MPhil (Econ.) & MSc (Political Economy)
Dept. of Economics
National and Kapodistrian University of Athens

Lecture 8: The origins of neoclassical economics and the "marginalist revolution"

Nicholas J. Theocharakis

Objectives of the lecture

- Analyze the theories that led to the "marginalist revolution"

  – Analyze the theories of Jeremy Bentham

  – State the main theories of the precursors of the "marginalist revolution", in particular, von Thünen, Cournot, Dupuit and Gossen

- Explain what the "marginalist revolution" was and analyse the contribution of Jevons, Menger and Walras

Contents

- Jeremy Bentham
  - The precursors of the Marginalist Revolution
    - J.H. Von Thünen
    - A. Cournot
    - J. Dupuit
    - H.H. Gossen
- The Marginalist Revolution
  - W.S. Jevons
  - C. Menger
  - L. Walras

Jeremy Bentham (1748-1832)

Studio of Thomas Frye
oil on canvas, 1760, NPG

by Henry William Pickersgill
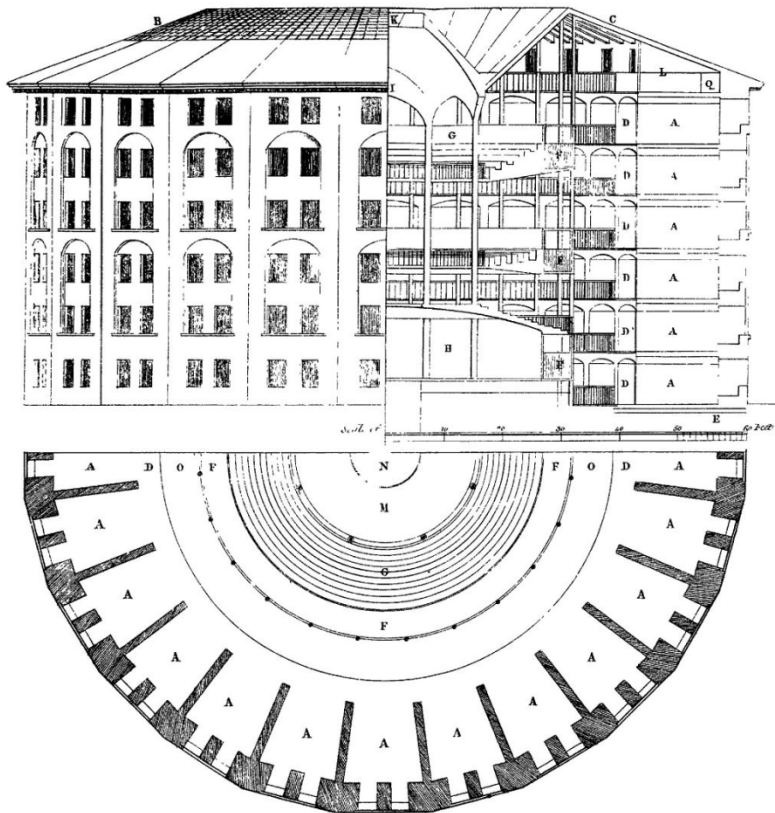oil on canvas, exhibited 1829,
NPG

Jeremy Bentham (1748-1832)

My body I give to my dear friend Doctor Southwood Smith to be disposed of in a manner hereinafter mentioned, and I direct … he will take my body under his charge and take the requisite and appropriate measures for the disposal and preservation of the several parts of my bodily frame in the manner expressed in the paper annexed to this my will and at the top of which I have written Auto Icon. The skeleton he will cause to be put together in such a manner as that the whole figure may be seated in a chair usually occupied by me when living, in the attitude in which I am sitting when engaged in thought in the course of time employed in writing. I direct that the body thus prepared shall be transferred to my executor. He will cause the skeleton to be clad in one of the suits of black occasionally worn by me. The body so clothed, together with the chair and the staff in the my later years bourne by me, he will take charge of and for containing the whole apparatus he will cause to be prepared an appropriate box or case and will cause to be engraved in conspicuous characters on a plate to be affixed thereon and also on the labels on the glass cases in which the preparations of the soft parts of my body shall be contained

Jeremy Bentham (1748-1832)

Panopticon

PANOPTICON;

OR,

THE INSPECTION-HOUSE:

CONTAINING

The IDEA of a NEW PRINCIPLE of CONSTRUCTION
applicable to any Sort of ESTABLISHMENT, in which
Persons of any Description are to be kept
under INSPECTION:

AND IN PARTICULAR TO

PENITENTIARY - HOUSES,

PRISONS,	MANUFACTORIES,
HOUSES OF INDUSTRY,	MAD-HOUSES,
WORK-HOUSES,	LAZARETTOS,
POOR-HOUSES,	HOSPITALS,

AND SCHOOLS:

WITH

A PLAN OF MANAGEMENT
Adapted to the Principle:
IN A SERIES OF LETTERS,
Written in the Year 1787, from Crecheff in White Ruffia,
to a Friend in England.

By JEREMY BENTHAM,
OF LINCOLNS INN, ESQUIRE.

DUBLIN, PRINTED:
LONDON, reprinted; and fold by T. PAYNE, at the Mews-Gate.

1791.

Jeremy Bentham (1748-1832)

LETTER II.

Plan for a Penitentiary Inspection-House.

BEFORE you look at the plan, take in words the general idea of it.

The building is circular.

The apartments of the prisoners occupy the circumference. You may call them, if you please, the *Cells*.

These *Cells* are divided from one another, and the prisoners by that means secluded from all communication with each other, by *partitions* in the form of *radii* issuing from the circumference towards the center, and extending as many feet as shall be thought necessary to form the largest dimension of the Cell.

The apartment of the Inspector occupies the center; you may call it if you please the *Inspector's Lodge*.

It will be convenient in most, if not in all cases, to have a vacant space or *area* all round, between

B 3   such

such center and such circumference. You may call it if you please the *Intermediate* or *Annular* Area.

About the width of a Cell may be sufficient for a *passage* from the outside of the building to the Lodge.

Each Cell has in the outward circumference, a *window*, large enough, not only to light the Cell, but, through the Cell, to afford light enough to the correspondent part of the Lodge.

The inner circumference of the Cell is formed by an iron *grating*, so light as not to screen any part of the Cell from the Inspector's view.

Of this grating a part sufficiently large opens, in form of a *door*, to admit the prisoner at his first entrance; and to give admission at any time to the Inspector or any of his attendants.

To cut off from each prisoner the view of every other, the partitions are carried on a few feet beyond the grating into the Intermediate Area; such projecting parts I call the *Protracted Partitions*.

It is conceived, that the light, coming in, in this manner through the Cells, and so across the Intermediate Area, will be sufficient for the Inspector's Lodge. But, for this purpose, both the windows

Jeremy Bentham (1748-1832)

A

F R A G M E N T

O N

GOVERNMENT;

BEING

An EXAMINATION of what is delivered,

On the Subject of GOVERNMENT in General

In the INTRODUCTION to

Sir *William Blackstone*'s COMMENTARIES:

WITH A

P R E F A C E,

IN WHICH IS GIVEN

A CRITIQUE ON THE WORK AT LARGE.

Rien ne recule plus le progrès des connoissances, qu'un
mauvais ouvrage d'un Auteur célèbre : parce qu'avant
d'instruire, il faut commencer par détromper.
MONTESQUIEU Esprit des Loix, L. XXX, Ch. XV.

L O N D O N:

Printed for T. PAYNE, at the Mews-Gate; P. ELMSLY, opposite
Southampton-Street in the Strand; and E. BROOKE, in Bell-Yard,
Temple-Bar.

M.DCC.LXXVI.

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pable of bearing the name of discoveries : with so
little method and precision have the consequences

Motives of the present undertaking.

of this fundamental axiom, *it is the greatest happiness
of the greatest number that is the measure of right
and wrong*, been as yet developped.

XLVIII.

But the principle of u-
TILITY is
all-sufficient.

XLVIII.

Now this *other* principle that still re-
curs upon us, what other can it be than
the *principle of* UTILITY ? The princi-
ple which furnishes us with that *reason*,
which alone depends not upon any higher
reason, but which is itself the sole and
all-sufficient reason for every point of
practice whatsoever.

Jeremy Bentham (1748-1832)

AN

INTRODUCTION

TO THE

PRINCIPLES

OF

MORALS AND LEGISLATION.

BY

JEREMY BENTHAM, ESQ.

BENCHER OF LINCOLN'S INN; AND LATE OF
QUEEN'S COLLEGE, OXFORD, M.A.

IN TWO VOLUMES.

A NEW EDITION, CORRECTED BY THE AUTHOR.

VOL. I.

LONDON:

PRINTED FOR W. PICKERING,
LINCOLN'S-INN FIELDS;
AND
E. WILSON, ROYAL EXCHANGE.
1823.

THE FIRST EDITION OF THIS WORK WAS PRINTED

IN THE YEAR 1780;

AND FIRST PUBLISHED IN 1789.

Utilitarianism
Consequentialism

AN

INTRODUCTION

TO THE

PRINCIPLES OF MORALS AND LEGISLATION.

CHAP. I.

OF THE PRINCIPLE OF UTILITY.

NATURE has placed mankind under the governance of two sovereign masters, *pain* and *pleasure*. It is for them alone to point out what we ought to do, as well as to determine what we shall do. On the one hand the standard of right and wrong, on the other the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we say, in all we think: every effort we can make to throw off our subjection, will serve but to demonstrate and confirm it. In words a man may pretend to abjure their empire: but in reality he will remain subject to it all the while. The *principle of utility* * recognises this subjection, and assumes it for the foundation of that system, the object of which is to rear the fabric of felicity by the hands of reason and of law. Systems which attempt to question it, deal in sounds instead of sense, in caprice instead of reason, in darkness instead of light.

Mankind governed by pain and pleasure.

