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Studies of Thunen in Japan

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(1)

No one can deny the important contributions made by Johann Heinrich von Thünen (1783 - 1850) as an independent discoverer of the marginal productivity theory and as the father of the economics of space. Commemorating the two hundredth anniversary of his birth, Samuelson (1983) analyzed these contributions beautifully and skillfully. Thünen is also known by the formula of natural wage inscribed on his grave stone. Interest on this formula was revived by the recent discussions between Samuelson (1983), Dorfman (1986) and Samuelson (1986). Both Samuelson and Dorfman, along with some others, seem to consider that Thünen's natural wage is the socially optimal wage from the point of view of welfare economics.[1]

Studies of Thünen in Japan has a very long history, longer than in English speaking world.[2] Pioneering and still major contributions are Kondo (1928) and Yamada (1934). Both of them interpreted that Thünen's natural wage should be the competitive equilibrium wage in a long-run stationary economy. From such a point of view, they criticized Thünen and offered suggestions on what Thünen should have done to derive his formula correctly. Unfortunately, however, these suggestions have been left undeveloped and no formal models have been constructed to vindicate Thunen.

In section (2) and (3), we briefly review Samuelson (1983, 1986),

Dorfman (1986), Kondo (1928) and Yamada (1934). Section (4) is devoted

to some quotations from Thünen's <u>Der isolirte Staat</u> (the isolated

state), which may indicate the possilibity of an interpretation of

Thünen's theory of the natural wage, suggested by Kondo and Yamada, and

different from that of Samuelson, Dorfman and some others. A simple

model based on this interpretation is given, then, in sections (5), (6),

and (7) to derive Thünen's formula of the natural wage.

(2)

Thünen derived his formula of natural wage from the maximization of

zy, where z is the rate of interest any y is the annual surplus of each

working family, which is converted into capital. If $\underline{a}$ denotes the

subsistence amount of consumers' goods (which we take as numeraire),

the annual wage of a family is a + y. Assuming that one unit of labor

(supplied annually by a working family) is necessary to produce one

unit of capital which does not depreciate, z can be written as

(1) $z = [p - (a + y)]/q(a + y)$

where p denotes the annual product of the consumers' goods for a working

family assisted by q units of capital. If p, q and $\underline{a}$ are considered as

constatns, then, the maximization of zy with respect to y requires the

condition that $(a + y)^2 = ap$. In words, the natural wage is the

geometric mean between the necessary subsistence $\underline{a}$ and the average

product of a working family.[3]

Samuelson (1983) strongly argued against the assumption of the

constant q. If the rate of wage is higher, q and therefore p should be

larger.[4] Assuming that the production function of consumers' goods is

homogeneous of degree one with respect to labor and capital inputs, and

denoting that $p = f(q)$, $f' > 0$, $f'' < 0$, we have

(2) $a + y = f(q) - q f'(q)$

where f' denotes the marginal productivity of capital and annual rent

for a unit of capital. From (1) and (2),

(3) $z = f'(q)/(a + y)$,

and

(4) $zy = f'(q) - a f'(q)/(f(q) - q f'(q))$.

Both Samuelson (1983) and Dorfman (1986) insisted that Thünen should

have maximized (4) with respect to q, and Dorfman (1986) found that it

also requires the condition that $(y + a)^2 = ap$.

Dorfman (1986) found, however, that the social welfare function zy

that Thünen invoked to derive his formula uncongenial. Dorfman called

it a peculiar welfare function which he cannot defend. The maximization

of zy is called by Samuelson (1983) a crime against both normative

and positivistic economics. In Samuelson (1986) it is suggested that

Thünen had to consider, for example, an alternative welfare economics

exercise in which all workers' surplus of wages over their a of consumption

is one time saved and we seek the society's q that maximizes society's

increment of perpetual flow of consumers' goods that results. Even

then, however, the question remains is that there is no reason why all

the surplus of wage over subsistence should be saved, as was rightly

pointed out by Samuelson and Niehans (1987). Samuelson (1986) concluded

the discussion with Dorfman that Thünen added to his important positivistic

theory (spatial equilibrium and marginal productivity) a rather strange

normative discussion.

We may conclude, therefore, that both Samuelson and Dorfman considered

Thünen's zy as a social welfare function and Thünen's natural wage as

the optimal wage.[5]   It is evident that zy is very peculiar as a social

welfare function and that the socially optimal wage cannot be the

geometric mean of p and _a_ if it is replaced by an alternative, more

plausible social welfare function, as was done by Samuelson (1986). The

question remains, however, is whether the natural wage Thünen was grouping

for is such an optimal wage and whether there cannot be a room for an

alternative interpretation in this respect.

