The first parameter, γ, is a proxy for the productivity of agriculture (when $\gamma = 1$ we have the exclusive productivity of agriculture and for $\gamma = 0$ that of industry) and an indicator for the price of corn. As we know, both phenomena are the two faces of the same coin.

We have now all we need to study the influences of the three parameters selected above.

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[7] If corn is chosen as *numéraire*, *produit net* (in corn) would be:

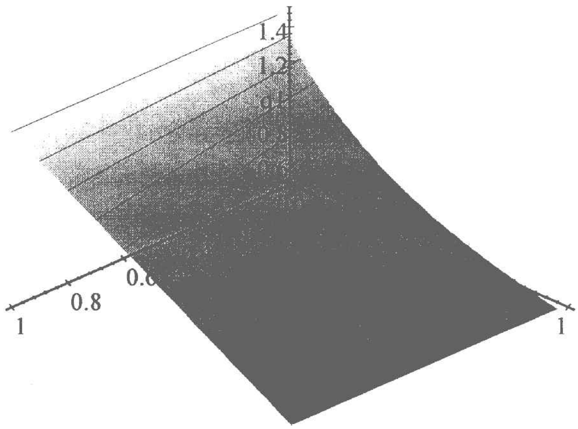
$$y = \frac{(2 + 6\lambda)q}{20\gamma q + 5(1 - \gamma)(1 + \lambda)}.$$

[8] For $\lambda = 0$, q is given by $8\gamma q^2 + (2 - 6\gamma + 2\alpha)q - (1 - \gamma) = 0$. The positive solution is then:

$$q = \frac{1}{16\gamma}(-2 + 6\gamma - 2\alpha + 2\sqrt{(1 + 2\gamma + 2\alpha + \gamma^2 - 6\alpha\gamma + \alpha^2)}).$$

Landlords Expenditures, Corn Price, and Produit Net: *Some Unexpected Results*

Let us represent the function of q just found in a three-dimensional diagram in order to show how it is related respectively to γ and α:

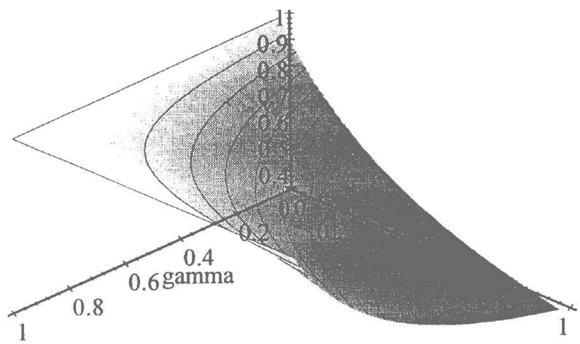


Not surprisingly, the importance of the *classe stérile* is negatively related to α and to γ, but to a lesser extent for the latter.[9]

The determination of q is a necessary step to calculate the *produit net* and to express it as function of α and γ. We have, replacing q in (9):

$$y = \frac{4\left(\frac{1}{8\gamma}(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1)})\right)}{4\gamma\left(\frac{1}{8\gamma}(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1)})\right) + 6(1-\gamma)}. \tag{13}$$

A three-dimensional diagram exhibits the respective influences of γ and α on y:



[9] A qualitatively identical result would be obtained for $\lambda = 0$, the level of q being uniformly lower due to the inferior technique used.

Produit net y increases with γ in accordance with Quesnay's theses. But, contrary to his repeated assertions, y decreases with α! This relation is steeper, the lower the values of γ.[10] Only for $\gamma = 1$ does y cease to depend on α. It is true that Quesnay considered only this special case. But there is no reason not to explore the formal properties of the model when the economy has not yet reached a natural order position and when the price of corn has not yet reached its natural value.