Jeremy Bentham (1748-1832)

It is in vain to talk of the interest of the community, without understanding what is the interest of the individual.* A thing is said to promote the interest, or to be *for* the interest, of an individual, when it tends to add to the sum total of his pleasures: or, what comes to the same thing, to diminish the sum total of his pains.

To a *number* of persons, with reference to each of whom the value of a pleasure or a pain is considered, it will be greater or less, according to seven circumstances: to wit, the six preceding ones; *viz.*

1. Its *intensity*.
2. Its *duration*.
3. Its *certainty* or *uncertainty*.
4. Its *propinquity* or *remoteness*.
5. Its *fecundity*.
6. Its *purity*.

And one other; to wit:

7. Its *extent;* that is, the number of persons to whom it *extends;* or (in other words) who are affected by it.

Johann Heinrich von Thünen (1783-1850)
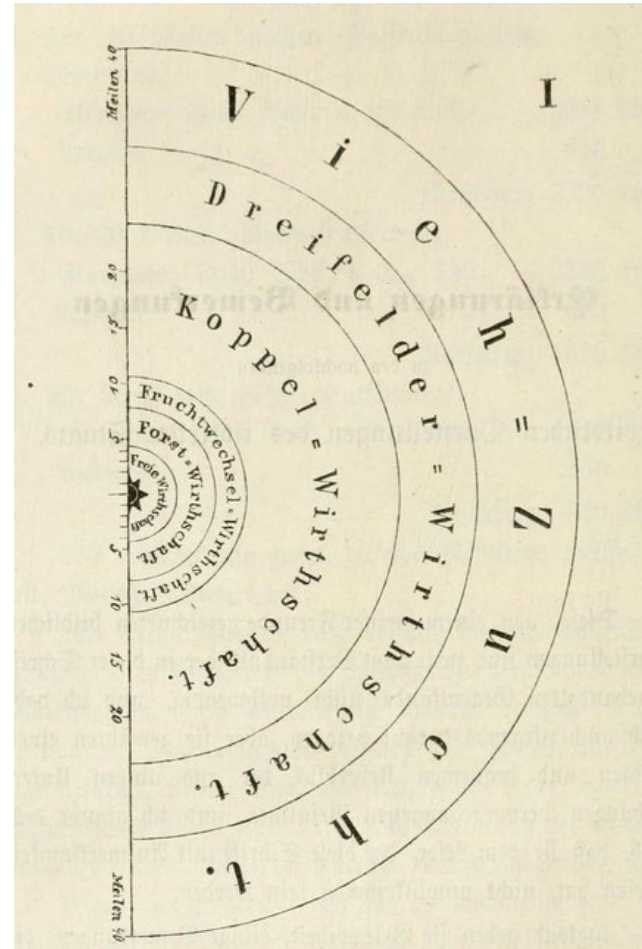
Johann Heinrich von Thünen (1783-1850)

von Thünen's farm at Tellow, Mecklenburg

Johann Heinrich von Thünen (1783-1850)
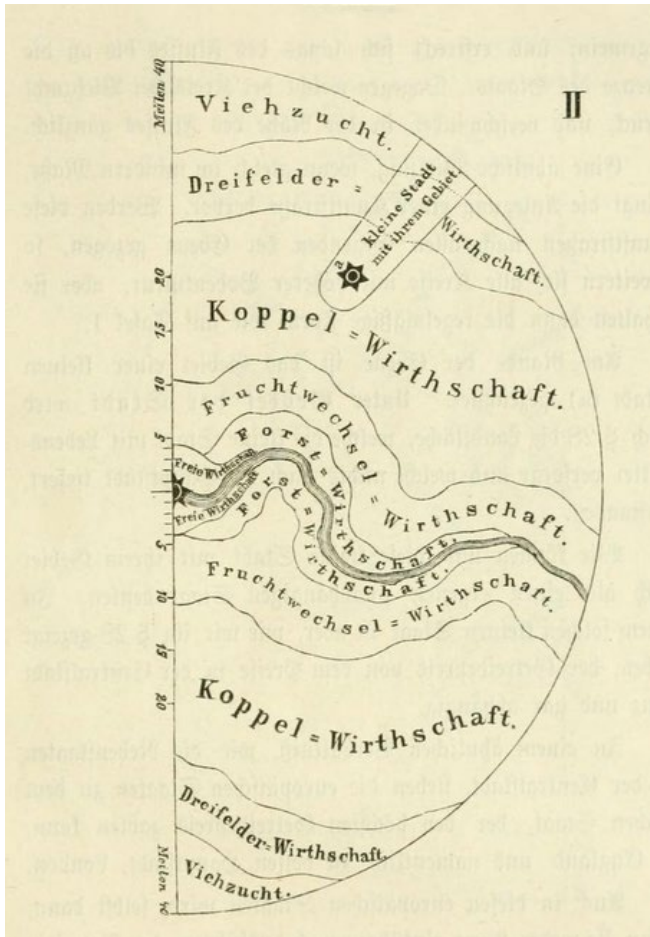
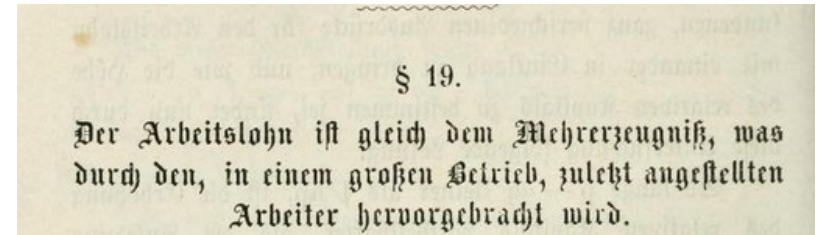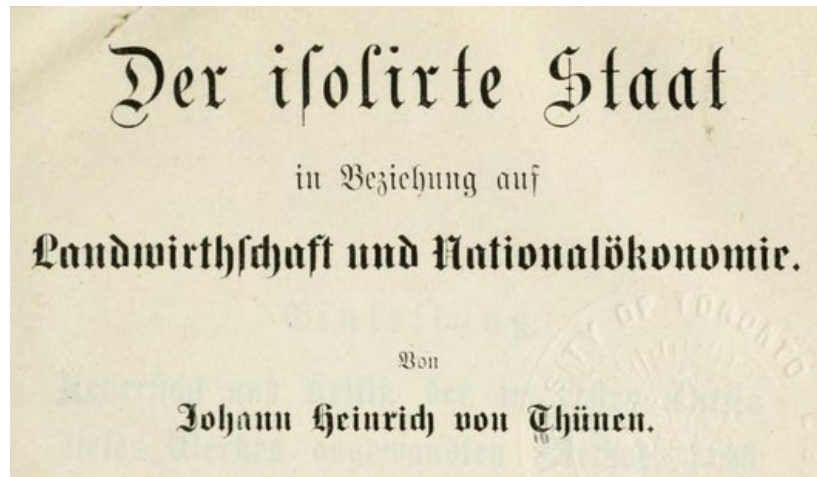# Johann Heinrich von Thünen (1783-1850)

Figure of the Thünen Resource Cycles, made in the nineteen-twenties for school purposes. Source: Thünen museum, Tellow.

Johann Heinrich von Thünen (1783-1850)

Der isolirte Staat

in Beziehung auf

Landwirthschaft und Nationalökonomie.

Von

Johann Heinrich von Thünen.

Zweiter Theil.

Der naturgemäße Arbeitslohn und dessen Verhältniß zum Zinsfuß und zur Landrente.

§ 19.

Der Arbeitslohn ist gleich dem Mehrerzeugniß, was durch den, in einem großen Betrieb, zuletzt angestellten Arbeiter hervorgebracht wird.

Marginal product of labour
1850

Augustin Cournot (1801 –1877)

RECHERCHES

SUR LES

PRINCIPES MATHÉMATIQUES

DE LA

THÉORIE DES RICHESSES,

PAR AUGUSTIN COURNOT,

RECTEUR DE L'ACADÉMIE ET PROFESSEUR A LA FACULTÉ DES SCIENCES
DE GRENOBLE.

Ἀνταμείβεσθαι πάντα ἀπάντων, ὥσπερ
χρυσοῦ χρήματα καὶ χρημάτων χρυσός.

Plut. de ei ap. Delph. 8.

PARIS

CHEZ L. HACHETTE,

LIBRAIRE DE L'UNIVERSITÉ ROYALE DE FRANCE,

RUE PIERRE-SARRAZIN, Nº 12.

—

1838

Augustin Cournot (1801 –1877)

RESEARCHES

INTO THE

MATHEMATICAL PRINCIPLES

OF THE

THEORY OF WEALTH

BY

AUGUSTIN COURNOT

1838

TRANSLATED BY NATHANIEL T. BACON
WITH AN ESSAY ON
COURNOT AND MATHEMATICAL ECONOMICS
AND A
BIBLIOGRAPHY OF MATHEMATICAL ECONOMICS
BY IRVING FISHER

New York
THE MACMILLAN COMPANY
1927
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Augustin Cournot (1801 –1877)

CHAPITRE IV.

De la loi du débit.

20. Pour asseoir les fondements de la théorie des valeurs échangeables, nous ne remonterons pas avec la plupart des écrivains spéculatifs jusqu'au berceau de l'espèce humaine ; nous n'entreprendrons d'expliquer ni l'origine de la propriété, ni celle de l'échange ou de la division du travail. Tout cela appartient sans doute à l'histoire de l'homme, mais n'est d'aucune influence sur une théorie qui ne peut devenir applicable qu'à une époque de civilisation très-avancée, à une époque où (pour parler le langage des géomètres) la part d'action des circonstances *initiales* est entièrement éteinte.