(3)

Studies of Thünen in Japan were pioneered by Yasuo Kondo (in 1928)

and Yuzo Yamada (in 1934). Both Kondo and Yamada did their studies of

Thünen in their youth. Kondo became a professor of agricultural economics

at the University of Tokyo, made important contributions to agricultural

economics, and had a great influence on the development of agricultural

policies in Japan. As a professor of economics at Hitotsubashi University,

Yamada contributed widely to economic theory, economic planning and the

history of economics, made a pioneering contribution in the estimation

of national income in Japan, and also had a great influence on the

development of welfare policies in Japan. It is interesting to see

that both Kondo and Yamada started their academic careers by careful

studies of Thünen's marginal productivity theory.

Kondo interpreted von Thünen's natural wage as the competitive equilibrium

wage in a stationary state, which is achieved through competition after

forces of demand and supply have worked out. According to Kondo, Thünen's

theory is a theory of the rational behavior of private farms in a competitive

situation. In part 1 of Thünen's Isolated State, entrepreneurs-landowners

organize farms optimally, with respect to the choice of crops and the

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intensity of cultivation, so as to maximize land rent or net revenue,
when prices of products are given. Similarly, argued Kondo, in part 2
of the Isolated State, entrepreneurs (capital-producing workers) organize
farms optimally (with respect to the capital-labor ratio q) so as to
maximize rent for capital, when prices and the rate of wage of hired
workers are given and there is no land-rent. Kondo criticiaed von Thünen
that the latter should not try to explain the rate of wage in his theory
of rational behavior of entrepreneurs-farmers, since under competitive
conditions they have to take the rate of wage as given.[6]

Samuelson (1983) felt odd at von Thünen's assumption that the prime
source of saving is workers' wages. Yamada emphasized, however, that
Thünen considered such a hypothetical unrealistic case to see the effects
of workers' saving on wages and interest, since he recognized that in
reality the saving is monopolized by capitalists so that interest is
high and wages are low. Admitting the conclusion of Kondo, Yamada argued
that (natural) wage and interest rate should be determined by the
macroscopic equilibrium condition of saving (supply of the surplus)
and investment (consumption of the surplus). According to Yamada, the
marginal productivity theory explains merely the demand for labor. To
determine the natural wage, therefore, we must also explain the supply
side, taking into consideration the relations between subsistence consumption
and the surplus, and between saving and investment of a whole economy.
Though Thünen tried it, Yamada concluded, the result was quite unsatisfactory,
since his assumptions were wrong.[7]

(4)
Thünen's famous explanation of the natural wage (der naturgemässe

Arbeitslohn) runs as follows. "Diesen, nicht aus dem Verhältnis zwischen Angebot und Nachfrage entspringenden, nicht nach dem Bedürfnis des Arbeiters abgemessenen, sondern aus der freien Selbstbestimmung der Arbeiter hervorgehenden Lohn $\sqrt{ap}$ nenne ich den naturgemässen order auch den natürlichen Arbeitslohn."[8] Here, "nicht aus dem verhälnis zwischen Angebot und Nachfrage entspringenden" should not be taken as independent of supply (Angebot) and demand (Nachfrage). This is a classical way of saying that demand and supply are equalized. It merely implies that the natural wage is different from the market wage. The latter wage changes according to the temporary relation between supply and demand, when the supply adjustment of rational workers has not fully worked out. The natural wage is the equilibrium wage determined by the equality of supply and demand, when workers have already adjusted their supply fully. In the period of the classical economics, however, the role of supply and demand was not so much emphasized for the equilibrium wage as for the market wage.

This interpretation can be confirmed by the following statement of Thünen, in which we can see clearly that Thünen is interested in a stationary economy and that the natural wage is considered as the wage to equate supply and demand of labor (Nachfrage und Angebot sind im Gleichgewicht). "Die Konkurrenz oder das Verhälnis des Angebots zum Begehr von Arbeit bestimmt nach Adam Smith die Höhe des Arbeitslohns; die Grösse der Nachfrage nach Arbeitern aber ist davon abhängig, ob der Nationalreichtum steigend, stillstehend order abnehmend ist. Wir haben uns nun aber die Aufgabe gestellt, die Höhe des Arbeitslohns für den beharrenden Zustand der bürgerlichen Gesellschaft zu erforschen. In einem sochen Zustand sind Nachfrage und Angebot im Gleichgewicht; beide

heben sich gewissermassen auf oder erscheinen als ruhend."[9] Clearly,

Thünen is not denying the effect of demand and supply on the natural

wage, he is merely saying that it _seems_ to stop (erscheinen als ruhend)

when demand and supply are equalized.