The result above is not difficult to understand once the false evidence is dissipated. Contrary to what Quesnay (and most of his commentators) thought, it does not make sense to pretend that *produit net* is due to the fertility of land. As a scalar product of prices by surplus product, *produit net* generally depends on the relative scale of activity of the two sectors which, in turn, depends on α. It is only in the special case where $\gamma = 1$ that this interdependence is broken. Developing (6) gives:

$$y = p_1 \frac{1+2\lambda}{5} \underbrace{- \frac{2}{5} p_1 q + p_2 q}_{\textit{net value in industry} = (1-\gamma)y} - p_2 \frac{1+\lambda}{4}, \qquad (14)$$

which makes it clear why q disappears in the evaluation of y when $\gamma = 1$ and why the story becomes complex when this does not occur (for $\gamma < 1$).

In order to understand why *produit net* y decreases with α, we need just to recall that two distinct influences have to be taken into account: the one concerns the vector of surplus product, the other the vector of prices. From (9), it appears that the partial derivative is

$$\frac{\partial y}{\partial q} = \frac{24(1-\gamma)}{(4\gamma q + 6(1-\gamma))^2} \geqslant 0 \text{ if } \gamma \leqslant 1.$$ [11]

When q increases, the composition of surplus product changes: it contains more iron dq and less corn $-\frac{2}{5}dq$. When $\gamma = 1$, prices are $\frac{5}{2}$ and 1 respectively. Thus, the positive variation of the *value* of iron dq is just compensated by the decrease of the *value* of corn component: $-\frac{2}{5}\frac{5}{2}d1$. But, for $\gamma < 1$, the price of corn is lower than $\frac{5}{2}$ and the decrease in value of corn component is no longer sufficient to compensate the increase dq. As a result:

$$\frac{\partial y}{\partial q} > 0.$$

Now, since

$$\frac{\partial q}{\partial \alpha} < 0$$

[10] The choice of *numéraire* obviously affects the relation between y and γ. As a matter of fact, if corn is taken as *numéraire*, *produit net* (in corn) is a decreasing function of γ. But, this does not at all influence the negative relation between y and α.

[11] The sign of $\frac{\partial y}{\partial q}$ is not affected by the choice of *numéraire*.

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as seen above, we have

$$\frac{\partial y}{\partial \alpha} < 0.$$

From the point of view of the influence of the structure of landlords' expenditures, the idea of sterility of industry is not a question of degree but a question of nature. An economy with $\gamma = 1$ qualitatively differs from one where $\gamma = 1 - \varepsilon$. Qualifying Quesnay's theory by admitting that industry could be "a little bit" productive as soon as agriculture is admittedly "far more" productive than industry (a point of view rather close to Forbonnais' views) would not do justice to it. It is only when natural order prevails that a negative influence of an increasing α ceases to be true. But, in this limit case ($\gamma = 1$) *produit net* y does not depend negatively on q and, therefore, not positively on α, despite one of Quesnay's favorite statements. Net value depends on the extension of *grande culture* only, that is on λ.

Another basic proposition of Quesnay is that a high price of corn, *i.e.*, a high γ, *ceteris paribus* leads to a higher *produit net* and thus to an increase in the wealth of a nation. That contention seems well supported by the formal study of the *Tableau* as shown by the diagram above. But, as we shall see later, the influence of γ on y depends on the *numéraire*. In order to avoid this difficulty, it may be convenient to consider the rate of return on advances rather than *produit net* since it gives an idea of economic efficiency independent from the *numéraire*. Quesnay himself emphasizes the importance of the rate of return on advances as a strategic variable. Therefore, it is worth inquiring into the influence of γ and α on the overall rate of return, that is, the ratio of *produit net* to the total advances a.

