Cantillon on Real Wages and Employment: a rational reconstruction of the significance of land utilization

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Abstract

It is quite a fundamental proposition of Richard Cantillon's *Essai sur la Nature du Commerce en Général* (1755) that employment and population bear a negative relation to the level of real subsistence wages - a form of wages (or subsistence) fund doctrine. This paper presents a 'rational reconstruction' of Cantillon's system and the relation between real wages and employment within it. It seeks thereby to clarify the difficulties in the way of this doctrine operating in a market economy constructed along Cantillonian lines - as opposed to a Cantillonian command economy. These results are contrasted with a model of Cantillon by Hans Brems.
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CANTILLON ON REAL WAGES AND EMPLOYMENT: a rational reconstruction of the significance of land utilization

It is probably a fair judgement to describe Richard Cantillon as the first writer in the history of economics to create a work which is recognizable, in modern terms, as an economic treatise - the first genuine 'Principles' of economics, even though it has a largely precapitalist character in terms of the kind of social economy it theorizes. The Essai sur la Nature du Commerce en Général (1755), apparently written in the late 1720s or early 1730s, is a remarkable watershed in the history of economic theory. It deserves to sit in the same company as Quesnay's Tableau, Turgot's Réflexions, Smith's Wealth of Nations, Ricardo's Principles and Marx's Capital. The Essai covers a comprehensive economic terrain, at least for the social economy of its time. The focus of this article is just one element of Cantillon's system - the relation between real wages and employment. However, as one would expect in a system of interconnected economic phenomena, the relation between real wages and employment in Cantillon's system is embedded in a wider set of causal relations.

With regard to the determination of the level of population and employment in a society, Cantillon systematically advanced a number of fundamental principles, one of which was the existence of an inverse relation between population and employment on the one hand and the rate of real wages per capita on the other - where the latter was conceived as a kind of subsistence level of consumption, though conventionally determined. We seek to clarify the causal economic logic, or process, underlying the determination of employment in Cantillon's system - and in particular, underlying his oft-stated view of the manner in which variations in real wages (customary subsistence) would influence

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employment and population. Section 1 provides a 'rational reconstruction' of Cantillon on employment and real wages. By rational reconstruction is meant the application of formal models designed to accurately capture the intentions or ideas of an earlier author or text, while going beyond the actual analytical or formal execution of the writer. This is an interpretive method which may enable a clearer grasp of the logical coherence (or otherwise) and implications of a system - but runs the risk of losing contact with the text under examination. Section 2 therefore documents, in his own words, Cantillon's characteristic views on the determinants of population and employment. The purpose of all this is to demonstrate the extent to which Cantillon's principle concerning the relation between real wages and employment is valid - not in the sense that it is true, but in the sense that it follows logically from his analytical framework. Our inquiry in part is stimulated by Brems (1986: 40-49), who in a formal model designed to capture Cantillon's theoretical intentions, claims to show that this principle is an error on Cantillon's part, in the sense that it does not follow from his own economics. We shall comment further on this interpretation below. As a matter of fact, there is a problem in Cantillon's treatment of real wages and employment; but it lies elsewhere, and at a deeper level, than Brems supposes. Specifically, it is not clear how - in a market economy, as opposed to a 'command' economy - Cantillon's 'subsistence fund' approach to determination of population and employment can be reconciled with his further doctrine, that labour supply more or less passively adjusts to labour demand. Section 3 seeks to resolve this fundamental issue and thereby cast Cantillon's system in a clearer light. A brief conclusion follows.

1. A Rational Reconstruction

Cantillon's system may be accurately formalized, albeit in a simplified manner, along the following lines.

In the first instance, suppose there are two produced commodities, both consumer goods (1,2). There are no produced means of production, except that labour is a kind of commodity in this system. Commodity 1 is a necessity consumed by labour, with a given necessary consumption per worker per time period (c_n). Commodity 2 is a luxury consumed by landowners and landowners alone. Workers are landless and landowners don't work. Functional income distribution resolves exclusively into wages and rents. There is no net saving out of wages or rents (and hence, no net investment). Each commodity is produced by means of fixed coefficients of labour input per unit of gross output produced per uniform time period (a_n, a_n) and land input per unit of gross output produced per time period (b_n, b_n). Constant returns to scale prevail and there is no choice of technique. Equilibrium money prices (P_1, P_2) are equal to costs of production, with the (implicit) assumption that in equilibrium competition has generated a uniformity of prices for each of the two homogeneous commodities, a uniform money wage per time period for homogeneous labour (w) and a uniform money rate of rents per time period for homogeneous land (n):

\[ P_1 = a_n w + b_n n \]  
\[ P_2 = a_n w + b_n n \]  
\[ n = c_n P_1 \]  
\[ P_1 = a_n c_n P_1 + b_n n \]  
\[ P_2 = a_n c_n P_2 + b_n n \]  

These two equations in three variables (P_1, P_2, n) enable a determination of the real rate of rents (n/P_1, n/P_2) and relative commodity prices (P_1/P_2).

From equation (4),

\[ n/P_1 = (1-a_n c_n)b_n \]  
From equation (5),

\[ P_1/P_2 = a_n c_n + b_n (n/P_1) \]  

Substituting equation (6) into equation (7) and rearranging:
\[ \frac{P_1}{P_2} = b_1a_1b_2c_1 + b_1(1-a_1c_1) \]
\[ = b_1b_2 + b_1b_2c_1[(a_1/b_2) - (a_1/b_1)] \]
From equations (6) and (9),
\[ \frac{n}{P_1} = \frac{(n/P_2)(P_2)}{P_1} \]
\[ = \frac{(1-a_1c_1)[b_1 + b_1b_2c_1[(a_1/b_2) - (a_1/b_1)]]}{b_1b_2 + b_1b_2c_1[(a_1/b_2) - (a_1/b_1)]} \]
The economic meaningfulness of equations (6) to (11) requires that c, be less than unity, or
\[ c < \frac{1}{a_1} \]
This is equivalent to assuming that necessary labour consumption for the production of a unit of necessities is less than one unit, so that a positive surplus is available to be distributed as rents. Further, as the substitution of equation (3) into equations (1) and (2) indicates - generating equations (4) and (5) - in a sense labour input to the production process can be reduced to commodity input.