Thünen repeatedly mentioned that he is concerned with a stationary

state (der beharrende Zustand). "Unsere Untersuchungen beruhen auf

der Voraussetzung, dass der isolierte Staat sich im beharrenden Zustand

befindet." "Im isolierten Staat haben wir dagegen stets den endlichen

Erfolg, also das erreichte Ziel, vor Augen gehabt. Mit dem erreichten

Ziel tritt Ruhe und damit der beharrende Zustand ein."[10] In a stationary

economy, the labor population has to remain constant. "Da es unser

Zweck ist, die Gesetze, welche den Arbeitslohn und Zinsfuss regulieren,

für den beharrenden Zusatand der bürgerlichen Gesellschaft zu erforschen,

so müssen wir auch die Zahl der Arbeiter als gleichbleibend ansehen, und

annehmen, dass die arbeitenden Fammilien im ganzen so viele Kinder

erzielen, als zum Ersatz der durch Alter und Tod abgehenden Arbeiter

erforderlich sind. Die Arbeitskraft erscheint dadurch als eine sich

nicht abnutzende, unveränderliche Grösse. Die Summe der Subsistenzmittel,

welche eine Arbeiterfamilie – unter dieser Beschränkung – _zur Erhaltung_

ihrer Arbeitsfähigkeit notwendig bedarf, setze ich für jede Famile im

Wert gleich _a_ Scheffel Roggen järlich."[11]

To keep the labor population constant, the consumption (not the

wage) of each working family has to be at this subsistence level _a_.

Therefore, the surplus y of wage over the subsistence level _a_ is assumed

by Thünen to be saved and invested. "Der Überschuss, den die Arbeit

liefert, kann eine zweifache Bestimmung erhalten, er kann nämlich verwandt

werden: a) zur Ansammlung und Aufbewahrung eines Vorrats, in der Absicht,

späterhin, ohne zu arbeiten, davon zu leben; b) zur produktiven Anlegund im Landbau order in den Gewerden."[12] This suggests a life-cycle model of working families, in which each generation of workers lives for two periods. In the first period, each worker works for wage, keeps the consumption of his family at the subsistence level $\underline{a}$, and saves the surplus y of wage over $\underline{a}$. In the second period, he consumes the saving (possibly with interest) which he saved in the previous period, so that without working (ohne zu arbeiten) he can keep the family consumption at the subsistence level.

(5)

.Let us consider a simple two commodity model of a stationary economy in which each individual worker lives for two periods, works only in the first period, and is replaced by his successor. Consumers' goods are assumed to be produced by labor and capital while capital goods are assumed to be produced by labor alone, as was done by Thünen. To make the story simple, we assume that the life-span of capital goods is a unit period.

Since the labor population remains unchanged in a stationary state, we have to assume from the classical law of population that the level of consumption is at the subsistence level $\underline{a}$ for each of worker's household. The life-time budget constraint for each worker is then

(5) $w = a + a/(1 + r)$

where r is the rate of interest and w is the wage for the first period. Both $\underline{a}$ and w are given in terms of consumers' goods. This can be decomposed into single period budget constraints,

(6) $w = a + S$

and

(7) $(1 + r) S = a$

where S is the saving in the first period, which is consumed, with

interest earnings, in the second period. From (6) and (7) we have

(8) $(1 + r) = a/(w - a).$

Let us assume that a unit of labor can produce a unit of capital

goods and that the production function of consumers' goods is homogeneous

of degree one with respect of labor and capital. If x denotes the

number of workers used to produce consumers' goods, then, the output of

consumers' goods can be given by $x f(q)$, where f is the average product

of labor (Thünen's p) and q is the capital labor ratio in the production

of consumers' goods. As emphasized by Kondo, entrepreneurs under competitive

conditions maximize the surplus over wage and interest payments

(9) $(f(q) - w) x - (1 + r) w q x$

when w and r are given. From the condition for the maximization of (9)

with respect to q, i.e.,

(10) $f'(q) = (1 + r) w,$

the optimal q is determined.[13] Since such surplus disappeared in a

long-run equilibrium of a stationary economy, however, we have also

(11) $f(q) - w = (1 + r) w q.$

Suppose there are L workers in their first period and L workers in

their second period in a stationary state. The equilibrium condition of

demand and supply of consumers' goods is

(12) $x f(q) = 2 a L$

since each worker demands consumers' goods a in each period. From (12),

the ratio of workers in consumers' goods industry x to the total active

labor force L is

(13) $x/L = 2a/f(q)$.