Total advances are (for $\lambda = 1$): $\frac{2}{5}(1+q)p + \frac{1}{2}$. Calculating p, taking into account (12) gives:

$$p = \frac{20\gamma \frac{1}{8\gamma}\left(8\gamma - 4\alpha - 2 + 2\sqrt{4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1}\right) + 10(1-\gamma)}{8\gamma \frac{1}{8\gamma}\left(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1)}\right) + 12(1-\gamma)}. \tag{15}$$

Total advances are then

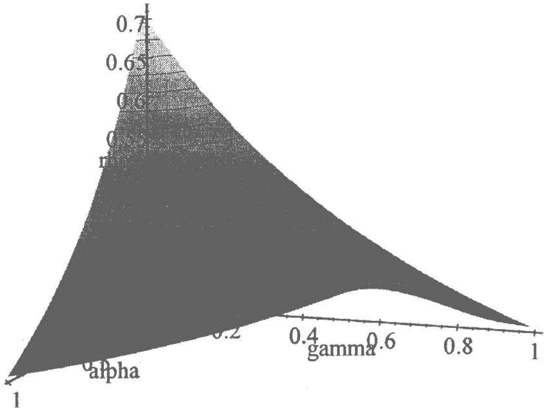
$$a = \frac{2}{5}\left(1 + \frac{1}{8\gamma}\left(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 - 4\alpha + 1)}\right)\right) \tag{16}$$

$$\left(\frac{20\gamma \frac{1}{8\gamma}\left(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1)}\right) + 10(1-\gamma)}{8\gamma \frac{1}{8\gamma}\left(8\gamma - 4\alpha - 2 + 2\sqrt{(4\gamma^2 - 16\alpha\gamma + 4\gamma + 4\alpha^2 + 4\alpha + 1)}\right) + 12(1-\gamma)}\right) + \frac{1}{2}.$$

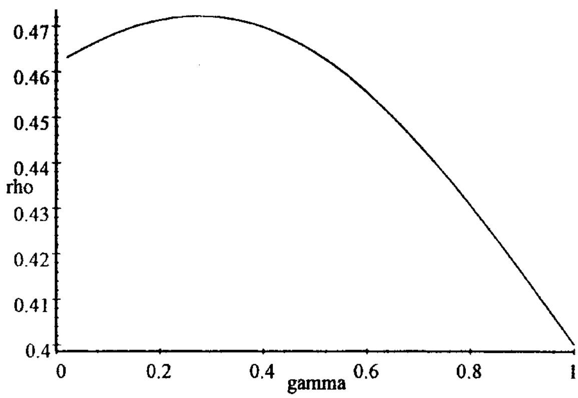
The overall rate of return is:

$$\rho = \frac{y}{a}.$$

The diagram below shows how ρ varies with α and γ:



Unexpectedly, at least if one is true to Quesnay, the global productivity of the economy does not vary positively with γ. It is quite the contrary! This global relation is a combination of two opposed partial ones. In agriculture an increase in the relative price of corn improves the productivity of this sector and its own rate of return. This is due to the fact that the quantity of corn as output is greater than as input. For a similar reason, that very increase in the relative price of corn (which is a decrease in the relative price of iron) lessens the productivity of industry since the quantity of iron as output is greater there than as input. The global relation depends on the relative importance of these two opposite and simultaneous effects. As the sign of the derivative $(\partial p/\partial \gamma)$ depends on both functions, whether ρ varies positively or negatively with γ is not known *a priori*. As a matter of fact, the specific result above is contingent on the technique. It could have happened, with a different technique, that ρ would be an increasing function of γ as well. But, by an historical irony, the data of the *Tableau* are not favorable to Quesnay's point of view. For example, taking $\alpha = 0.5$, the two-dimension diagram is:



For $\gamma = 1$, we have $\rho = 0.4$, which is Quesnay's own result. A modification of relative price p in favor of corn results in a decrease of the global rate of return of the economy for a very large range of values of γ.

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Natural Order and Extension of Grand Culture

The developments above have made it clear that a great source of trouble comes from the situations with $\gamma < 1$. The life of the physiocratic scholar is far better when $\gamma = 1$. There are (at lease *ex post*) strong analytical reasons for Quesnay's insistence in favor of a "good price of corn," that is, the price to be observed in the international market for corn. Abolition of the French regulation on corn trade, which expresses a "subsistence pact" between the sovereign and the French people, is for him the best thing to do in order to get that result. The basic idea behind such a policy is that free competition will drive market prices to their "natural" level. At this level, agriculture is the only activity for which the value of sales (*valeur vénale*) is above that of costs (*valeur fondamentale*).