Turning from distribution and value to outputs and employment, the aggregate quantity of land available to the economic system (owned by the landowners) is given (N). This is available to produce some aggregate quantities \( X, X' \) of the necessity and the luxury respectively, with the application of the available aggregate workforce \( L \). Cantillon recognizes two constraints upon \( X, X' \). First and most obviously, output is constrained by the available quantity of land \( \text{(the land constraint)}: \)
\[ b_2X_1 + b_1X_2 \leq N \]
\[ X_1 \leq \frac{N}{b_2} - (b_1/b_2)X_2 \]
In other words, production of \( X_1, X_2 \) cannot utilize more land than is available. Second, whatever quantities \( X_1, X_2 \) the system produces, there must be sufficient of the necessity produced to meet the subsistence consumption requirements of the total workforce employed in production of \( X_1, X_2 \) \( \text{(the subsistence constraint)}: \)
\[ c_1(a_1X_1 + a_2X_2) \leq X_1 \]
\[ X_1 \leq \frac{(1-a_1c_1)[a_1c_1]}{a_2c_1}X_2 \]
This obliges the landowners to keep the workforce alive. Inequality (16) is akin to an input-output (Leontief inverse) multiplier, which shows the 'induced' demand for the necessity arising from autonomous demand for the luxury. Consider the limiting case in which landowners do not consume the necessity. Then, the subsistence constraint becomes
\[ X_1 = \frac{[(1-a_1c_1)[a_1c_1]}{a_2c_1}X_2 \]
\[ X_1 = \frac{[(a_2c_1)/(1-a_1c_1)]}{X_2} \]
where \( a_2X_2 \) is the necessary consumption of the labour directly required to produce \( X_2 \); and \( 1/[(1-a_1c_1)] \) accounts for the necessary consumption requirements of the indirect labour required - due to the fact that while the \( a_2X_2 \) labourers are producing the luxury, other labourers must be producing a surplus of the necessity to sustain them. The direct and indirect consumption requirement of labour, arising from production and consumption of one unit of the luxury, is \( c_1a_2/(1-a_1c_1) \).

The manner in which these two principles act to constrain production and consumption possibilities can be more readily seen with the aid of a diagram (Figure 1). Function I is the land constraint, showing the feasible set of outputs \( X_1, X_2 \) which the available quantity of land allows. The subsistence constraint says that output also must lie on or to the right of function II, ensuring that the workforce producing \( X_1, X_2 \) is sustained. (Points on function II show, for any given level of the luxury consumed by the landowners, the quantity of the necessity required for the associated direct and indirect workforce.) Up to this point therefore, it can be concluded that Cantillon's principles constrain the system's outputs to the region OAB, including its boundaries. If the system were on the line segment OA, landowners are consuming only the luxury and available land (N) is not being fully utilized in production of \( X_1, X_2 \) (except at A). If the system were on AB, landowners are consuming both commodities (except at A) and N is fully utilized for those purposes. If the system were on OB, only the necessity is being produced and consumed. Within OAB landowners are consuming both commodities and land is not being fully
utilized in production of $X_r$. How much more determinate a theory of output as a whole can be found in Cantillon is taken up below.

**FIGURE 1**

$$a,x/b,ca/b(a/a,c,b,b,c)$$

What of the determinacy of aggregate employment? In Cantillon, labour (and indeed, population) is like a produced commodity: so far as subsistence (the 'input') is provided, labour/population (the 'output') is generated or sustained. This is a mechanism in which society's population size is regulated by the fund of subsistence goods made available via the landowners' willingness collectively to allocate land to that purpose. Elsewhere the present writer has presented an interpretation of the determination of population and employment in Cantillon's system (Aspromourgos 1989: esp. 360-63) - though without paying much attention to the relation between real wages and employment. That interpretation may briefly be restated.

In this interpretation, Cantillon's point of departure is the proposition that population ($P$) is regulated by the proportion ($k$) of society's available homogeneous land ($N$) which is allocated to production of necessities, by the collective outcome of the landowners' decisions concerning land use - together with the quantity of necessities produced per unit of land ($1/b$) and the level of homogeneous subsistence consumption ($c_i$):

$$P = \frac{1}{b}kn/c_i$$  \hspace{1cm} (19)

Population adjusts to the 'fund' of land available to produce subsistence ($kn$), the land's productiveness in generating necessities ($1/b$), and the level of necessary consumption per capita ($c_i$). The proportion of land available for production of subsistence is supposed exogenously given, subject to certain qualifications indicated below. Furthermore, the workforce ($L$) is assumed to be an exogenously given proportion ($m$) of total population. Hence employment is given by

$$L = mP$$  \hspace{1cm} (20)

$$= m\frac{1}{b}kn/c_i$$  \hspace{1cm} (21)

and employment is unambiguously a negative function of the real wage, which is supposed equal to $c_i$:

$$\frac{dL}{dc_i} = -m\frac{1}{b}kn/c_i^2$$  \hspace{1cm} (22)

The fixed 'real wages fund' ($mk/Nb$) means that the relation between real wages and employment is a rectangular hyperbola.$^1$

One qualification to the exogenity of $k$ may be noted. In the *Essai* Cantillon also presents a treatment of 'surplus labour', understood as society's total employment net of the quantity of employment ($L_s$) required to produce the subsistence consumption of the total population. With $A$, the labour input required to produce a unit of necessity output,

$$L_s = a,c,P$$  \hspace{1cm} (23)

Substituting equation (20) into equation (23):

$$L_s = a,c,L/m$$  \hspace{1cm} (24)

and surplus labour ($L_s - L$) is positive on the supposition that

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1. This makes clear, if it were not already, that this inverse relation between real wages and employment has no kinship with the marginalist treatment of labour demand and factor prices. The latter in any case requires multiple available methods of production and substitutability, both of which here are excluded by assumption.
This assumption is perhaps most intuitively understood by noting that it is equivalent to requiring that the proportion of necessity output which is 'surplus' \((1-a, c)_x\), exceed the proportion of the population which is non-working \((1-m)\), so that surplus necessity output is not fully exhausted in meeting the subsistence of non-workers: some necessity output is left over to 'fund' employment in other, non-subsistence activities. Now, in general the values taken by \(a, c\), and \(m\) constrain the values which can be taken by \(k\), if the economic system is to be viable. If some land \([(1-k)N]\) is allocated to purposes other than production of necessities, then in general some labour also will have to be allocated to non-necessary purposes. Given the average labour-land ratio \((q)\) in non-necessary uses of land - and assuming that, in some sense, all land is 'employed' (more on this below) - the quantity of labour employed on surplus land \((L_{m})\) is given by

\[
L_{m} = q(1-k)N
\]

The quantity of surplus labour available is given by

\[
L-L_{m} = (m-a,c)P
\]

\[
= (m-a,c)(kN/b,c)
\]

Clearly, viable allocations of labour must satisfy

\[
L-L_{m} \geq L_{m}
\]

\[
(m-a,c)(kN/b,c) \geq q(1-k)N
\]

It best captures Cantillon's intention to interpret this as constraining the value of \(k\), with all the other variables determined exogenously to this inequality:

\[
q/(q+[(m-a,c)/(b,c)]) \leq k \leq 1
\]

where the term on the L.H.S. of the first inequality is necessarily positive and less than unity. Rather than exploring all aspects of this constraint, just two points may be noted. (1) The larger the quantity of surplus labour per head of population \((m-a,c)\), the greater the scope for the quantity of land devoted to subsistence production \((k)\) to vary below unity. (2) If \(k\) exceeds the first term in inequality (31), then there is surplus labour over and above that employed on surplus land (e.g., available for employment in manufacture or transport).