Now we can determine the natural wage w from the equality of saving

and investment, as was suggested by Yamada. The condition is from (6)

(14) $L (w - a) = w x q$

since x q of capital goods has to be produced in each period. From (14),

(15) $x/L = a/(f(q) - w)$

since we have from (5) and (11)

(16) $(w - a)/wq = a/(f(q) - w)$.

Now by eliminating x/La in (15) through the substitution from (13), we

arrive at the relation between w and f(q)

(17) $w = f(q)/2$.

The natural wage as the competitive wage in a stationary state is exactly

one half of the average product of labor.

(6)

As for the rate of interest, the problem is whether it can be

positive in a stationary state. As is well known, Böhm-Bawerk adduced

three causes of the existence of positive rate of interest in a stationary

state.[14] They are (1) better provision for wants expected in the

future than in the present, (2) undervaluation of future wants, and (3)

the superiority of more roundabout method of production. The first

cause implies that the marginal utility of the future consumption is

lower than that of the present consumption, since one is given more

goods in the future than in the present, while the second cause insists

that the marginal utility of the future consumption is lower than that

of the present one, even if one is provided equally in the future as

well as in the present. These two causes are concerned with the supply

of capital or saving in the sense there will be no supply if the rate of interest is zero. The third cause implies that the capital or saving is demanded even if the rate of interest is positive, since more roundabout and more capital-using method of production is technically superior than less roundabout and less capital-using one.

As Samuelson (1983) rightly argued that "Thünen, --- ought to understand the --- analysis of the Wicksell-Jevons model," it cannot be said that there is no third cause in Thünen. Since it takes a unit period to produce the capital goods to be used in the production of consumers' goods and the capital-labor ratio q in the production of the consumers' goods can be variable, the production with the higher q implies the more roundabout method of production. To derive, however, the economic superiority of more roundabout production (value productivity of capital) from this technical superiority of more roundabout production (physical production of capital), it is necessary to have either the first or the second cause of interest. The first cause is irrelevant for Thünen, since it is assumed that the classical law of population keeps the level of consumption at the subsistence level in a stationary state. There might be, furthermore, no strong evidence of the second cause assumed by Thünen, for whom Böhm-Bawerk asserted that he did not know the law of marginal utility.[15]

We must admit, therefore, that the net rate of interest r might be zero in our Thünen-like model of a stationary state. This conclusion might also be supported by the fact that Thünen evaluated Adam Smith very high.[16] According to Smith, the natural rate of wage is at the subsistence level and the natural rate of interest is very low in a stationary economy, while both rates of wage and of interest can be much

higher in a growing economy.[17] Thünen argued against Smith that the rate of wage (not the consumption) can be higher than the subsistence level in a stationary state. He made, however, no such clear argument against Smith in the case of the rate of interest.

If $r = 0$ in our model of a stationary economy, from (8) we can conclude that

(18) $w = 2a$.

The natural wage in a stationary economy is twice as high as the subsistence level of the consumption of workers' household. Now we have two expressions for the natural rate of wage, (17) and (18). Combining them together, we can arrive at the Thünen's formula for the natural wage

(19) $w^2 = a \, f(q)$

or in Thünen's own notations

(20) $(a + y) = \sqrt{a \, p}$.

(7)

Let us consider how robust is our conclusion (20), if we drop some of our simplifying assumptions. Suppose, first, that the life-span of capital goods is n (> 1) periods and they depreciate linearly, i.e., in each period $1/n$ of the stock of capital goods is retired and must be replaced in a stationary state. Now we have only to replace (11) and (14) respectively by

(11)' $f(q) - w = rwq + wq/n$

and

(14)' $L(w - a) = wxq/n$.

It can be easily seen that (17) remains unchanged if $r = 0$, since (15) remains unchanged from (5) and (11)'. Therefore, the formula of the

natural wage (20) is unchanged, even if the life span of capital goods
is longer.