To keep the story simple, let us consider hereafter an economy where such a policy has been successfully applied and where $\gamma = 1$, that is, when industry is sterile and agriculture exclusively productive. Hence, (8) reduces to:

$$\frac{p_1}{p_2} = p = \frac{5}{2} \tag{17}$$

and (6) to:

$$y \equiv \frac{1 + 3\lambda}{4}. \tag{18}$$

Now, *produit net* does not depend on landlords' choice of consumption but only on the part of the territory cultivated by farmers with horses. This is true also for total advances (*avances annuelles* plus amortization of *avances primitives*) in agriculture that amount to

$$\frac{3 + \lambda}{4} + \frac{1 + \lambda}{4}\,\frac{5}{2} = \frac{2 + \lambda}{2}.$$

Note that if the rate of return on annual advances only is 100 percent and independent of λ, this is not the case for the return on total advances equal to:

$$\frac{1 + 3\lambda}{4 + 2\lambda},$$

which grows from 25 percent, when $\lambda = 0$, to 66.666 percent when $\lambda = 1$.[12] Quesnay is then right, on his own standard, when he advocates the extension of the *grande culture* and a good price for corn.

Besides, the quantity of iron increases with λ (and thus with the *produit net*) and its level is higher the greater is $1 - \alpha$, the fraction spent in respect to the sterile class.

In monetary terms, with $p_2 = 2$ billions taken as a *numéraire*, (18) is:

$$y = \frac{1 + 3\lambda}{2}. \tag{19}$$

[12] These rates are respectively 33.3 percent and 66.6 percent if the value of iron inputs is taken into account. Total advances, i.e., total value of inputs in the corn and iron sectors, are $a = 1 + q + (\lambda/2)$. If we consider the rate of return for the economy as a whole (with the iron sector), the rates $\rho = (y/a)$ respectively become, for $q = 1$, 12.5 percent and 40 percent. They negatively depend now on q: for $\lambda = 1$, varies ρ from 50 percent when $q = (1/2)$ to 33.3 percent when $q = (3/2)$.

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It is not very difficult to draw alternative *Formules* according to different values for α and λ. The monetary description given by the *Tableau* has to be amended in order to take into account the various extensions of the *grande culture*.

Instead of taking for granted a net revenue of two billion, we have to consider a value of

$$\frac{1+3\lambda}{2}.$$

This revenue is spent according to, respectively, α and $1-\alpha$ with respect to agriculture and industry. That sterile class spends the entirety of its revenue to the productive class does not depend on α but only on the assumption that it is sterile. It remains to determine the amount spent by the productive class in respect to the sterile class. The physical quantity of corn produced is known:

$$\left(\frac{1+\lambda}{2}\right),$$

which determines the quantity of input bought to sterile class,

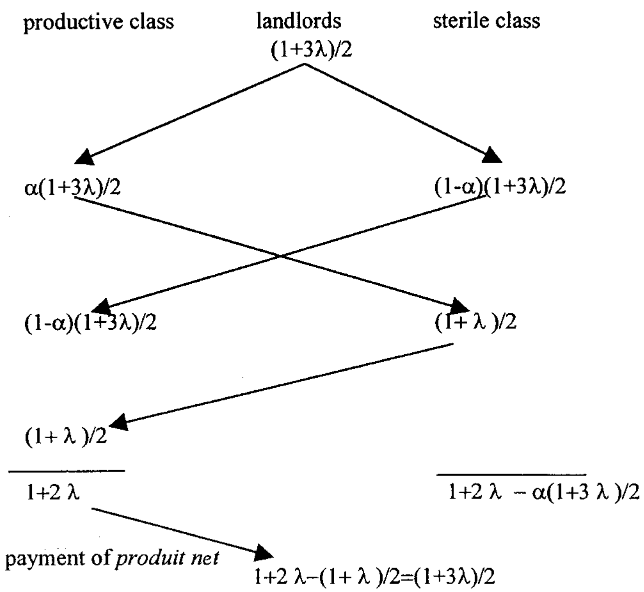
$$\left(\frac{1+\lambda}{4}\right),$$

independently of its importance. The price of iron is known (2 billion), which means that the productive class buys for

$$\frac{1+\lambda}{2}$$

billion to sterile class. The *Formule* is then:

Tableau's formule



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It is easy to check that for $\alpha = 0.5$ and $\lambda = 1$ we get the 1766 *Formule* (the 2 billions of avances annuelles being *in natura*) whereas we have $y = 2$ and $R_p = 3$ irrespective of α, which influences only $R_a = 3$ for $\alpha = 0$ and $R_s = 1.5$ for $\alpha = 1$.

Most of the results mentioned above are unexpected or counter-intuitive. But it is not yet clear whether or not they confirm Quesnay's recommendations about the means to get a French monarchy able to resist England.

III. "AGRICULTURAL KINGDOM": THE BEST ROAD TO WEALTH AND POWER?

Produit Net *and Choice of* Numéraire

First of all, the choice of *numéraire* is relevant for our problem. Such an assertion may sound strange since the *Tableau* is expressed in money terms. But in an exercise where Quesnay's affirmations are not taken at their face value, it must be a rule to accept only those propositions that can be derived logically from the initial assumptions. Does money enter the *Tableau* as more than a descriptive device? It is difficult to answer such a question. In any case, even if it is not impossible to find some elements of a monetary theory of wealth (some interesting quotations may be found in *Hommes*), it would be difficult to give a clear account of it in modern terms. Another line of interpretation is explored above according to which Quesnay's implicit price theory is not in money terms but, as with any classical price system, in real terms. Prices are determined up to a scalar factor, which means that we have to choose a *numéraire*. Wealth, although evaluated by Quesnay in money terms, is *theoretically* determined only in real terms.

In the formal study above, iron is taken as the *numéraire*. *Produit net* is conceived of as a purchasing power of corn over iron. The relative price of corn p is thus a decisive determinant of *produit net*. As p is positively related to γ, it is no surprise to find a positive relation between γ and y. Of course, if we had considered corn as *numéraire* $1/p$ would have been inversely related to γ, as would have been *produit net* evaluated in corn. As a consequence, maintaining that a high price of corn is favorable to a high *produit net* is theoretically meaningful only if there is a good reason to choose iron as the *numéraire*.

As far as military power and international preeminence are concerned, is there a *numéraire* specially significative? Are military expenditures oriented toward agriculture or toward industry? Quesnay is not very prolix on this point. He prefers (probably rightly) to insist on the importance of the navy, which has the great advantage not to diminish the labor force in agriculture as does the army, (*Hommes*, p. 520). The value of surplus product is thus the essential factor: "What is to increase the progress of our navy is the increase in the revenue of the State" (*Hommes*, II, p. 524). The fact that Quesnay (*Hommes*, p. 520), reasons in money terms makes him forget that *produit net* is the value of a vector and not an indistinct purchasing power. Composition of *produit net* could matter, but it is not plain to assess which is best suited to the development of navy.

If military considerations do not allow a conclusion in favor of a *numéraire*, political considerations do. There is a clear political motive to choose iron as a

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numéraire and to stress the positive relation between a high price of corn and wealth. What is essential to Quesnay is the market power of an agricultural nation, power exerted upon non-agricultural countries. More specifically, he conceives of France as a combination of two nations:

> "Thus an agricultural kingdom which engages in trade unites in itself two nations which are distinct from one another: one, bound to the territory which provides the revenue, constitutes the essential part of the society; and the other is an extrinsic addition which forms part of the general republic of external trade, employed and paid by the agricultural nations" (Quesnay, *Formule*, 1991, p. 225; Meek 1963, p. 162).