Nous n'invoquerons qu'un seul axiome, ou, si l'on veut, nous n'emploierons qu'une seule hypothèse, savoir que chacun cherche à tirer de sa chose ou de son travail la plus grande valeur possible. Mais en déduisant les conséquences rationnelles de ce principe, nous essaierons de fixer mieux qu'on ne l'a fait les éléments, les données que l'observation seule peut fournir. Malheureusement, ce point fondamental est celui que les théoriciens se sont à peu près accordés à présenter, nous ne dirons pas d'une manière fausse, mais d'une manière qui n'offre réellement aucun sens.

CHAPITRE V.

Du monopole.

26. Supposons, pour la commodité du langage, qu'un homme se trouve propriétaire d'une source minérale, à laquelle on vient de reconnaître des propriétés salutaires qu'aucune autre ne possède. Il pourrait sans doute fixer à 100 francs le prix du *litre* de cette eau ; mais il s'apercevrait bien vite, à la rareté des demandes, que ce n'est pas le moyen de tirer grand parti de sa propriété. Il abaissera donc successivement le prix du litre jusqu'au terme qui lui donnera le plus grand profit possible ; c'est-à-dire que, si $F(p)$ désigne la loi de la demande, il finira, après divers tâtonnements, par adopter la valeur de p qui rend le produit $p\,F(p)$ un maximum, ou qui est déterminée par l'équation

$$(1) \qquad F(p) + p\,F'(p) = o \ .$$

Le produit

$$p\,F(p) = \frac{[F(p)]^2}{-F'(p)}$$

sera la rénte annuelle du propriétaire de la source, et cette rente ne dépendra que de la nature de la fonction F.

Augustin Cournot (1801 –1877)

CHAPTER IV

OF THE LAW OF DEMAND

20. To lay the foundations of the theory of exchangeable values, we shall not accompany most speculative writers back to the cradle of the human race ; we shall undertake to explain neither the origin of property nor that of exchange or division of labour. All this doubtless belongs to the history of mankind, but it has no influence on a theory which could only become applicable at a very advanced state of civilization, at a period when (to use the language of mathematicians) the influence of the *initial* conditions is entirely gone.

We shall invoke but a single axiom, or, if you prefer, make but a single hypothesis, *i.e.* that each one seeks to derive the greatest possible value from his goods or his labour. But to deduce the rational consequences of this principle, we shall endeavour to establish better than has been the case the elements of the data which observation alone can furnish. Unfortunately, this fundamental point is one which theorists, almost with one accord, have presented to us, we will not say falsely, but in a manner which is really meaningless.

CHAPTER V

OF MONOPOLY

26. For convenience in discussion, suppose that a man finds himself proprietor of a mineral spring which has just been found to possess salutary properties possessed by no other. He could doubtless fix the price of a *liter* of this water at 100 francs ; but he would soon see by the scant demand, that this is not the way to make the most of his property. He will therefore successively reduce the price of the liter to the point which will give him the greatest possible profit ; *i.e.* if $F(p)$ denotes the law of demand, he will end, after various trials, by adopting the value of p which renders the product $pF(p)$ a maximum, or which is determined by the equation

(1) $$F(p) + pF'(p) = 0.$$

The product $$pF(p) = \frac{[F(p)]^2}{-F'(p)}$$

will be the annual revenue of the owner of the spring, and this revenue will only depend on the nature of function F.

To make equation (1) applicable, it must be supposed that for the value of p obtained from it, there will be a corresponding value of D which the owner of the spring can deliver, or which does not exceed the annual flow of

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CHAPITRE VII.

De la concurrence des producteurs.

43. Tout le monde se forme une idée vague des effets de la concurrence : la théorie aurait dû s'attacher à préciser cette idée ; et pourtant, faute d'envisager la question sous le point de vue convenable, faute de recourir aux signes dont l'emploi devient indispensable, les écrivains économistes n'ont perfectionné en rien, sous ce rapport, les notions vulgaires. Elles sont restées mal définies, mal appliquées dans leurs ouvrages, comme dans le langage du monde.

Pour rendre sensible la conception abstraite du monopole, nous imaginions une source et un propriétaire. Maintenant, imaginons deux propriétaires et deux sources, dont les qualités sont identiques, et qui, en raison de la similitude de leur position, alimentent concurremment le même marché. Dès lors le prix est nécessairement le même pour l'un et pour l'autre propriétaire. Soit p ce prix, $D = F(p)$ le débit total, D_1 le débit de la source (1), D_2 celui de la source (2), de sorte que $D_1 + D_2 = D$. En négligeant, pour débuter, les frais d'exploitation, les revenus des propriétaires seront respectivement $p\,D_1$, $p\,D_2$; et *chacun de son côté* cherchera à rendre ce revenu le plus grand possible.

d'où il suit que les valeurs définitives de D_1, D_2, par conséquent D et p seront déterminés au moyen du système d'équations

$$(1)\quad f(D_1 + D_2) + D_1\, f'(D_1 + D_2) = o,$$
$$(2)\quad f(D_1 + D_2) + D_2\, f'(D_1 + D_2) = o.$$

En effet, supposons que les variables D_1, D_2 étant représentées par des coordonnées rectangulaires, la courbe $m_1\,n_1$ (fig. 2) soit le tracé de l'équation (1), et la courbe $m_2\,n_2$ le tracé de l'équation (2). Si le propriétaire (1) adoptait pour D_1 une valeur représentée par $ox_{\prime}$, le propriétaire (2) adopterait pour D_2 la valeur $oy_{\prime}$, laquelle, pour la valeur supposée de D_1, lui donne le plus grand bénéfice. Mais alors, par la même raison, le producteur (**1**) devrait adopter pour D_1 la valeur $ox_{\prime\prime}$, qui donne le bénéfice *maximum* quand D_2 a la valeur $oy_{\prime}$. Ceci raménerait le producteur (2) à retomber sur la valeur $oy_{\prime\prime}$, et ainsi de suite : par où l'on voit que l'équilibre ne peut s'établir que lorsque les coordonnées ox, oy, du point d'intersection i, représentent les valeurs de D_1, D_2. La même construction, répétée sur la figure de l'autre côté du point i, conduit à des résultats symétriques.

La situation d'équilibre, correspondante au sys-

Augustin Cournot (1801 –1877)

CHAPTER VII

OF THE COMPETITION OF PRODUCERS

43. Every one has a vague idea of the effects of competition. Theory should have attempted to render this idea more precise; and yet, for lack of regarding the question from the proper point of view, and for want of recourse to symbols (of which the use in this connection becomes indispensable), economic writers have not in the least improved on popular notions in this respect. These notions have remained as ill-defined and ill-applied in their works, as in popular language.

To make the abstract idea of monopoly comprehensible, we imagined one spring and one proprietor. Let us now imagine two proprietors and two springs of which the qualities are identical, and which, on account of their similar positions, supply the same market in competition. In this case the price is necessarily the same for each proprietor. If p is this price, $D = F(p)$ the total sales, D_1 the sales from the spring (1) and D_2 the sales from the spring (2), then $D_1 + D_2 = D$. If, to begin with, we neglect the cost of production, the respective incomes of the proprietors will be pD_1 and pD_2; and *each of them independently* will seek to make this income as large as possible.

We say *each independently*, and this restriction is very

whence it follows that the final values of D_1 and D_2, and consequently of D and of p, will be determined by the system of equations

$$(1) \qquad f(D_1 + D_2) + D_1 f'(D_1 + D_2) = 0,$$
$$(2) \qquad f(D_1 + D_2) + D_2 f'(D_1 + D_2) = 0.$$

Let us suppose the curve $m_1 n_1$ (Fig. 2) to be the plot of equation (1), and the curve $m_2 n_2$ that of equation (2), the variables D_1 and D_2 being represented by rectangular coordinates. If proprietor (1) should adopt for D_1 a value represented by ox_1, proprietor (2) would adopt for D_2 the value oy_1, which, for the supposed value of D_1, would give him the greatest profit. But then, for the same reason, producer (1) ought to adopt for D_1 the value ox_{11}, which gives the maximum profit when D_2 has the value oy_1. This would bring producer (2) to the value oy_{11} for D_2, and so forth; from which it is evident that an equilibrium can only be established where the coördinates ox and oy of the point of intersection t represent the values of D_1 and D_2. The same construction repeated on a point of the figure on the other side of the point i leads to symmetrical results.

The state of equilibrium corresponding to the system of values ox and oy is therefore *stable*; *i.e.* if either of the producers, misled as to his true interest, leaves it temporarily, he will be brought back to it by a series of reactions, constantly declining in amplitude, and of which the dotted lines of the figure give a representation by their arrangement in steps.

Augustin Cournot (1801 –1877)

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tème de valeurs ox, oy, ==est donc *stable*==; c'est-à-dire que si l'un ou l'autre des producteurs, trompé sur ses vrais intérêts, vient à s'en écarter momentanément, il y sera ramené par une suite de réactions, toujours diminuant d'amplitude, et dont les lignes ponctuées de la figure, par leur disposition en gradins, offrent l'image.

La construction précédente suppose que l'on a $om_1 > om_2$, $on_1 < on_2$: les résultats seraient diamétralement opposés, si ces inégalités changeaient de signe, et si les courbes m_1n_1, m_2n_2 affectaient la disposition représentée sur la fig. 3. Les coordonnées du point i, où les deux courbes se coupent, cesseraient alors de correspondre à un système d'équilibre stable. Mais il est facile de se convaincre qu'une pareille disposition des courbes est inadmissible. En effet, quand $D_1 = o$, les équations (1) et (2) se réduisent, la première à

$$f(D_2) = o,$$
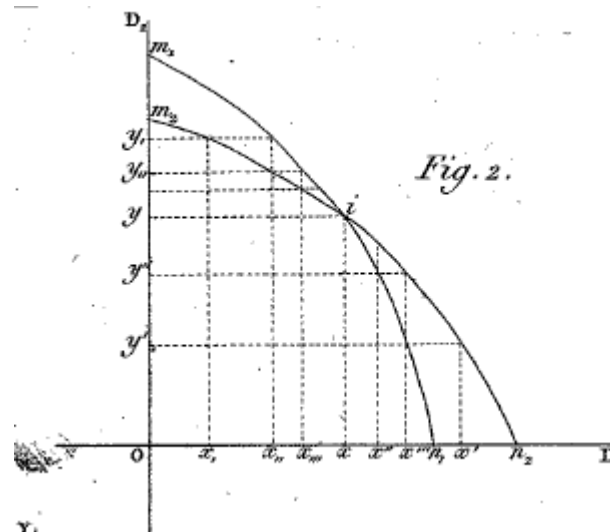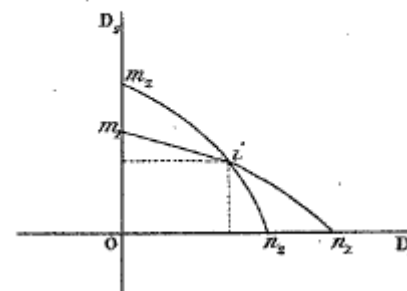
la seconde à

$$f(D_2) + D_2 f'(D_2) = o.$$

Fig. 2.