Imposing this wages fund principle alters the character of the subsistence constraint, or at least makes its content more explicit and particular. Since population and the workforce are now determined, this constraint becomes

\[
X_{s} \geq (1/b_s)kN
\]

\[\text{FIGURE 2}\]

At least sufficient necessities must be produced to meet the subsistence requirements of the exogenously determined population. The diagrammatic representation of Cantillon's two principles also changes (Figure 2). While the land constraint is unaffected (I), the subsistence constraint becomes a given (minimum) quantity \(X_{s}\), which must be produced, irrespective of the magnitude of \(X_{s}\) (II). The system's aggregate outputs \(X_{a}, X_{p}\) must lie in the region ABC. If on AC, no excess of \(X_{a}\) over total social subsistence is produced, and land is not fully utilized in production of \(X_{a}, X_{p}\) (except at A). If on AB, land is fully utilized in production of \(X_{a}, X_{p}\) and a social surplus...
consisting of quantities of both the necessity and the luxury is produced (except at A). If on CB, only the necessity is produced, and land is not fully utilized in this purpose (except at B). Within ABC, landowners are consuming a social surplus of both commodities and land is not fully utilized in this production. To this construction may be added a third function (the employment constraint). Given the wages fund principle, the available workforce is determined and this imposes a third constraint upon the system’s output of \( X\), \( X_i \):

\[
a_X + a_X_i \leq m(b_i) \frac{kN}{a_i}
\]

(32)

\[
X_i \leq \frac{m(b_i) kN(a_i, c_i)}{a_i} - (a_i/a_i) X_i
\]

(33)

The labour allocated to production of \( X, X_i \) cannot exceed the available workforce, represented by function III in Figure 2.

Three further comments may be made upon the resulting complete construction. (i) Under our assumptions in an economically meaningful feasible region for \( X, X_i \) always exists. This is so because so long as the proportion of land allocated to subsistence (k) is less than unity, the intercept of II (\( kN/b_i \)) is always to the left of the \( X_i \)-axis intercept of both I (\( N/b_i \)) and III (\( m(a_i, c_i) kN/b_i \)), where \( m > a_i, c_i \) - see ineq. 25). The former relation simply means that surplus land is available by assumption; the latter relation, that surplus labour - in excess of that required to meet the subsistence consumption of nonworker population - is also available, and also by assumption. (ii) On the other hand, function I may be within or outside function III - and I may intersect III from above below.* To illustrate, in the simulation presented in Figure 2, the particular configuration of parameter values means that the workforce is incapable of being fully employed (efficiently) in production of \( X_i, X_i \) to the right of II, the employment constraint is entirely outside the land constraint. If labour is not to be idle, it must be employed in some other activity. (iii) While in this construction, via determinacy of population and employment, the quantity of social subsistence output has become determinate, aggregate outputs as a whole are as much indeterminate as in our earlier analysis (ineqs. 13-16; Figure 1). Necessary output is determinate but surplus outputs remain indeterminate, though (for \( X_i, X_i \)) constrained to ABC.

Finally, how is a rise in the real wage (necessary consumption per capita) to be interpreted in this model of Cantillon’s system? Suppose the real wage is given initially, at the value associated with III and feasible region ABC in Figure 2. Then the real wage rises. The land constraint (I) is unaffected - and, so long as the landowners decline collectively to change (increase) the proportion of society’s land devoted to production of subsistence (k), the subsistence constraint (II) is also unaffected. Hence, population and employment must decline, with III shifting to III* and the feasible region contracting to CDE. The landowners’ surplus consumption possibilities are reduced - and even if they were initially consuming a necessity/luxury combination within CDE (and choose to maintain this combination after c rises), the labour available for other surplus purposes will have declined. (Note that the particular configuration of parameter values represented in Figure 2 means that at the higher real wage, \( c_i^* \), III* lies entirely inside I; so that, so long as k is unchanged, the stock of land is incapable of being fully employed in production of \( X_i, X_i \) - even if the total

\[
a_i/a_i \leq b/b_i
\]

\[
a/b_i \leq a_i/b_i
\]

The relation between slopes depends upon the relation between labour-land ratios in the production of \( X_i \) and \( X_i \), respectively.

---

3. With respect to \( X_i \)-axis intercepts, since \( k \leq 1 \), and \( a_i, c_i \leq m \), then

\[
kN(b_i) \leq (N/b_i)
\]

\[
kN(b_i) \leq (m/a_i, c_i) kN/b_i
\]

On the other hand, since (\( m/a_i, c_i \) \( k \geq 1 \), then

\[
(m/a_i, c_i) k (N/b_i) \geq (N/b_i)
\]

With respect to slopes,
workforce is so employed: some land must be idle, or otherwise employed, perhaps without labour.

On the other hand, Brems's interpretation of Cantillon on real wages, mentioned at the beginning of this article, is different. His model in fact is Figure 1 (though he does not use this diagram), with two additional restrictions: landowners consume only the luxury; and land is fully employed in production of \( X_x, X_y \). The former restriction replaces ineq. (15) with eq. (18); the latter replaces ineq. (14) with

\[
X_x = (N/b_j) - (b_i/b_j)X_y \tag{34}
\]

Hence Cantillon's system is supposed to generate a unique equilibrium solution for aggregate outputs, given by the simultaneous solution of eqs. (18), (34). Diagrammatically, this is point A in Figure 1. If the same rise in the real wage as is presented in Figure 2 is applied to Figure 1, function II pivots downward around the origin to II* - and the supposed unique equilibrium shifts to A*. The impact on employment may be illustrated diagrammatically by an employment function wherein all labour is employed in production of \( X_x, X_y \):

\[
a_iX_i + a_jX_j = L \tag{35}
\]

\[
X_x = (L/a_j) - (a_i/a_j)X_y \tag{36}
\]

This shows the \( X_x, X_y \) combinations which can be produced with any given \( L \); or alternatively, as here, the employment associated with any particular \( X_x, X_y \). The relative positions of this function through points A and A* in Figure 1 indicate that L indeed has fallen with a rise in c, to \( c_1^* \), in Brems's interpretation (II to II*). But this result does not hold in general in his model, as will be seen in section 3 below. Before turning to resolve these matters, we present Cantillon in his own words.

2. Cantillon in His Own Words

4. See also the Appendix below. To facilitate comparison, symbols employed here and throughout are the same as those employed by Brems, in all possible cases. But Brems identifies population with employment, though in any case, adhering to Cantillon's doctrine that employment/population is endogenously determined.

The Essay opens with a portrayal of land ownership in any society as necessarily being limited to a relative few (E: 3-7; also 31, 46). Cantillon's fundamental class categories are landowners, hired labourers and entrepreneurs - the latter genus having as a leading species, farmers (E: 47-57). It is a recurring theme of the Essay that landowners constitute a uniquely 'independent' class, economically and socially. This independence is manifest in a variety of forms. For example, with respect to consumption propensities, landowners are...

...the principal Agent in the changes which may occur in demand. Labourers and Mechanicks who live from day to day change their mode of living only from necessity. If a few Farmers, Master Craftsmen or other Undertakers in easy circumstances vary their expense and consumption they always take as their model the Lords and Owners of the Land. They imitate them in their Clothing, Meals, and mode of life (E: 63; also 93, 97, 103).