Favoring one against the other leads Quesnay to express the wealth of the former as a power to command commodities produced by the latter.

But now a conflict arises. On the one hand, it makes sense to adopt iron as a *numéraire* to stress that agriculture is really the heart of the economy but, on the other, for France as a whole, it is the global rate of return in the economy that is the decisive factor. And as we have seen, given the data of the *Tableau*, global productivity is not higher the greater the fraction of *produit net* going to agriculture. In other words, the global rate of return is not necessarily correlated with a high price of corn. It is just the contrary. Such a result, although contingent on the technique, does contradict the search for an increased efficiency and a maximum wealth. That contradiction deserves to be explored further.

Productive Activity and Increase of Wealth

The point may be put in a nutshell. *According to the formal logic of the Tableau, a society where the unique activity considered as productive dominates does not generate a greater net value than one where the sterile class is important*. What matters is not the proportion of productive to non-productive activity but, inside the former, the relative extension of *grande culture* as compared to *petite culture*. In formal terms, what explains the importance of *produit net* is not q or

$$\frac{q}{\frac{1+\lambda}{2}},$$

but λ. An agricultural kingdom is not proved to be the most convenient form of society according to Quesnay's own criterion of wealth.

This counter-intuitive conclusion ceases to be surprising as soon as the "intuitive" reasoning is shown to be false. This reasoning is the following: as the exclusive productivity of agriculture comes from its intrinsic properties (fertility of land, Nature's gift, etc.), the greater the fraction of activity devoted to it, the greater the amount of wealth. But the story really told by the economics of the *Tableau* is different. What determines the relative importance of agriculture is the way in which landlords spend the net value, denoted by α. We have shown why α was indifferent to y when $\gamma = 1$ and why $(\partial y/\partial\alpha) < 0$ when $\gamma < 1$. The indifference of α may be directly obtained from the *Tableau*. If we consider the

Formule, we immediately see that all receipts of the sterile class are spent with respect to the productive class. This means that all the *produit net* is spent directly or indirectly with respect to the productive class whatever α may be. The only important point, clearly made by Quesnay, is that *produit net* should not be hoarded.

Were industry allowed to be "a little bit" productive, some very unexpected results would follow, namely that luxury is to be preferred to conspicuous consumption as allowing a higher *produit net*! Again we must avoid confusing surplus product—which is a *vector* equal to the difference between the output and input vectors of the economy as a whole—and *produit net*—which is the scalar product of the price vector by the surplus product. Surplus product is affected by the expenditure behavior of landlords, both in size and in structure, in a way clearly intelligible: q varies inversely with α. The influence of α on prices is not so clear, as (15) reminds us. The influence of α on wealth is a combination of both influences that cannot be known except by making explicit all the formal relations contained in the *Tableau*.

There is thus no economic foundation, strictly understood, to Quesnay's position on the relative importance of the two classes. But there is obviously a strong political motivation. Loïc Charles and Philippe Steiner (2000) clearly explain this relative to the debate on the *noblesse commerçante* prompted by the book by Coyer. As a matter of fact, Quesnay's argument is part of a larger attempt at rehabilitating nobility. Not being politically justifiable, as Quesnay himself recognizes in the *Traité de la monarchie*, nobility may appear more acceptable when disguised as landlords. But the argument runs short and cannot be sustained by convincing arguments (Cartelier 2000). There seems to be no economic (or even rational) argumentation supporting the restriction of industry to a minimum. When the territory is cultivated at its best ($\lambda = 1$) there is no obvious economic harm in favoring industry by *luxe de décoration*; even if the *produit net* is not greater, the surplus product increases. Would it not be better to have a greater surplus product with an undiminished *produit net*? Would it not be better to have a greater population making a living from industry? The answer to this question is not an economic one. It depends heavily on the idea one has about a *royaume agricole*. More precisely, if one thinks that citizens must be attached to the territory (directly or indirectly) one should favor a strict *faste de subsistence*, i.e., $\alpha = 1$, which would imply the minimum production of iron compatible with the needs of agriculture ($q = \frac{1}{2}$) with a flow of 1 billion in the *Formule* and of $3 + 2 = 5$ billions for agriculture if we take into account advances *in natura*. In that case, the system of quantities is, following (3):

$$\begin{pmatrix} \frac{2}{5} & \frac{1}{5} \\ \frac{1}{2} & 0 \end{pmatrix} \Rightarrow \begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{2} \end{pmatrix}. \tag{20}$$