Fig. 3.

The preceding construction assumes that $om_1 > om_2$ and $on_1 < on_2$: the results would be diametrically opposite if

G

Fig. 2.

these inequalities should change sign, and if the curves m_1n_1 and m_2n_2 should assume the disposition represented by Fig. 3. The coördinates of the point i, where the two curves intersect, would then cease to correspond to a state of stable equilibrium. But it is easy to prove that such a disposition of the curves is inadmissible. In fact, if $D_1 = 0$, equations (1) and (2) reduce, the first to

$$f(D_2) = 0,$$

and the second to

$$f(D_2) + D_2 f'(D_2) = 0.$$

The value of D_2 derived from the first would correspond to $p = 0$; the value of D_2 derived from the second corresponds to a value of p which would make the product pD_2 a maximum. Therefore the first root is necessarily greater than the second, or $om_1 > om_2$, and for the same reason $on_2 > on_1$.

44. From equations (1) and (2) we derive first $D_1 = D_2$ (which ought to be the case, as the springs are supposed to be similar and similarly situated), and then by addition:

$$2f(D) + Df'(D) = 0,$$

an equation which can be transformed into

(3) $$D + 2p\frac{dD}{dp} = 0,$$

whereas, if the two springs had belonged to the same property, or if the two proprietors *had come to an understanding*, the value of p would have been determined by the equation
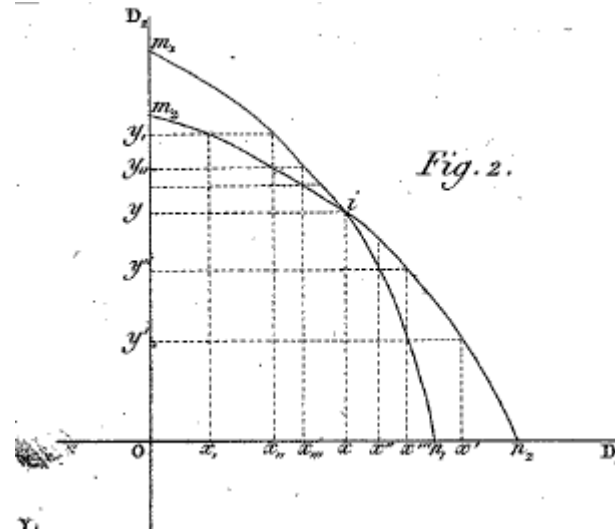
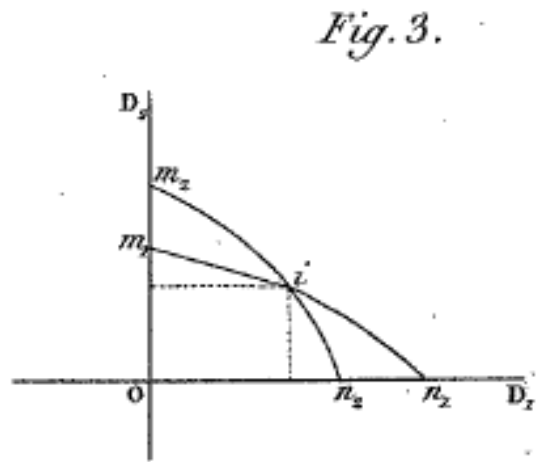(4) $$D + p\frac{dD}{dp} = 0,$$

Fig. 3.

The preceding construction assumes that $om_1 > om_2$ and $on_1 < on_2$: the results would be diametrically opposite if these inequalities should change sign, and if the curves m_1n_1 and m_2n_2 should assume the disposition represented by Fig. 3. The coördinates of the point i, where the two curves intersect, would then cease to correspond to a state of stable equilibrium. But it is easy to prove that such a disposition of the curves is inadmissible. In fact, if $D_1 = 0$, equations (1) and (2) reduce, the first to

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(3) $$D + 2p\frac{dD}{dp} = 0,$$

whereas, if the two springs had belonged to the same property, or if the two proprietors *had come to an understanding*, the value of p would have been determined by the equation
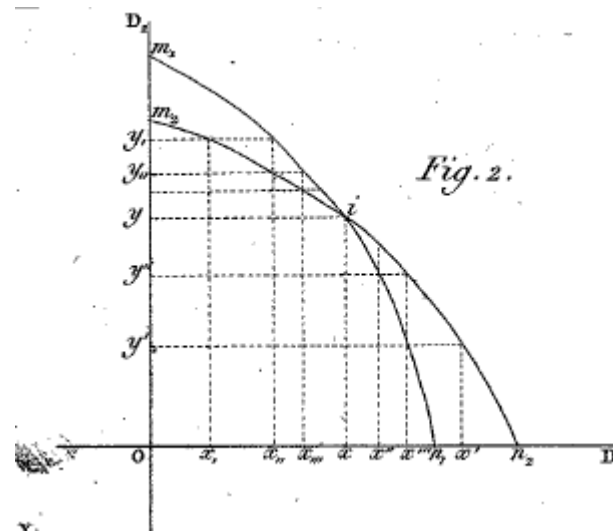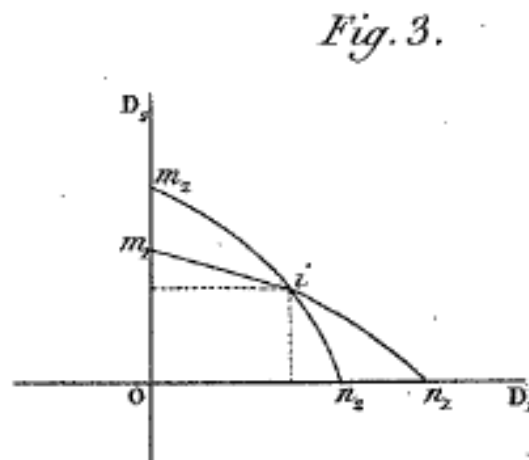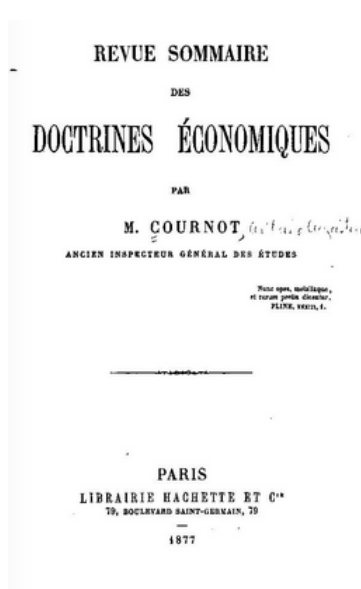
(4) $$D + p\frac{dD}{dp} = 0,$$

Fig. 2.

Fig. 3.

Augustin Cournot (1801 –1877)

46. S'il y avait 3 , 4.... n producteurs en concurrence, toutes les circonstances restant les mêmes, l'équation (3) serait successivement remplacée par les suivantes :

$$D + 3p\frac{dD}{dp} = o , \quad D + 4p\frac{dD}{dp} = o , \quad \ldots\ldots\ldots$$
$$D + np\frac{dD}{dp} = o ;$$

la valeur de p , qui en résulte , diminuerait indéfiniment par l'accroissement indéfini du nombre n.

REVUE SOMMAIRE

DES

DOCTRINES ÉCONOMIQUES

PAR

M. COURNOT, *ancien inspecteur*

ANCIEN INSPECTEUR GÉNÉRAL DES ÉTUDES

Nunc opus, mobilisque, et rerum prolis clamilur,
PLINE, XXXIII, 1.

PARIS
LIBRAIRIE HACHETTE ET Cie
79, BOULEVARD SAINT-GERMAIN, 79
—
1877

CHAPITRE VIII.

I

De la concurrence indéfinie.

50. Les effets de la concurrence ont atteint leur limite , lorsque chacune des productions partielles D_k est *insensible*, non seulement par rapport à la production totale $D = F(p)$; mais aussi par rapport à la dérivée $F'(p)$, en sorte que la production partielle D_k pourrait être retranchée de D , sans qu'il en résultât de variation appréciable dans le prix de la denrée. Cette hypothèse est celle qui se réalise dans l'économie sociale pour une foule de productions , et pour les productions les plus importantes. Elle introduit dans les calculs une grande simplification , et c'est à en développer les conséquences que ce chapitre est destiné.