For our purposes here, the most important dimension of this independence or autonomy is the capacity of the landowning class in large measure to freely determine the proportion of society's land devoted to production of subsistence for the population:

I ... lay it down as a principle that the Proprietors of Land alone are naturally independent in a State: that all the other Classes are dependent whether Undertakers or hired... (E: 57; also 43, 55). If a Lord or Owner who has let out all his lands to farm, take the fancy to change considerably his mode of living; if for instance he decreases the number of his domestic servants and increases the number of his Horses: not only will his Servants be forced to leave the Estate in question but also a proportionate number of Artisans and of Labourers who worked to maintain them. The portion of land which
was used to maintain these Inhabitants will be laid down to grass for
the new Horses, and if all Landowners in a State did the like they
would soon increase the number of Horses and diminish the number
of Men (E:68-69; also 47).
Hence the landowners’ consumption propensities, in regulating the
proportion of land available for subsistence, regulates population and
employment:

If the Proprietors of Land had at heart the increase of
Population, if they encouraged the Peasants to marry young and
bring up Children by promising to provide them with Subsistence,
devoting their Land entirely to that purpose, they would doubtless
increase the Population up to the point which the Land could
support [eq. (19) above, with k=1], according to the produce they
allotted for each person whether an Acre and a Half or Four to Five
Acres a head (b,c, in eq. (19)).

But if instead of that the Prince, or the Proprietors of Land,
cause the Land to be used for other purposes than the upkeep of the
People [k<1 in eq. (19)]; if by the Prices they offer in the Market for
produce and Merchandize they determine the Farmers to employ the
Land for other purposes than the Maintenance of Man ... the People
will necessarily diminish in number. Some will be forced to leave
the country for lack of employment, others not seeing the necessary
means of raising Children, will not marry or will only marry late ...
(E:73).
The more Horses there are in a State the less food will remain for
the People. The upkeep of Carriage horses, Hunters, or Chargers,
often takes three or four Acres of Land.

...[And] when the Nobility and Proprietors of Land draw from
Foreign Manufacturers their Cloths, Silks, Laces, etc. and pay for
them by sending to the Foreigner their native produce they diminish

extraordinarily the food of the People and increase that of Foreigners
... (E:75).
Also, the lower the quantity of land required to produce per capita
subsistence (b,c), the higher population:
The Increase of Population can be carried furthest in the
Countries where the people are content to live the most poorly and to
consume the least produce of the soil [c, lower]. In Countries where
all the Peasants and Labourers are accustomed to eat Meat and
drink Wine, Beer, etc. so many Inhabitants cannot be supported
(E:83).

It is ... a question outside of my subject whether it is better to
have a great multitude of Inhabitants, poor and badly provided, than
a smaller number, much more at their ease: a million who consume
the produce of 6 acres per head or 4 millions who live on the produce
of an Acre and a half [b,c, lower] (E:85).\footnote{7. The monarch, in effect, is the leading landowner - as well as (ultimately) commanding the tax revenues.}

These propositions and arguments by Cantillon add up to a clear
statement that available subsistence output is regulated by the quantity
(N) and quality (b,) of society’s land, together with exogenously given
landowners’ consumption propensities manifest in the proportion of land
left available for provision of the population’s subsistence (k). These
parameters then determine population and employment as negative
functions of subsistence per capita (c). Cantillon’s position is a clear form
of wages (or subsistence) fund doctrine. The qualification to the exogeneity
of k which was formally examined in the previous section (ineq. 31) is of

\footnote{8. For further discussion by Cantillon of the relations between population (employment),
land available to produce subsistence, and per capita subsistence consumption, see E:68-
85; 91; 92-93, 225-230.}

As for the use to which the Land should be put, the first
necessity is to employ part of it for the Maintenance and Food of those
who work upon it and make it productive: the rest depends principally upon the Humour and Fashion of Living of the Prince, the Lords, and the Owner: if these are fond of drink, vines must be cultivated; if they are fond of silks, mulberry-trees must be planted and silkworms raised, and moreover part of the Land must be employed to support those needed for these labours; if they delight in horses, pasture is needed, and so on (E:7; emphasis added; also 33-35, 59-61).

This is as well a clear enough statement of what, in section 1 above, was called the subsistence constraint - with the indirect land (and implicitly, labour) requirements taken into account. Finally, given the determination of population, Cantillon treats the labour force as a given proportion of population (m in eq. 21 above), determined by demographic and socio-economic factors:

It may be assumed that a good third of the People of a State are too young or too old for daily work and that another sixth are Proprietors of Land, Sick, or Undertakers of different sorts who do not by the Labour of their hands, contribute to the different needs of Men. That makes half the People without work, or at least without the work in question (E:87).

However there remains a serious conceptual problem with regard to Cantillon's theory of employment. On the one hand, Cantillon proposes a mechanism running from land available to produce subsistence, to population and employment, as shown above. On the other, he also argues that labour supply adjusts to labour demand (similar to the adjustment of commodity supply to commodity demand in Cantillon):

*The Number of Labourers, Handicraftsmen and others, who work in a State is naturally proportioned to the Demand for them.*

If all the Labourers in a Village breed up several Sons to the same work there will be too many Labourers to cultivate the Lands belonging to the Village, and the surplus Adults must go to seek a livelihood elsewhere, which they generally do in Cities: if some remain with their Fathers, as they will not all find sufficient employment they will live in great poverty and will not marry for lack of means to bring up children, or if they marry, the children who come will soon die of starvation with their Parents, as we see every day in France (E:23).

...[When labourers and handicraftsmen] have no work they quit the Villages, Towns or Cities where they live in such numbers that those who remain are always proportioned to the employment which suffices to maintain them; when there is a continuous increase of work there is gain to be made and enough others arrive to share in it (E:25; also 53).

The difficulty is that these two principles do not appear to be reconciled by Cantillon. The obstacles to doing so can be seen via a thought experiment. Suppose the system given by equations and inequalities (19) to (31) above is initially in equilibrium - such that output demands and supplies, employment and labour available, are in balance (at some point in region ABC of Figure 2) - and then is subjected to a rise in subsistence per capita. With m, b, k, N given, population and employment fall; but since the quantity of subsistence output produced is unchanged, so too is the quantity of labour devoted to subsistence production (L_s). It follows that the quantity of labour available for use in the sum of all other activities (L - L_s) falls. In the absence of labour unemployment (as implied by the above adjustment process of labour supply to labour demand) - or migration (E:163-65) - the scale and composition of non-subsistence production somehow has to adjust; which appears quite inconsistent with the apparent autonomy of landowners' demand for surplus outputs and labour.