Next, let us suppose that workers live for n ($>$ 2) periods but
work only in the first period. If r = 0, then, (18) must be replaced by

(18)'   w = n a.

Now we have

(12)'   x f(q) = n a L

and

(13)'   x/L = n a/f(q)

instead of (12) and (13). From (11), (14), and (18)', on the other
hand, (15) should be replaced by

(15)'   x/L = (n-1)a/(f(q) - w),

when r = 0. Then, from (13)' and (15)', we have

(17)'   w = f(q)/n

instead of (17). From (17)' and (18)', however, we have again (20)
unchanged.

Now suppose that workers live for n periods but have to work in the
first m ($<$ n) periods. Instead of (18)', then, we have

(18)"   m w = n a.

While (12)' and (13)' remain unchanged, now (14) should be replaced by

(14)'   m L (w - a) = wxq.

From (11), (14)' and (18)", on the other hand, (15)' should be replaced
by

(15)"   x/L = (n-m)a/(f(q) - w),

when r = 0. Then, from (13)' and (15)", we have

(17)"   w = m f(q)/n

instead of (17)'. From (17)" and (18)", however, we arrive at (20) again.

Finally, let us return to our original model given in section (5) and assume that goods are malleable and there is no distinction between consumers' goods and capital goods. The stationary state equilibrium of supply and demand requires

(21) $f(q) = 2a + q$

where q and f denote the capital labor ratio and the average productivity of labor in the production of goods which can be used both in consumption and in production as capital goods. Since the equality of saving and investment requires $q = S$, we have

(22) $(1+r)q = a$

from (7). Using (8), then, we arrive at

(23) $w = f(q) - a$

from (21) and (22). In view of (18), however, this implies that

(24) $f(q) = 3a$

and

(25) $w = (f(q) + a)/2,$

which coincides with Samuelson (1986)'s natural wage.[18]

Footnotes

1) See also Blaug (1986) and Niehans (1987).

2) Thünen's <u>Der isolierte Staat</u>, part I, which was first published in 1826, was partly translated by Ruisuke Tanii into Japanese in 1916 and Kondo's translation which includes Part I and Part II, section 1 (originally published in 1850) was published in 1929. See Dickinson (1969) for English translation.

3) See Thünen (1910), pp. 542 - 550, particularly p. 549. See also Dempsey (1960), pp. 288 - 294, particularly p. 293.

4) See, however, Thünen's verbal discussions and numerical examples in Thünen (1910), pp. 501 - 508, Dempsey (1960), pp. 260 - 264.

5) See also Blaug (1986) and Niehans (1987). Leigh (1946) considered, however, in his classical study of Thünen in English speaking world, that the natural wage was supposed by Thünen to prevail in the real world.

6) See Kondo (1928), pp. 57 - 59, and 246 - 250.

7) See Yamada (1934), pp. 131 - 2, 159 - 160, 171 - 172, and 208 - 209.

8) See Thünen (1910), p. 549. See also Dempsey (1960), p. 293. The natural wage is an equilibrium wage in a hypothetical world constructed on unrealistic assumption on saving, as pointed out by Yamada (1934), p. 131, and Blaug (1986). It does not, however, necessarily imply that it is an optimal wage obtained by the maximization of a social welfare function.

9) See Thünen (1910), p. 449. See also Dempsey (1960), pp. 226 - 227.

10) See Thünen (1910), pp. 538 and 431. See also Dempsey (1960), pp. 284 and 213.

11) See Thünen (1910), p. 476. See also Dempsey (1960), pp. 244 - 245.

12) See Thünen (1910), p. 590. See also Dempsey (1960), p. 320.

13) Alternatively, optimal q is obtained by the maximization of r

(considered as the internal rate of return) in (11), as was suggested

by Dorfman (1986). The condition is again (10).

14) See Böhm-Bawerk (1959b), pp. 259 - 289, especially 283. See also

Negishi (1989), pp. 297 - 300.

15) See Böhm-Bawerk (1959b), p. 458. See Böhm-Bawerk (1959a), pp.

111 - 116, for Böhm-Bawerk's criticism on Thünen's theory of interest.

16) See Thünen (1910), pp. 461 and 462. See also Dempsey (1960), pp.

234 - 235.

17) See Smith (1976), pp. 72, 91, and 109. See also Negishi (1989),

pp. 83 - 89.

18) See Beckmann(1987) for an entirely different but very interesting

interpretation, in which the formula of natural wage is approximated by

the use of specified production and utility functions.