En vertu de l'hypothèse, on pourra, dans l'équation

$$D_k + \left[p - \varphi'_k(D_k) \right] \cdot \frac{dD}{dp} = o ,$$

négliger, sans erreur sensible , le terme D_k , ce qui la réduira à
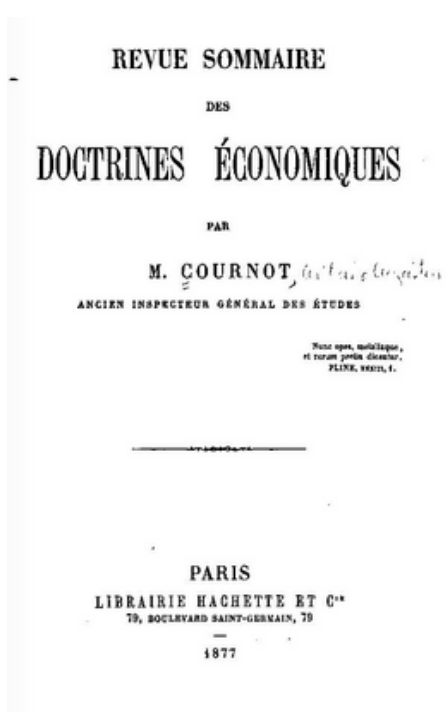
$$p - \varphi'_k(D_k) = o .$$

Augustin Cournot (1801 –1877)

46. If there were 3, 4, . . ., n producers in competition, all their conditions being the same, equation (3) would be successively replaced by the following:

$$D + 3p\frac{dD}{dp} = 0, \; D + 4p\frac{dD}{dp} = 0, \cdots D + np\frac{dD}{dp} = 0;$$

and the value of p which results would diminish indefinitely with the indefinite increase of the number n.

REVUE SOMMAIRE

DES

DOCTRINES ÉCONOMIQUES

PAR

M. COURNOT, *...*

ANCIEN INSPECTEUR GÉNÉRAL DES ÉTUDES

Nunc opes, metallique,
et rerum pretia dicantur.
PLINE, XXXIII, 1.

PARIS

LIBRAIRIE HACHETTE ET Cⁱᵉ
79, BOULEVARD SAINT-GERMAIN, 79

—

1877

CHAPTER VIII

OF UNLIMITED COMPETITION

50. The effects of competition have reached their limit, when each of the partial productions D_k is *inappreciable*, not only with reference to the total production $D = F(p)$, but also with reference to the derivative $F'(p)$, so that the partial production D_k could be subtracted from D without any appreciable variation resulting in the price of the commodity. This hypothesis is the one which is realized, in social economy, for a multitude of products, and, among them, for the most important products. It introduces a great simplification into the calculations, and this chapter is meant to develop the consequences of it.

According to this hypothesis, in the equation

$$D_k + [p - \phi_k'(D_k)] \cdot \frac{dD}{dp} = 0,$$

the term D_k can be neglected without sensible error, which reduces the equation to

$$p - \phi_k'(D_k) = 0.$$

In consequence, the system of equations (6) of the preceding chapter will be replaced by

$$(1) \; p - \phi_1'(D_1) = 0, \; p - \phi_2'(D_2) = 0, \cdots p - \phi_n'(D_n) = 0.$$

Jules Dupuit (1804—1866)

(1844) « De la mesure de l'utilité des travaux publics », *Annales des ponts et chaussées: Mémoires et documents*, 2 (116)

Hermann Heinrich Gossen (1810—1858)

Entwickelung der Gesetze

des

menschlichen Verkehrs,

und der daraus fließenden

Regeln für menschliches Handeln

von

Hermann Heinrich Gossen,

Königlich preußischen Regierungs-Assessor außer Dienst.

Braunschweig,
Druck und Verlag von Friedrich Vieweg und Sohn.
1 8 5 4.

UN ÉCONOMISTE INCONNU[1]
HERMANN-HENRI GOSSEN

JOURNAL DES ÉCONOMISTES.

4º SÉRIE, T. XXX. — 15 *avril* 1885.

LÉON WALRAS.

The Laws of Human Relations and the Rules of Human Action Derived Therefrom. By Hermann Heinrich Gossen. Translated by Rudolph C. Blitz with an introductory essay by Nicholas Georgescu-Roegen. Cambridge: M.I.T. Press, 1983. Pp. 460.

THE

THEORY OF POLITICAL ECONOMY.

W. STANLEY JEVONS,

London:
MACMILLAN AND CO.
1879.

From this statement it is quite apparent that Gossen has completely anticipated me as regards the general principles and method of the theory of Economics. So far as I can gather, his treatment of the fundamental theory is even more general and thorough than what I was able to scheme out. In discussing the book, I lie under the serious difficulty of not being able to read it;

Hermann Heinrich Gossen (1810—1858)

Freude, schöner Götterfunken,
  Tochter aus Elysium,
Wir betreten feuertrunken,
  Himmlische, dein Heiligthum.
Deine Zauber binden wieder,
  Was die Mode streng getheilt;
Alle Menschen werden Brüder,
Wo dein sanfter Flügel weilt.

Chor.
Seid umschlungen, Millionen!
  Diesen Kuß der ganzen Welt!
  Brüder — über'm Sternenzelt
Muß ein lieber Vater wohnen.
Schiller.

Vorrede.

Auf den folgenden Blättern übergebe ich der öffentlichen Beurtheilung das Resultat eines 20jährigen Nachdenkens.

Was einem Kopernikus zur Erklärung des Zusammenseins der Welten im Raum zu leisten gelang, das glaube ich für die Erklärung des Zusammenseins der Menschen auf der Erdoberfläche zu leisten. Ich glaube, daß es mir gelungen ist, die Kraft, und in großen Umrissen das Gesetz ihrer Wirksamkeit zu entdecken, welche das Zusammensein der Menschen möglich macht, und die Fortbildung des Menschengeschlechts unaufhaltsam bewirkt. Und wie die Entdeckungen jenes Mannes es möglich machten, die Bahnen der Weltkörper auf unbeschränkte Zeit zu bestimmen; so glaube ich mich durch meine Entdeckungen in den Stand gesetzt, dem Menschen mit untrüglicher Sicherheit die Bahn zu bezeichnen, die er zu wandeln hat, um seinen Lebenszweck in vollkommenster Weise zu erreichen.
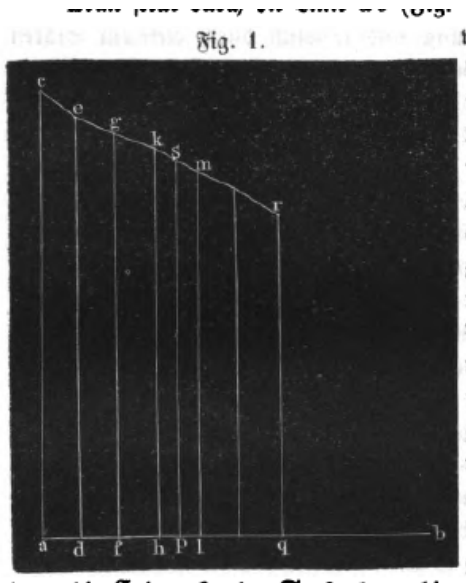
Es muß das Genießen so eingerichtet werden, daß die Summe des Genusses des ganzen Lebens ein Größtes werde.

Allocation of pleasures, so that the sum of the pleasures of the whole life is maximum
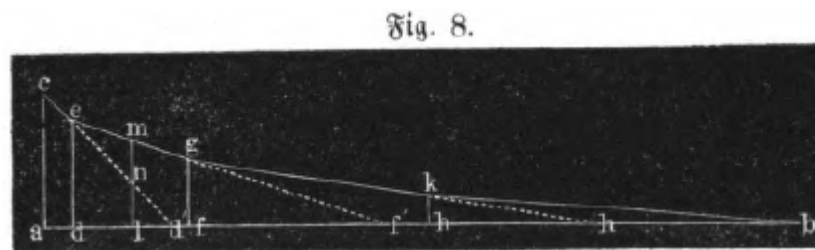
Hermann Heinrich Gossen (1810—1858)

Gossen's 1st Law:
Diminishing marginal
utility

Gossen's 2nd Law:
The ratio of marginal utilities and
prices is the same for all goods

$$\frac{\partial U/\partial x_i}{p_i} = \frac{\partial U/\partial x_j}{p_j} \; \forall\, (i,j)$$

Division of time

Marginalist revolution

- W. Stanley Jevons (1835-1882)

- Carl Menger (1840-1921)

- Léon Walras (1834-1910)

Marginalist revolution

THE

THEORY OF POLITICAL ECONOMY.

BY

W. STANLEY JEVONS, M.A. (LOND.)
PROFESSOR OF LOGIC AND POLITICAL ECONOMY
IN OWENS COLLEGE, MANCHESTER.

London and New York
MACMILLAN AND CO.
1871.

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GRUNDSÄTZE

DER

VOLKSWIRTHSCHAFTSLEHRE.

VON

Dᴿ CARL MENGER.

WIEN 1871.
WILHELM BRAUMÜLLER
K. K. HOF- UND UNIVERSITÄTSBUCHHÄNDLER.

ÉLÉMENTS

D'ÉCONOMIE POLITIQUE

PURE

OU

THÉORIE DE LA RICHESSE SOCIALE

PAR

LÉON WALRAS
Professeur d'Economie politique à l'Académie de Lausanne.

LAUSANNE
IMPRIMERIE L. CORBAZ & Cⁱᵉ, ÉDITEURS

PARIS
GUILLAUMIN & Cⁱᵉ, ÉDITEURS
11, rue Richelieu.

BALE
H. GEORG, LIBRAIRE-ÉDITEUR
Même maison à Genève.