Surplus product is made of corn only, and industry is nothing but the strictly necessary appendix to agriculture.

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Grande Culture Versus Petite Culture*: The Real Source of an Increased Wealth*

Concerning the increase of wealth, the decisive distinction is not between productive and unproductive activity but that between *grande culture* and *petite culture*, a distinction internal to agriculture. In our formal study, it is denoted by λ, the fraction of the territory devoted to the culture with farmers and horses. We may interpret Quesnay's idea of growth as a progressive increase of λ through time that ceases when λ reaches its maximum, $\lambda = 1$. At this point a natural order situation exists. Growth stops unless the technique improves.

A brief parallel with Adam Smith may be interesting. Remember that, for Smith, productive labor is the one that is exchanged against capital and that growth is interpreted as an increase in the *proportion* of waged or productive labor employed in the country. More precisely, labor hired by capital produces this year a value (expressed in labor commanded) $(1+r)$ times higher. If a certain fraction of this additional value, say β, is devoted to hiring more labor next year, quantity of productive labor increases by a factor $(1+\beta r)$. If the total quantity of labor available is constant, growth will crease (except for increasing returns coming from a greater division of labor) when all labor has become productive, i.e., spent in a capitalist relation of production, as opposed to a relation with menial servants. More than an increase in the mass of commodities produced, growth of nations is characterized by extension of a certain mode of production. The relation above shows that for Quesnay it is only the extension of a special relation of production in agriculture (the *grande culture*) accounting for the growth of the net product. Growth cannot be reduced to a purely quantitative phenomenon since it requires by its very definition a change in the social relations of production.

The difference with Smith, however, is important. Quesnay does not explain clearly how an increase in the advances comes about (see however Eltis 1999). The key to this shortcoming would be, according to R. Meek, the following contradiction. On the one hand, Quesnay could not admit that a fraction of *produit net* comes into the hands of the farmers: there should be no reason to exempt them from taxation. On the other hand, he could not state that farmers never get some part of the revenue: there could not be any increase in the productive advances and consequently no increase in wealth. This dilemma would explain the strange treatment of farmers' profit, which is condemned to be transitory, existing only during the intervals between rent contracts. Meek's interpretation is interesting and full of ingenuity. But he takes for granted that Quesnay had in mind an unlimited increase in wealth, which is precisely the point at hand. It seems, on the contrary, that Quesnay thinks only of a permanent high level of wealth when he refers to a "large kingdom whose territory [is] fully cultivated by the best possible methods" (Quesnay, *Formule*, 1991, p. 210; Meek's translation, 1963, p. 151). Moreover, according to Quesnay, a source exists for the increase of productive advances: it is nothing but the expenditure of the landlords' revenue:

> Thus it is with reference to the order of the distribution of expenditure, according to whether it is returned to or taken from the productive class,

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> according to whether it increases or diminishes the advances of this class, and according to whether it maintains the prices of products or causes them to fall that we may calculate the effects of the good or bad leadership of a nation (Quesnay, *Formule*, 1991, p. 223; Meek's translation, 1963, p. 161).

But Quesnay's calculations sharply differ on this point (the influence of α and γ on y and ρ) from those presented above.

If the interpretation in terms of a classical price system suggested in this paper is correct, we may admit that, despite its impressive character and its incredible sophistication, Quesnay's economic argumentation is far less consistent with his political recommendations than most commentators believe. In this sense, Quesnay is betrayed by his own *Tableau économique*.

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