### 3. A (Partial) Resolution: the Significance of Land Utilization

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9. It may be noted here that for Cantillon subsistence is both customary (conventional) and multiple, differing for different categories of labour (E:35-43, 67-71, 77-85).
The tension, if not contradiction, which requires resolution is this:
How - at one and the same time - is employment to be determined by
• the 'land fund' made available for provision of social subsistence (in
effect, L determined by k, given b, c, m, N); and
• by labour demand, in a manner similar to that in which commodity
outputs are supposed to be determined by commodity demands?
Before presenting our own reconciliation, Brems's overall interpretation -
and implicit resolution of this issue - may briefly be explained and made
explicit.

Brems's model (validly) generates a result, that the relation between
the real wage and aggregate employment is ambiguous, depending upon
the relation between labour-land ratios in the production of the necessity
and the luxury respectively (a/b, a/b). If this model were true to
Cantillon's intentions, it then would show that his wages fund doctrine and
inverse relation between wages and employment do not follow from his
economics. In the illustration of Brems's interpretation already discussed
(section 1, Figure 1) a rise of c, does lead to a fall in L. But this is only
because that illustration assumes that the luxury is relatively labour
-intensive (a/b < a/b). Diagrammatically, this is embodied in the fact that
the employment function (III) is flatter than the land constraint; so that a
shift along the land constraint, from A to A*, must shift III towards the
origin. In the instance of the Brems model illustrated in Figure 3 - with
the necessity assumed labour-intensive (a/b > a/b) - a rise of c, shifts the
equilibrium similarly from A to A* but employment rises. The fact that the
employment function is steeper than the land constraint means that this
shift must shift the former away from the origin (IIIB to IIIB*). The
economic logic behind this ambiguous relation between c, and L can be
stated fairly straightforwardly, in four steps. Recall that in Brems's
conception of Cantillon's system, N is fully employed in production of X, X,
labourers consume only the necessity, and landowners consume only the
luxury - hence the unique equilibrium at the intersection of I and II. A rise
of c, first, causes the real rate of rents (n/P, in eq. 11 above) to fall.
Second, with all land rented, the purchasing power of aggregate rents - and
so, demand and output of the luxury - decline. Third, the composition of
the equilibrium output of fully employed land shifts away from the luxury
and in favour of the necessity (as is evident diagrammatically in both
Figures 1 and 3). Will this reduce or increase employment? This is the
fourth and quite intuitive step: if the luxury is labour-intensive, L will fall
(Figure 1); if the necessity is labour-intensive, L will rise (Figure 3). At
this point it may simply be added that in Brems's interpretation, the
proportion of land allocated to social subsistence (k) is the antithesis of an
exogenous variable under the control of the landowning class (subject to
constraints). It is strictly endogenously determined:

\[ \text{FIGURE 3} \]
\[ a/b > a/b (a/a > b/b) \]

10. The case of (a/b) equals (a/b) may be excluded on the basis that it is incompatible
with the necessity and luxury being distinct commodities. Combining land and labour in
the same proportions (and over the same time period) and producing qualitatively
different commodities (also in general different in quantity) is an absurdity. Note also that
in Brems's model, if it were allowed that labourers' subsistence included commodity 2
and landowners' consumption demand included commodity 1, the ambiguity would merely be
compounded. In our model, since landowners are allowed to consume the necessity, as
part of the surplus produced, this commodity is subsistence in one role and surplus in
another.
\[ k = b \frac{X_i}{N} \]  
(37)

and \( X_i \) is fully determined by the four production coefficients and \( c_i \). A rise of \( c_i \) necessarily increases equilibrium \( X_i \), and therefore increases \( k \) (though Brens does not make the \( k \) parameter explicit in his model).\(^{11}\)

All the formal constructions, in section 1 and here, have been merely groundwork for now addressing this fundamental issue of textual interpretation. Figure 3 also restates our interpretation of Cantillon: functions I, II A and III A, with a feasible region for \( X_i, X_j \) bounded by the \( X_i \)-axis, I and III A. To clarify the conditions under which labour supply adjusting to equality with labour demand, can be reconciled with the wages fund principle (and associated exogenous labour supply) in this framework, consider first Cantillon’s characterization of a command economy. This arises in a remarkable passage in the *Essai* in which Cantillon, by way of a thought experiment, postulates the possible equivalence of distributive and allocative outcomes by command and by market exchange:

If the Owner of a large Estate (which I wish to consider here as if there were no other in the world) has it cultivated himself he will follow his Fancy in the use to which he will put it. ...

Let us now suppose that to avoid so much care and trouble he makes a bargain with the Overseers of the Labourers, gives them Farms ... and leaves to them the responsibility for maintaining in the usual manner all the Labourers they supervise ... [Suppose further that the Owner ... fixes a common measure, like silver, to settle the price at which the Farmers will supply ... wool and ... [Master-Craftsmen] will supply ... cloth [and so on] ... We suppose then that after this change [to market exchange] all the people on this large Estate live just as they did before, and so all the portions

11. The proportion of available land allocated to subsistence has a slightly different meaning in Brens’s construction and in ours: the former effectively draws no distinction between workforce and population (in our terms, \( m = 1 \), implicitly).

and Farms of this great Estate will be put to the same use as it formerly was (E:59-61).

In the case of one monolithic landowner in command of the entire economy, the reconciliation of Cantillon’s two principles is not difficult. Under such conditions, with \( c_i \) given, the single landowner’s decision to allocate land to social subsistence (determining \( k \)), and the single landowner’s decision to demand a particular surplus of \( X_i, X_j \) plus land and labour devoted to other activities, are united in one and the same decision. The wages (or population) fund is codetermined with demand for \( (X_i - c, P), X_i, \) and \( (N - (b, X_i + b, X_j), (N - (a, X_i + a, X_j)) \) for other surplus uses. To illustrate, suppose the monolithic landowner has chosen point B in Figure 3. Then period after period, the following will occur. Landowner demands a surplus of (90, 30) units of \((X_i, X_j)\). This demand is given effect by allocating 360 units of available land (0.36 x 1,000) to production of social subsistence, the resulting 120 units of \( X_i \) being associated with reproduction of a population of 600 (120/0.2) and workforce of 348 (0.58 x 600). Two hundred and ten labourers (1 x 210) and 630 units of land (3 x 210) are allocated to production of 210 units of \( X_i \) (120 subsistence, 90 surplus); 30 labourers (1 x 30) and 300 units of land (10 x 30), to production of 30 units of \( X_j \) surplus. The induced demand for subsistence by the workforce and larger population is satisfied, and there remain 108 workers and 70 units of land for other surplus activities. This third class of activities, ‘other surplus activities’ - when labour-utilizing, with or without direct land input - may generically be described as ‘retainers’ of the landowner; e.g., servants-in-waiting, gardeners, game-keepers, militia, and so on. When such activities are land-utilizing without labour input, they may generically be described as ‘wilderness’. The latter may alternatively be named ‘idleness’.\(^{12}\)