1874
Tous droits réservés.

W. Stanley Jevons (1835—1882)

by William Stanley Jevons
albumen print on paper mount, 1858, NPG

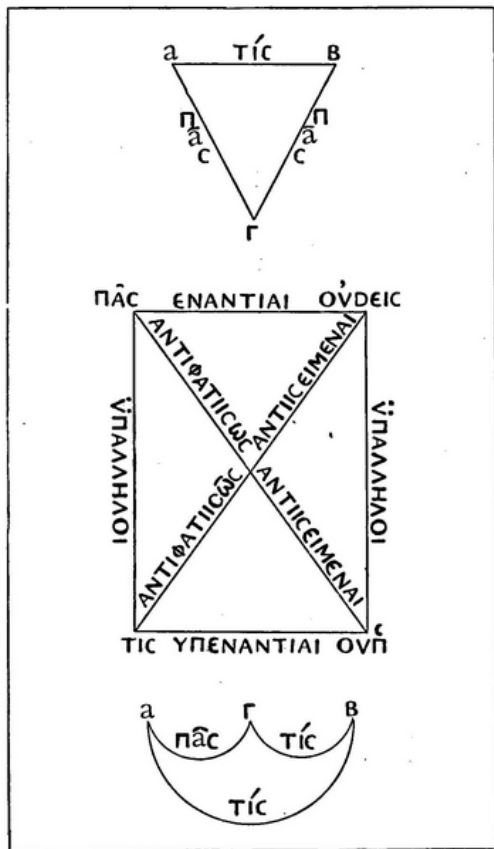Professor of Political Economy at University College, London

W. Stanley Jevons (1835—1882)

1862. "A General Mathematical Theory of Political Economy"
1863. *A Serious Fall in the Value of Gold*, Edward Stanford.
1864. *Pure Logic; or, the Logic of Quality apart from Quan*tity, Edward Stanford
1865. *The Coal Question*, Macmillan
1869. *The Substitution of Similars, The True Principle of Reasoning*, Macmillan
1870. *Elementary Lessons on Logic*, Macmillan
1871. *The Match Tax: A Problem in Finance*, Edward Stanford.
1871. ***The Theory of Political Economy*, Macmillan**
1874. *Principles of Science*, Macmillan
1875. *Money and the Mechanism of Exchange*, D. Appleton
1878. *A Primer on Political Economy*, Macmillan
1880. *Studies in Deductive Logic*, Macmillan
1882. *The State in Relation to Labour*, Macmillan
1883. *Methods of Social Reform and Other Papers*, Macmillan

W. Stanley Jevons (1835—1882)

ANCIENT LOGICAL DIAGRAMS. See Preface, *ad finem.*

STUDIES

IN

DEDUCTIVE LOGIC.

A Manual for Students.

BY

W. STANLEY JEVONS,

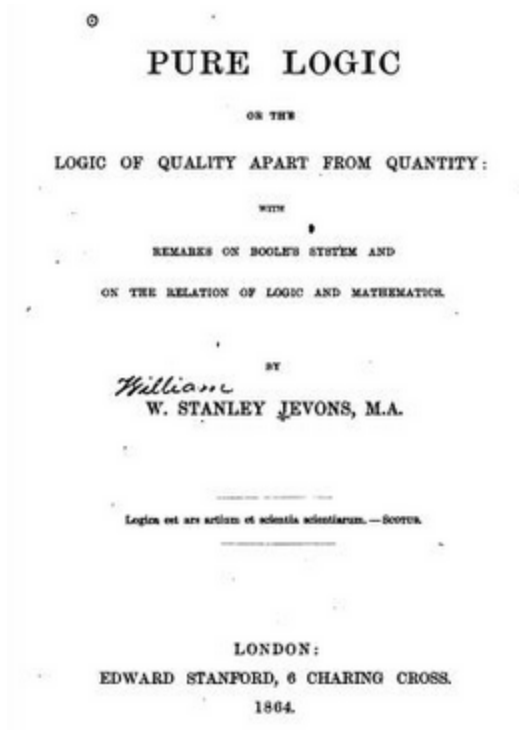LL.D. (Edinb.), M.A. (Lond.), F.R.S.

London:
MACMILLAN AND CO.
1880.

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W. Stanley Jevons (1835—1882)

Jevons' Logic Machine or Logic 'Piano'.
Museum of the History of Science, Oxford.

W. Stanley Jevons (1835—1882)

BRITISH ASSOCIATION, 1862.

THIRTY-SECOND *Meeting of the* BRITISH ASSOCIATION *for the Advancement of Science, held at* CAMBRIDGE, *1st—8th October,* 1862.

Section (F).—*Economic Science and Statistics.*

Tuesday, 7th October, 1862.

The President.—On the Subject Matters and Methods of Competitive Examinations for the Public Service.

Rev. William Emery, B.D.—On the Expenses and Social Condition of University Education.

Henry Roberts, F.S.A.—Statistics which show the Increasing Circulation of a Pure and Instructive Literature adapted to the Capacities and the Means of the Labouring Population.

Rev. W. N. Molesworth, M.A.—On the Instruction and Training of the Unemployed in the Manufacturing Districts during the present Crisis.

W. Stanley Jevons, M.A.—Notice of a General Mathematical Theory of Political Economy.

W. Stanley Jevons, M.A.—On the Study of Periodic Commercial Fluctuations.

Edwin Hill.—On the Prevention of Crime.

Notice of a General Mathematical Theory of Political Economy.
By W. S. Jevons, M.A.

1. The main problem of economy may be reduced to a rigorous mathematical form, and it is only the absence of exact data for the inductive determination of its laws or functions which will always prevent it from becoming an exact science.

2. A true theory of economy can only be attained by going back to the springs of human action—the *feelings of pleasure and pain* which accompany our common wants, and the satisfaction of those wants by labour exerted to that purpose. These feelings are the commonest motives of action; but other motives of a moral or religious nature must be recognized by the economist as outstanding and disturbing forces of his problem.

3. Feelings of pleasure and pain vary in *intensity* and in *duration*. They have two dimensions. The *quantity* of feeling, therefore, resembles an *area*, and is got by integration of the function which expresses the relation of the intensity to the duration.

4. Pleasure and pain are opposed as positive and negative quantities.

5. Anticipation of future pleasure or pain gives a less degree of present feeling, related to the anticipated feeling by some vague function of the intervening time, peculiar to each person's character.

6. A *useful object* is that which causes pleasure, either by present use or by expectation of its future use.

7. *Amount of utility* corresponds to amount of pleasure produced. The use or

consumption of successive equal increments of a useful substance does not usually produce equal increments of pleasure, but the *ratio of utility* on the last increment usually decreases as some function of the whole quantity consumed. Let this be called the *final ratio of utility*.

8. Labour is accompanied by pain, and will be exerted both in intensity and duration until a further increment will be more painful than the increment of produce thereby obtained is pleasurable.

9. The abilities of two men in producing the same or of one man in producing general kinds of useful objects are very various, contrary to the erroneous assumption of Ricardo.
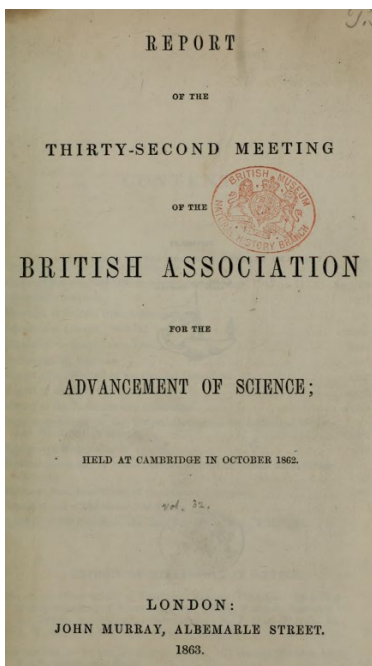
10. When two persons, each possessing a known quantity of a commodity or useful substance capable of division into small quantities, exchange with each other, the unknown quantities which pass between them are determined by *two equations*, involving the known quantities of commodity previously possessed and the functions expressing the final ratios of utility of those commodities. It is also a necessary condition of the exchange that any portions of the commodities, and therefore the last small portions, are exchanged in the same ratio as the whole quantities.

11. When there are more than two persons or commodities, a simple law of combinations gives the numbers of equations which will determine all the quantities passing in exchange. The whole system of trade, howsoever extensive, is thus theoretically represented by a system of equations.

12. When the quantities of commodities are considered as produced by labour under the conditions stated in (8), a new set of equations will determine, in conjunction with the equations of exchange, the new set of unknown quantities introduced. Any system of production and trade is thus theoretically represented.

13. *Capital* is defined to be simply *maintenance of labourers while they are awaiting the results of labour employed in a manner which does not give immediate returns.* As maintenance may be applied indifferently to any branch of industry, the interest of all (free) capital is the same. The interest is determined by the ratio which a new increment of produce bears to the increment of capital by which it was produced. It is shown to be a simple mathematical result of the above conditions that the interest of capital always tends to fall rapidly as its quantity in proportion to labour increases.

14. When the remaining parts of the theory are completed, it will probably be shown that the *rate of wages* is the average produce of labour after deduction of rent, interest, profit, insurance, and taxation. These are so many payments which the labourer makes for peculiar advantages enjoyed.

REPORT

OF THE

THIRTY-SECOND MEETING

OF THE

BRITISH ASSOCIATION

FOR THE

ADVANCEMENT OF SCIENCE;

HELD AT CAMBRIDGE IN OCTOBER 1862.

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1863.

W. Stanley Jevons (1835—1882)

The MATHEMATICAL THEORY *of* POLITICAL ECONOMY.

THE following paper was read by Professor W. Stanley Jevons, M.A., at the opening night of the present session of the Manchester Statistical Society. A similar topic was brought under the notice of Section F of the British Association by the same writer in 1862, as a "Notice of a General Mathematical Theory of Political Economy." The subject of the present paper was " The Progress of the Mathe- " matical Theory of Political Economy, with an Explanation of the " Principles of the Theory."