References

Beckmann, M.J., 1987, " Managers as Principals and Agents," <u>Agency</u>

<u>Theory, Information, and Incentives</u>, G. Bamberg and K. Spremann eds.,

Springer Verlag, 1987, 379 - 388

Blaug, M., 1986, "The Economics of Johann Von Thünen," <u>Research in the</u>

<u>History of Economic Thought and Methodology</u>, 3, W.J. Samuels ed., JAI

Press, 1986, 1 - 25.

Böhm-Bawerk, E. v., 1959a, <u>History and Critique of Interest Theories</u>,

G.D. Huncke and H.F. Sennholz tr., Libertarian Press, 1959.

Böhm-Bawerk, E. v., 1959b. <u>Positive Theory of Capital</u>, G.D. Huncke tr.,

Libertarian Press, 1959.

Dempsey, B.W., 1960, <u>The Frontier Wage</u>, Loyola University Press, 1960.

Dickinson, H.D., 1969, "Von Thünen's Economics," <u>Economic Journal</u>, 79

(1969), 894 - 902.

Dorfman, R., 1986, "Comment: P.A. Samuelson, 'Thünen at Two Hundred,'"

<u>Journal of Economic Literature</u>, 24 (1986), 1773 - 1776.

Kondo, Y., 1928, <u>Thünen Koritsukoku no Kenkyu</u> (Studies of Thünen's

Isolated State), Nishigahara-Kankoukai, 1928.

Leigh, A.H., 1946, "Von Thünen's Theory of Distribution and the Advent

of Marginal Analysis," <u>Journal of Political Economy</u>, 64 (1946), 481 -

502.

Negishi, T., 1989, <u>History of Economic Theory</u>, North-Holland, 1989.

Niehans, J., 1987, "Thünen, Johann Heinrich von," <u>The New Palgrave</u>, 4,

Macmillan, 1987.

Samuelson, P.A., 1983, "Thünen at Two Hundred," <u>Journal of Economic</u>

<u>Literature</u>, 21 (1983), 1468 - 1488.

Samuelson, P.A., 1986, "Yes to Robert Dorfman's Vindication of Thünen's

Natural-Wage Derivation," <u>Journal of Economic Literature</u>, 24 (1986),

1777 - 1785.

Smith, A., 1976, <u>An Inquiry into the Nature and Causes of the Wealth of</u>

Nations, Oxford University Press, 1976.

Thünen, Johann Heinrich von, 1910, Der isolierte Staat in Beziehung auf Lanswirtschaft und Nationalökonomie, Gustav Fischer, 1910.

Yamada, Y., 1934, Thünen Bunpairon no Kenkyu (Studies of Thünen's Theory of Distribution), Moriyamashoten, 1934.

English translations of quotations from Von Thünen

page 6.
" <u>This wage, not originating in the relation of supply and demand , not measured by the needs of worker, but proceeding from the free self-determination of the worker, this √ap I call the natural level of wage, or even the natural wage.</u>"

pages 6 - 7.
" Competition, or the interrelation of supply along with the demand for labor, according to Adam Smith, determines the level of wages. But the level of the demand for workers is also dependent upon whether the national wealth is rising, stationary or declining. We have now set ourselves the task to investigate the level of wages for the stationary state of sivil society. In such a state the demand and supply are in equilibrium. They offset each other to a certain extent,* or appear as resting."
* Demsey's translation of " beide heben sich gewissermassen auf " into " both rise to a certain extent " does not seem to make sense.   See Demsey(1960), p. 226.

page 7.
" Our inquiry is based on the assumption that the Isolated State is in a stationary state; therefore its magnitude and extent must be unchanged."
" In the isolated State, on the other hand, we have had in mind only the final goal. With the reaching of the final goal there is then no further change and disturbance. There appears a stationary state."
" As it is our aim to find the laws which determines wages and the rate of interest for the stationary state of society, we must assume that the number of workers remain unchanged and that the working families, on the whole, have as many children as are necessary to substitute for those withdrawn by age and death. The sum of means of subsistence which a working family, under this restricting assumption, must necessarily have <u>for the maintenance of its capacity for work</u>, I will set for every familyas being equal to <u>a</u> bushels of rye."

Pages 7 - 8.
" The surplus which labor yields can have a twofold aspect, for it can happen (1) that it can be accumulated, saved, and stored with a view to living on it later without work; and (2) that it can be applied to productive investment in agriculture or industry."

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