12. In the context here, it would be merely semantic to enquire whether or not idleness is an activity. As long as there are at least two distinct activities within the third class, involving distinct labour-land ratios, there is always some combination of such activities which ‘fully employs’ available land and labour. To take a simple example, suppose one unit of wilderness output requires simply one unit of land so allocated; and one unit of servant output requires simply one labourer so allocated; and that these two are the only outputs in the third class. Then output of 70 units of wilderness and 108 servants will satisfy full ‘employment’ of all land and labour. Codetermine with the landowner’s
What then happens in the command case when real wages rise?
Even given the degrees of freedom open to the landowner in our formulation of Cantillon's system, what is certain is that the landowner's consumption possibilities are reduced. So long as \( k \) remains unchanged, the quantity of surplus labour available necessarily falls; if \( k \) rises in reaction, the quantity of surplus land available falls. It follows that the landowner must react in some manner to a rise of \( c_r \). In the illustration in Figure 3, with a rise of \( c_r \) to \( c_r^* \), the surplus of \( X_r \) associated with point B ceases to be feasible, so long as \( k \) is unchanged. The constraints have so tightened (to the area bounded by the \( X_r \)-axis, IIA and IIA*, given \( k \)) that \( X_r \) must adjust. While a rise in \( k \) offers some measure of an alternative by restoring surplus labour - though at the cost of reducing surplus land available (side Appendix below) - Cantillon never explicitly entertains this possibility; indeed, he does not address the necessity for landowners to react to a higher \( c_r \) at all. In this instance, Cantillon's notion of the landowners' autonomy may have blinded him to a significant issue arising out of his economics. The only escape from this particular textual difficulty seems to be to suppose that the third class of activities constitutes a kind of residual activity, concerning which landowners are more or less indifferent - and that rises of \( c_r \) do no more than reduce the residual labour in this sector. That is to say, rises of \( c_r \) are not so drastic as to render the initial \( X_r \), \( X_r \) surplus nonviable; and therefore, may be met, with \( k \) unchanged, by reductions in 'retainers' - a kind of 'unlimited supplies of retainers' argument, a reduction in whose number can absorb the shock of a higher real wage. (For visual purposes the simulation in Figure 3 involves a huge rise of \( c_r \)). But it must be stressed that Cantillon never puts such an argument: this is simply offered as an explicit (though speculative) rationale for making sense of what his text does not do.\(^{13}\) Nevertheless, in

\[ \text{demand for a surplus of} \ (X_r, \ X_r, \ \text{servants}) \ \text{of} \ (90, 30, 70, 105), \ \text{is an allocation of} \ 36 \text{ percent} \ (k) \ \text{of land to social subsistence.} \]

\(^{13}\) On the other hand, Cantillon's characterization of the response of \( L_r \) to a change in \( k \) given \( c_r \), is entirely unproblematic in the command economy case. If, for example, the

his discussion of the quantity of surplus labour available in France Cantillon certainly makes it appear to be a residual for which useful activities have to be found (Es:87-96); for example:

If enough employment cannot be found to occupy the 25 (surplus) persons in a hundred upon work useful and profitable to the State, I see no objection to encouraging employment which serves only for amusement or ornament. ... How little soever the labour of a Man supplies ornament or even amusement in a State it is worth while to encourage it unless the Man can find a way to employ himself usefully (Es:91-93).

This discussion has a definite undertone of the retainers of the landowning class being understood as residual 'employment' which establishes a tendency to full labour 'employment' (i.e., 'underemployment').

Whatever minor difficulties may exist for the wages fund principle and real wage changes in the command economy case, the difficulties seriously deepen when one considers the market exchange economy case.\(^{14}\)

Now, the reconciliation of the wages fund principle with balancing of supplies and demands, requires some mechanism for ensuring that the proportion of total land which is marketed for rent by the landowners will actually be demanded, under conditions of decentralized exchange.

Cantillon offers no such account of land supply and demand equilibration in exchange, simultaneous with equilibration of commodity and labour demands and supplies. One can pose the issue in hypothetico-deductive form: if, following a rise of \( c_r \); (i) \( k \) can remain invariant; and (ii) demands and supplies, including for marketed land, can re-equilibrate; then the

\(^{14}\) Land remaining available after production of \( X_r \), \( X_r \) of 130,30 rises to 310 units; labour remaining available falls to 14 labourers.
wages fund principle can be applied to a decentralized market economy. Both ifs are dubious in Cantillon's system. While in the command case, the landowner's autonomy with regard to demand for output and k, following a change in \( c_i \), can be preserved albeit with changed constraints; in the market case, the capacity of the landowners to maintain \( k \) invariant as \( c_i \) changes is not at all evident, since at least part of available land (the part which is rented) is beyond their direct control as to the uses to which it is put. Apart from land not rented, their only control then over land utilization is via their market demands for outputs indirectly influencing land utilization. But in the absence of any determinate account of aggregate real rents (i.e., landowners' aggregate market income) - due to the absence of determinate theories of aggregate market outputs as a whole and the aggregate quantity of land rented - these landowner demands are indeterminate. Furthermore, as eq. (11) attests, given any quantity of land rented, a rise of \( c_i \) will reduce aggregate real rents realized (vide Appendix below), and thereby, the influence of landowners upon market demands. In short, in the market economy case Cantillon has no theory for determining where the system is within the stated constraints, before or after a change in \( c_i \), - and it is not even clear that \( k \) (which enters two of the constraints) is under the control of the landowners collectively.

The ambiguous relation between employment and real subsistence wages which arises in Brems's model does not arise in the genuine Cantillon system for a deeper reason than that which is proposed by Brems.\(^{15}\) Beyond the determination of the level of subsistence output along the lines indicated above, Cantillon has no theory of the determination of the aggregate outputs of the economic system as a whole - unless one regards his appeals to the consumption propensities of landowners as such a theory; which would be far too generous an exegesis of the textual evidence quoted and cited in section 2. In addition, Cantillon has no
determination of the level of aggregate real rents for the economic system as a whole. The real rate of rents per unit of land is determinate; but to get from this to aggregate real rents requires a determination of the aggregate quantity of land (or the proportion of total available land) in rent-generating use.\(^{16}\) No such theory is to be found in the Essai; and certainly not the particular proposition which Brems imputes to Cantillon: that total available land is fully employed in rent-generating activity. Cantillon explicitly refers to land which does not generate rents (E:7, 59-61, 63-65) - and this is not surprising. In the kind of social economy theorized by Cantillon, the extent of vertical integration (versus decentralized production with market exchange) is far greater than in later and modern times. Furthermore, at equilibrium prices,\(^{17}\) whether a landowner rents a unit of land and spends the resulting proceeds - or directly employs it to produce some combination of commodities (at the same time providing the required labour with its subsistence); or chooses some combination of these two options - the landowner's consumption possibilities will be identical. Indeed, the real significance of Cantillon's 'land theory of value' is just this equivalence. (See the Appendix below.) The only substantive and clear conception of a determinate magnitude of output is for a subsystem of outputs as a whole - the subsistence fund, in the mechanism running from land available (kN) to population and employment via \( b_i, c_i, m_\).

Hence Cantillon is indeed right that the same consumption possibilities can be achieved by 'command' in the allocation of land - or by market exchange, if the total quantity of land indeed can be rented via the

\(^{15}\) 'Perhaps Cantillon took for granted that necessitie would always have a lower labour intensity than luxuries' (Brems 1966:48).