Journal of the Statistical Society of London,
Vol. 37, No. 4 (Dec., 1874), pp. 478-488

In our own subject of political economy, it has been much too commonly assumed that Adam Smith founded the science, that Ricardo systematised it, and that Mill finally expounded it in a nearly perfect form. An orthodox economical creed has thus been established, and all who can call its truth in question are too likely to be treated as noxious heretics, or, at the least, as harmless crotcheteers. But in spite of all danger of being thus regarded, I maintain that it is only by going back and reconsidering the primary notions of the science that we can arrive at a true theory of economy, and be enabled to distinguish between the true and the false in ancient doctrines. It is probably a mistake to put forward the new views of the science as forming specially a mathematical
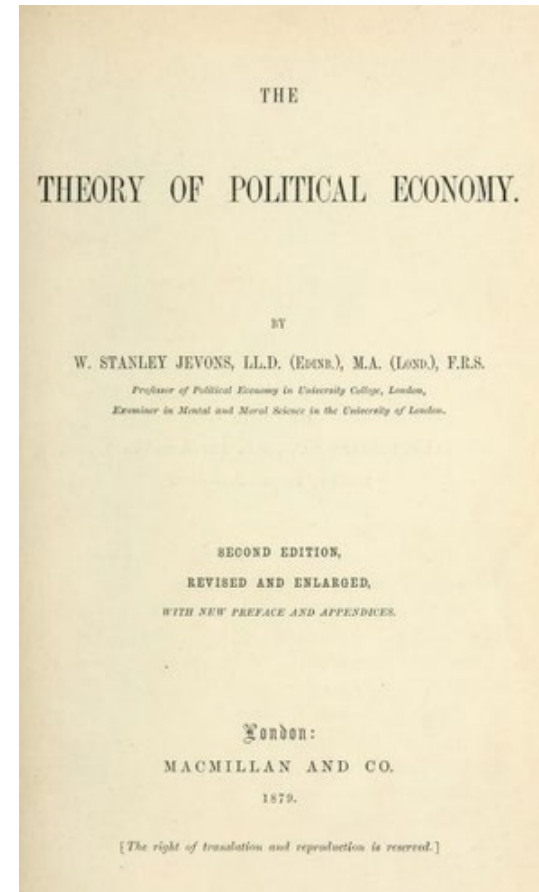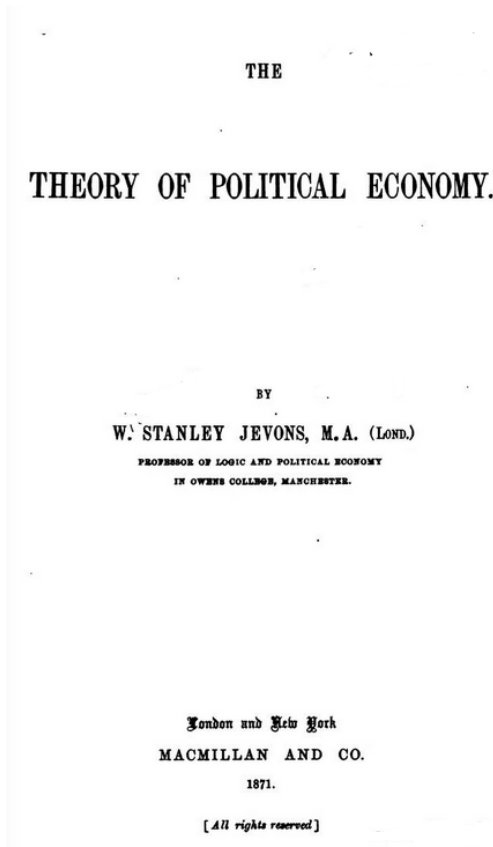
480 JEVONS—*The Mathematical* [Dec.

theory. In truth, there is nothing more theoretical, and but little more mathematical, in the views of M. Walras, M. d'Aulnis, and myself than in the ordinary doctrines. The laws of political economy must be mathematical for the most part, because they deal with quantities and the relations of quantities. If we turn to the explanations given of the principal elements of the subject in any of the chief authors, we shall find that they deal continually with quantities. Adam Smith says, " The value of any commodity

W. Stanley Jevons (1835—1882)

W. Stanley Jevons (1835—1882)

to Bastiat and Courcelle-Seneuil. The conclusion to which I am ever more clearly coming is that the only hope of attaining a true system of Economics is to fling aside, once and for ever, the mazy and preposterous assumptions of the Ricardian School. Our English Economists have been living in a fool's paradise. The truth is with the French School, and the sooner we recognise the fact, the better it will be for all the world, except perhaps the few writers who are too far committed to the old erroneous doctrines to allow of renunciation.
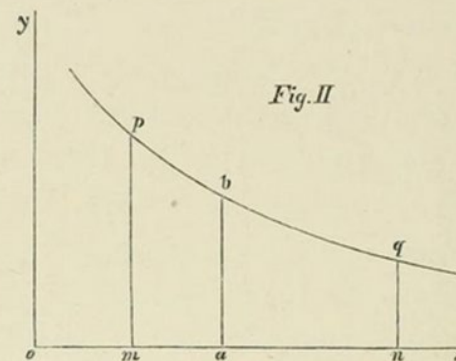
W. Stanley Jevons (1835—1882)

Pleasure and Pain as Quantities.

PROCEEDING to consider how pleasure and pain can be estimated as magnitudes, we must undoubtedly accept what Bentham has laid down upon this subject. 'To a person,' he says[a], 'considered *by himself*, the value of a pleasure or pain, considered *by itself*, will be greater or less according to the four following circumstances :—

    (1) Its *intensity*.
    (2) Its *duration*.
    (3) Its *certainty* or *uncertainty*.
    (4) Its *propinquity* or *remoteness*.

[a] 'An Introduction to the Principles of Morals and Legislation,' 2nd Ed., 1823, vol. i. p. 49. The earliest writer, who, so far as I know, has treated Pleasure and Pain in a definitely quantitative manner, is Francis Hutcheson, in his 'Essay on the Nature and Conduct of the Passions and Affections,' 1728, pp. 34–43, 126, etc.

character. In Fig. II the height of each point of

Fig. II

the curve *pq*, above the horizontal line *ox*, indicates the intensity of feeling in a moment of time; and the whole quantity of feeling generated in the time *mn* is measured by the area bounded by the lines *pm*, *qn*, *mn*, and *pq*. The feeling belonging to any other time, *ma*, will be measured by the space *mabp* cut off by the perpendicular line *ab*.
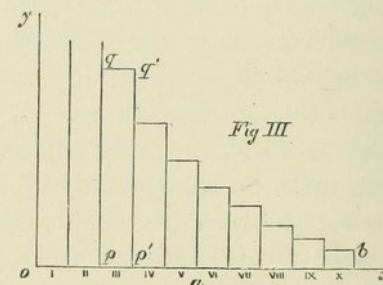
W. Stanley Jevons (1835—1882)

All that we can say, then, is, that water, up to a certain quantity, is indispensable; that further quantities will have various degrees of utility; but that beyond a certain quantity the utility sinks gradually to zero; it may even become negative, that is to say, further supplies of the same substance may become inconvenient and hurtful.
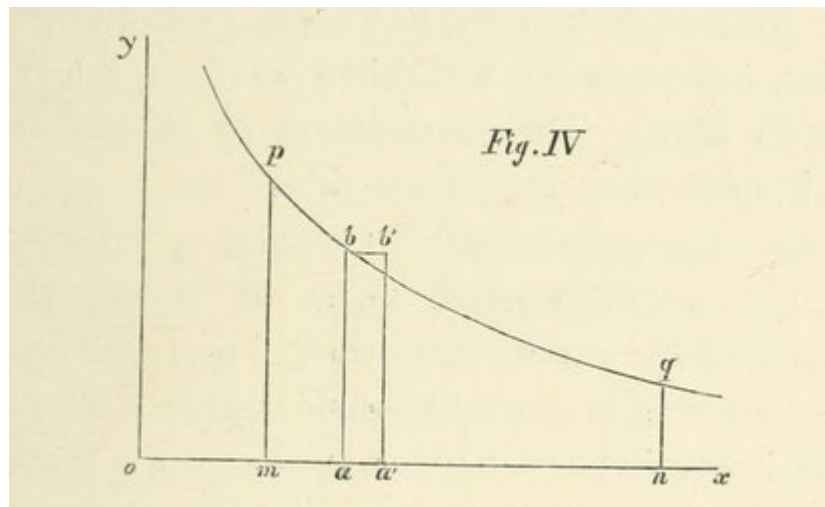
Exactly the same considerations apply more or less clearly to every other article. A pound of bread per day supplied to a person saves him from starvation, and has the highest conceivable utility. A second pound per day has also no slight utility: it keeps him in a state of comparative plenty, though it be not altogether indispensable. A third pound would begin to be superfluous. It is clear, then, that *utility is not proportional to commodity*: the very same articles vary in utility according as we already possess more or less of the same article.

Let the line *ox* be used as a measure of the quantity of food, and let it be divided into ten equal parts to correspond to the ten portions of food mentioned above. Upon these equal lines are constructed rectangles, and the area of each rectangle may be assumed to represent the utility of

Fig III

the increment of food corresponding to its base. Thus the utility of the last increment is small, being proportional to the small rectangle on x. As we approach towards *o*, each increment bears a larger rectangle, that standing upon III being the largest complete rectangle. The utility of the

W. Stanley Jevons (1835—1882)

Fig. IV

Total Utility and Degree of Utility.

We are now in a position to appreciate perfectly the difference between the *total utility* of any commodity and *the degree of utility* of the commodity at any point. These are, in fact, quantities of altogether different kinds, the first being represented by an area, and the second by a line. We must consider how we may express these notions in appropriate mathematical language.

to the quantity of commodity *x*. *The degree of utility is,* in mathematical language, *the differential coefficient of u considered as a function of x,* and will itself be another function of *x*.

in economic problems. We may state as a general law, that *the degree of utility varies with the quantity of commodity, and ultimately decreases as that quantity increases.* No commodity can be named which

W. Stanley Jevons (1835—1882)

The Law of Indifference.

would be a valid ground of choice. Hence follows what is undoubtedly true, with proper explanations, that *in the same open market, at any one moment, there cannot be two prices for the same kind of article.* Such differences as may practically occur arise from extraneous circumstances, such as the defective credit of the purchasers, their imperfect knowledge of the market, and so on.

The Theory of Exchange.