\(^{16}\) Cantillon also speaks of a determinate magnitude of rents as a share of agricultural produce (E:45-46, 47-49, 121-23), albeit merely in terms of a numerical convention or norm; but in any case, to get from this to aggregate rents requires a determination of the aggregate (value of) output produced on rent generating land, which is also lacking.

\(^{17}\) See equations (6), (9) and (11) above. These are a formal representation of Cantillon's 'intrinsic values' (E:27-43). This Brems characterization of distribution and value in Cantillon's system is unobjectionable save for the qualification that it abstracts from entrepreneurial incomes, produced means of production, and manufacture (production without direct land input). But no great violence is done by abstracting from them here.
market." If the latter could be plausibly argued, then no problems would exist for Cantillon’s account of allocation in his market economy, beyond those already considered in the command case. But Cantillon failed to provide just that bridge between nonmarket and decentralized economies. While the allocation of land via command by a single landowner, requires no very substantial economic theory; the full employment of the quantity of land supplied to market in return for rent via decentralized market exchange certainly does (not least, with respect to its relation with demands for marketed outputs). Cantillon provides no such theory. Cantillon’s thought experiment itself, as well as his wider economics, provides powerful testimony to the fact that in Cantillon’s world, exchange via the intermediation of markets and entrepreneurs was pervasive and expanding - and Cantillon has no substantive explanation for the determination of demands and outputs as a whole in such decentralized market systems.

4. Conclusion

Exercises in retrospective formalization of earlier theoretical systems which were not originally so constructed, need to be handled with care and caution. There are quicksands of error and triteness. One may, as a result of fascination with the resulting model itself, be drawn away from attention to the writer one is supposed to be seeking to engage with. Furthermore there is the danger of ‘over-theorizing’ the writer, so to speak: rational reconstruction which unwittingly goes beyond not only the execution, but also the intention, of the writer. The difficulties and dangers may be compounded when it is a contradiction in thought which one is seeking to grasp - and the contradictions in earlier economic theory are sometimes the most interesting and illuminating aspects. (This is best exemplified in Cantillon’s text by the status and function of entrepreneurship, and more particularly, financial capital. Vide Aspromourgos 1995: Ch. 7.3.) On the other hand, formalization of earlier informal systems of economic thought can assist in clarifying their content, meaning and significance. On the issue under consideration above - Cantillon on real wages and employment - the models of both Brems and the present writer are highly simplified attempts to capture some central arguments of Cantillon, abstracting from a vast amount of the achievement and rich detail of the Essai. But it is by that textual evidence that they must be judged. Brems’s argument in a nutshell is that Cantillon has a theory of real wages and employment, and a theory of real wages and outputs; and that the former is inconsistent with the latter. Our argument is that there is abundant textual evidence for the former, but negligible evidence of a theory of outputs as a whole in the Essai; so that Cantillon must be interpreted either - as failing to reconcile his determination of employment with a determination of outputs in a market economy, or as treating surplus employment as a residual.

18. It may occur to the reader (correctly) that if command and market exchange can produce identical economic outcomes, then there is no reason for market exchange to occur at all. The way to escaping this unsatisfactory result in relation to Cantillon’s economics is to recall the specialist functions of entrepreneurs. For example, the rationale for renting land would be that, relative to landowners, farmer-entrepreneurs have a comparative advantage in superintending production, which may make lease/rent exchanges mutually advantageous. Obviously this requires introduction of a distinct category of entrepreneurial incomes.
References


APPENDIX

At the beginning of section 3 above a quite complete but informal statement of Brems’s model is presented. A fuller and more formal statement is added here, though not in the manner in which Brems presents it.

Since by assumption all land is fully employed in production of $X_1$, $X_2$, equilibrium values of these only two outputs must conform to

\[ N = b_1X_1 + b_2X_2 \]  \hspace{1cm} (A1)

Employment is determined by

\[ L = a_1X_1 + a_2X_2 \]  \hspace{1cm} (A2)

Since, also by assumption, labourers consume only commodity 1, landowners consume only commodity 2, and labourers’ subsistence must be satisfied; equilibrium outputs must also conform to

\[ X_1 = c_1 L \]

\[ = c_1 (a_1X_1 + a_2X_2) \]

\[ X_2 = \frac{[a_2c_1]}{(1-a_1c_1)} X_1 \]  \hspace{1cm} (A3)

Substituting (18) into (A1) and rearranging:

\[ X_1 = \frac{[1-(1-a_1c_1)]}{D} N \]  \hspace{1cm} (A3)

\[ D = [b_1 + b_2c_1(\frac{a_2}{b_1} - \frac{a_1}{b_1})] > 0 \]  \hspace{1cm} (A4)

\[ c_1 < \frac{1}{a_1} \]  \hspace{1cm} (12)

where the term in square brackets in (A3) is just $n/P_1$ (see eq.11), fully determined by the production coefficients and $c_1$. This is what one would expect: if all rents are spent on commodity 2, land is fully employed, and labourers don’t consume commodity 2; then equilibrium $X_1$ will equal the relevant real rate of rents times available land.

Since $n/P_1$ is a negative function of $c_1$ (more on this below), equilibrium $X_1$ will be a negative function of $c_1$, also:

\[ \frac{\partial X_1}{\partial c_1} = \partial \left( \frac{n}{P_1} \right) / \partial c_1 \]  \hspace{1cm} (A5)

\[ = -a_1b_2N/D^2 \]  \hspace{1cm} (A6)
It follows from (A6) with (A1), that equilibrium $X_i$ rises as equilibrium $X_i$ falls with rising $c_s$. (It follows also, that for any given quantity of land, the real aggregate rents received will fall as $c_s$ rises.) From (A2), (18) and (A3):
\[ L = (a/D)N \]
\[ \frac{\partial L}{\partial c_s} = -a b_1 b_2 N (a/b_1) - (a/b_1)/D' \]
which is positive or negative depending upon whether $a/b_1 > a/b_2$.

Perhaps the least intuitive element of these results is the inverse relationship between $n/P_s$ and $c_s$. The relation between the real rate of rents measured in commodity 1 and $c_s$ is straightforward:
\[ n/P_s = (1 - a,c_s) (1/b_1) \]
\[ \frac{\partial}{\partial c_s} (n/P_s) = -a/b_1 \]
\[ k = b_1 X_s / N = a b_1 c_s / D \]
\[ \frac{\partial k}{\partial c_s} = a b_1 b_2 / D' \]
The first term on the RHS of (6) is the surplus of commodity 1 arising from production of one gross unit; the second, the quantity of land required to produce one gross unit. As $c_s$ rises the surplus falls and with it, the rate of rents in accordance with $a/b_1$. The real rate of rents measured in commodity 2 may be expressed as
\[ n/P_s = (n/P_s) (P/P_s) \]
and
\[ \frac{\partial (n/P_s)}{\partial c_s} = (P/P_s) \frac{\partial (n/P_s)}{\partial c_s} + (n/P_s) \frac{\partial (P/P_s)}{\partial c_s} \]
The first term on the RHS of (A11) is necessarily negative. If the entire expression on the RHS is to be necessarily negative, then the second term on the RHS must be negative - or, if positive, less than the absolute magnitude of the first term. In fact, the second term may be negative or positive:
\[ P/P_s = b'/D \]
\[ \frac{\partial (P/P_s)}{\partial c_s} = -b_1 b_2 (a/b_1) - (a/b_1)/D' \]
If commodity 1 is relatively labour intensive $(a/b_1 > a/b_2)$, a rise in the real wage raises the relative price of commodity 1 in terms of commodity 2 - and vice versa. From (6), (A9), (A10), (A11), (9) and (A12), in the case of $a/b_1 > a/b_2$, a negative relation between $n/P_s$ and $c_s$ requires that
\[ (b'/D) (a/b_1) > -(1-a,c_s) (b_1/b_2) (a/b_1) - (a/b_1)/D' \]
which reduces to
\[ -a/b_1 < 0 \]
a condition guaranteed by assumption. The relative price effect (possible upward movement of $P_s/P_s$) cannot offset the decline of $n/P_s$, in response to rising $c_s$.

Also in relation to Brem's model, it is asserted in the second paragraph of section 3 that the proportion of land allocated to production of subsistence is strictly endogenously determined by technology and the real wage. From (18) and (A3),
\[ k = b_1 X_s / N = a b_1 c_s / D \]
\[ \frac{\partial k}{\partial c_s} = a b_1 b_2 / D' \]
A rise of $c_s$ necessarily increases $k$ because $X_s$ necessarily increases. Hence in this framework the real wages 'fund' ($X_s$) is not really a fund at all, and its elasticity with respect to $c_s$ is given by
\[ \frac{\partial (X_s)}{\partial c_s} (c_s/X_s) = b_1/D \]
This elasticity will be greater (less) than unity - and hence $L$ will increase (decrease) with an increase of $c_s$ - when $a/b_1$ is greater (less) than $a/b_2$; which confirms (A8).

In the fourth paragraph of section 3 it is asserted that a rise of $c_s$ necessarily reduces landowner consumption possibilities. An unambiguous reduction in landowner consumption possibilities is synonymous with an unambiguous reduction in available quantities of surplus labour and surplus land. This ambiguous reduction certainly holds if $k$ is invariant to rises of $c_s$. However, though Cantillon never entertains the prospect of $k$ reacting (upwards) to a rise of $c_s$, it may be inquired whether this could lead to an ambiguous change in landowner consumption possibilities.
Surplus land is a straightforward negative function \((1-k)N\) of \(k\). Surplus labour is given by
\[
I_s = L - I_n = (m-a,c) \cdot (kN/bc) \tag{28}
\]
The total differential of \(I_s\) with respect to \(c\), and \(k\) is
\[
dI_s = (m-a,c) \cdot (N/bc) \cdot dk - \frac{1}{mkN/bc} \cdot dk\tag{A16}
\]
This will be greater than zero - and so, it will be possible for \(I_s\) to rise via a reaction of \(k\) to a rise of \(c\), - if
\[
\frac{dk}{dc} > \frac{mk}{c} (m-a,c) \tag{A17}
\]
Alternatively stated as an elasticity, it will be possible for \(I_s\) to rise if
\[
\frac{dk}{dc} \cdot \frac{c}{k} > \frac{m}{m-a,c} \tag{A18}
\]
There are logically possible configurations of \(a, c, k, m\) which are consistent with this - though subject to \(k \leq 1\) and \(c < m/a\). In these circumstances - with surplus labour rising and surplus land falling via a \(k\) reaction to a rise of \(c\) - an unambiguous contraction in the set of landowner consumption possibilities cannot be guaranteed.

In the last paragraph of section 3 it is asserted that if total available land can be rented via market exchange, then the landowners' consumption possibilities from earning rents are identical to their consumption possibilities from producing directly by command. In fact, since constant returns to scale in production are assumed, what is true for \(N\) units of land will be true for any proportion of \(N\). A unit of rented land generates \(n\) units of revenue which may be spent purchasing quantities of commodities 1 and 2 \((X_1^*, X_2^*)\) as follows:
\[
n = P_2X_1^* + P_2X_2^* \tag{A19}
\]
\[
X_1^* = \left(\frac{n}{P_1}\right) - \left(\frac{P_2}{P_1}\right)X_1^* \tag{A20}
\]
Substituting (6), (9) and (10) into (A20):
\[
X_1^* = \left(1 - a, c, b_1 b_2\right) \cdot \left(\frac{D}{b_1}\right) X_2^* \tag{A21}
\]
If instead, a unit of land is directly employed by a landowner, the gross outputs of commodities 1 and 2 producible \((X_1^{\prime}, X_2^{\prime})\) are given by
\[
l = b_1 X_1^{\prime} + b_2 X_2^{\prime} \tag{A22}
\]
\[
X_1^{\prime} = \left(1 - b_1 X_2^{\prime}\right) / b_1 \tag{A23}
\]
The feasible surpluses, or net products \((X_1^*, X_2^*)\) - i.e., the landowner's consumption possibilities - are given by deducting the necessary consumption of the landowner's labourforce from gross output:
\[
X_1^* = X_1^{\prime} - c, L \tag{A24}
\]
\[
= X_1^{\prime} - c_1(a, X_1^{\prime} + a_2X_2^{\prime})
\]
Substituting (A23) into (A24) and rearranging:
\[
X_1^* = \left(1 - a, c_b, c_1 / b_1\right) - \left(D / b_2\right) X_2^* \tag{A25}
\]
where \(D/b_1\) equals \(P_2/P_1\) (see eq. 9 above). The set of feasible \(X_1^*, X_2^*\) combinations in (A25) is identical to the set of \(X_1^*, X_2^*\) combinations in (A21). Reading from left to right these identical expressions state: the feasible surplus consumption of commodity 1 \((X_1^* - X_1^*)\), equals the real rate of rents expressed in commodity 1 (the physical surplus of commodity 1 per unit of land so employed - see eq. 6), minus the relative price of commodity 2 in terms of commodity 1 times surplus consumption of commodity 2 \((X_2^* - X_2^*)\). This 'equivalence theorem' captures the real significance of Cantillon's so-called 'land theory of value' (see, e.g., Brems 1978; Brewer 1988; cf. Aspromourgos 1995: Ch. 6) - a significance which has been missed, perhaps because of an over-fascination with the formal properties of Cantillon's value theory, at the cost of neglecting its economic substance. This theory means that relative prices of commodities equal the ratios of quantities of land directly and indirectly required to produce them - under conditions that (homogeneous) land is the only primary input and prices equal production costs (zero profits). Under these conditions, relative prices equal the (constant) rate at which one commodity can be 'transformed' into another by reallocating land from production of the former to production of the latter - but in net terms (the slope of the net or surplus 'production possibilities curve', so to speak). (This remains true if more than two commodities are treated.) The equivalence theorem and the land theory of value are one and the same principle.
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