The keystone of the whole Theory of Exchange, and of the principal problems of Economics, lies in this proposition—*The ratio of exchange of any two commodities will be the reciprocal of the ratio of the final degrees of utility of the quantities of commodity available for consumption after the exchange is completed.* When the reader has reflected a little

W. Stanley Jevons (1835—1882)

Hence, substituting for the second member by the equation given on p. 103, we have

$$\frac{\phi_1 (a - y)}{\psi_1 y} = \frac{y}{x}.$$

What holds true of A will also hold true of B, *mutatis mutandis.* He must also derive exactly equal utility from the final increments, otherwise it will be for his interest to exchange either more or less, and he will disturb the conditions of exchange. Accordingly the following equation must hold true—

$$\psi_2 (b - y) \,.\, dy = \phi_2 x \,.\, dx \,;$$

or, substituting as before,

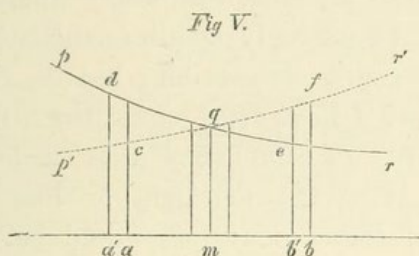$$\frac{\phi_2 x}{\psi_2 (b - y)} = \frac{y}{x}.$$

We arrive, then, at the conclusion, that whenever two commodities are exchanged for each other, and *more or less can be given or received in infinitely small quantities,* the quantities exchanged satisfy two equations, which may be thus stated in a concise form—

$$\frac{\phi_1 (a - x)}{\psi_1 y} = \frac{y}{x} = \frac{\phi_2 x}{\psi_2 (b - y)} \,.$$

W. Stanley Jevons (1835—1882)

line $p'qr'$ is the like curve of another commodity which has been reversed and superposed on the other. Owing to this reversal, the quantities of the first commodity are measured along the base

Fig V.

line from a towards b, whereas those of the second must be measured in the opposite direction. Let units of both commodities be represented by equal lengths: then the little line $a'a$ indicates an increase of the first commodity, and a decrease of the second. Assume the ratio of exchange to be that of unit for unit, or 1 to 1: then, by receiving the commodity $a'a$ the person will gain the utility ad, and lose the utility $a'c$; or he will make a net gain of the utility corresponding to the mixtilinear figure cd. He will, therefore, wish to extend the

Let us now suppose that the first body, A, originally possessed the quantity a of corn, and that the second body, B, possessed the quantity b of beef. As the exchange consists in giving x of corn for y of beef, the state of things after exchange will be as follows :—

A holds $a-x$ of corn, and y of beef.

B holds x of corn, and $b-y$ of beef.

Let $\phi_1(a-x)$ denote the final degree of utility of corn to A, and $\phi_2 x$ the corresponding function for B. Also let $\psi_1 y$ denote A's final degree of utility for beef, and $\psi_2(b-y)$ B's similar function. Then, as explained on p. 104, A will not be satisfied unless the following equation holds true—
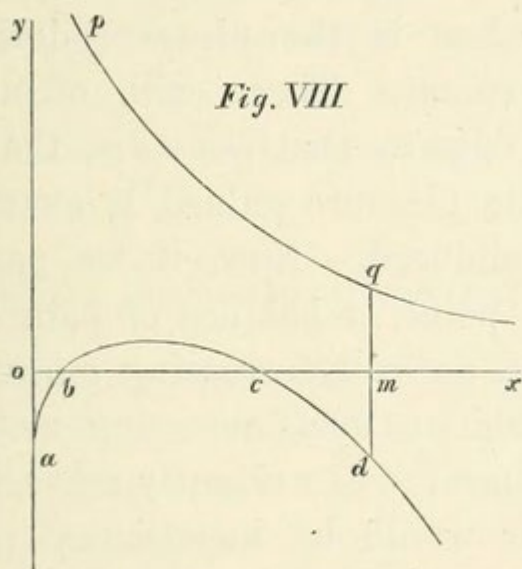
$$\phi_1(a-x) \cdot dx = \psi_1 y \cdot dy;$$

or

$$\frac{\phi_1(a-x)}{\psi_1 y} = \frac{dy}{dx}.$$
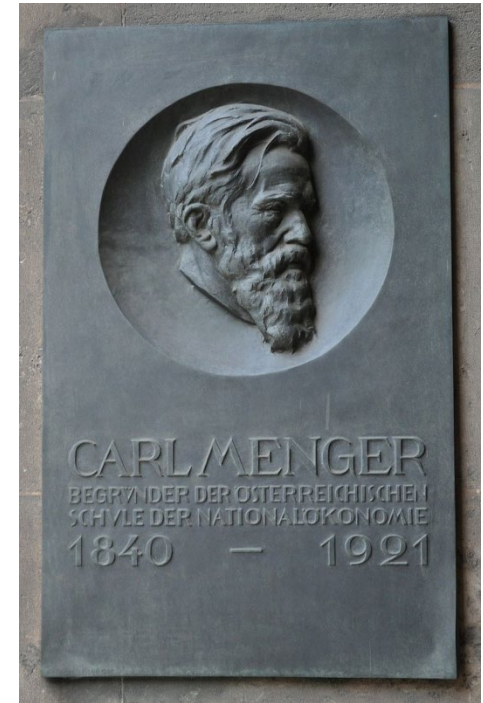
W. Stanley Jevons (1835—1882)

Fig. VIII

CHAPTER V.

THEORY OF LABOUR.

But intensity of labour may have more than one meaning; it may mean the quantity of work done, or the painfulness of the effort of doing it. These two things must be carefully distinguished, and both are of great importance for the theory. The one is the reward, the other the penalty, of labour. Or rather, as the produce is only of interest to us so far as it possesses utility, we may say that there are three quantities involved in the theory of labour—the amount of painful exertion, the amount of produce, and the amount of utility gained. The variation of utility, as depending on the quantity of commodity possessed, has already been considered; the variation of the amount of produce will be treated in the next chapter; we will here give attention to the variation of the painfulness of labour.

Carl Menger (1840—1921)

Carl Menger (1840—1921)

Titles

Grundsätze der Volkswirtschaftslehre
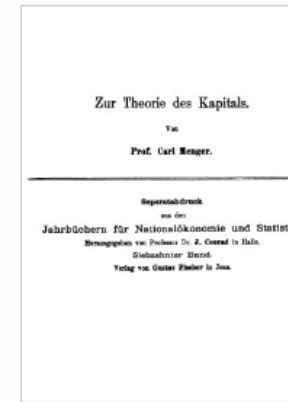Carl Menger

Grundzüge einer Klassifikation der Wirtschaftwissenschaften
Carl Menger

Die Irrthümer des Historismus in der deutschen Nationalökonomie
Carl Menger

Zur Kritik der Politischen Oekonomie
Carl Menger

Zur Theorie des Kapitals
Carl Menger

Untersuchungen über die Methode der Sozialwissenschaften
Carl Menger

https://oll.libertyfund.org/people/carl-menger/titles

Carl Menger (1840—1921)

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08/24/1934 · Carl Menger

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Carl Menger (1840—1921)

GRUNDSÄTZE

DER

VOLKSWIRTHSCHAFTSLEHRE.

———

VON

Dᵣ CARL MENGER.

———

WIEN 1871.
WILHELM BRAUMÜLLER
K. K. HOF- UND UNIVERSITÄTSBUCHHÄNDLER.

Ueber das Wesen der Güter. 3

Damit ein Ding ein Gut werde, oder mit andern Worten, damit es die Güterqualität erlange, ist demnach das Zusammentreffen folgender vier Voraussetzungen erforderlich:

1. Ein menschliches Bedürfniss.
2. Solche Eigenschaften des Dinges, welche es tauglich machen, in ursächlichen Zusammenhang mit der Befriedigung dieses Bedürfnisses gesetzt zu werden.
3. Die Erkenntniss dieses Causal-Zusammenhanges Seitens der Menschen.
4. Die Verfügung über dies Ding, so zwar, dass es zur Befriedigung jenes Bedürfnisses thatsächlich herangezogen werden kann.

Carl Menger (1840—1921)

PRINCIPLES OF ECONOMICS

Carl Menger

FOREWORD BY PETER G. KLEIN
INTRODUCTION BY F.A. HAYEK

TRANSLATED BY
JAMES DINGWALL AND BERT F. HOSELITZ

Ludwig von Mises Institute
AUBURN, ALABAMA

If a thing is to become a good, or in other words, if it is to acquire goods-character, all four of the following prerequisites must be simultaneously present:

1. A human need.
2. Such properties as render the thing capable of being brought into a causal connection with the satisfaction of this need.
3. Human knowledge of this causal connection.
4. Command of the thing sufficient to direct it to the satisfaction of the need.

Only when all four of these prerequisites are present simultaneously can a thing become a good. When even one of them is absent, a thing cannot acquire goods-character,[3] and a thing already possessing goods-character would lose it at once if but one of the four prerequisites ceased to be present.[4]

Carl Menger (1840—1921)

Μετάφραση: Βασίλειος Ν. Γαργάλας
Αθήνα, Ηρόδοτος, 2007

Carl Menger (1840—1921)

§. 2.

Ueber den Causal-Zusammenhang der Güter.

Der Kreis der Dinge, deren Güterqualität wir anerkennen, ist jedoch hiemit nicht abgeschlossen. Neben diesen Gütern, die wir um der Kürze des Ausdruckes willen im weiteren Verlauf der Darstellung: „Güter der ersten Ordnung" nennen werden, begegnen wir vielmehr in der Wirthschaft der Menschen einer grossen Anzahl anderer Dinge, die in keinerlei unmittelbaren Causal-Zusammenhang mit der Befriedigung unserer Bedürfnisse gesetzt werden können, und deren Güterqualität doch nicht minder feststeht als jene der Güter erster Ordnung. So sehen wir auf unseren Märkten neben dem Brote, und unter anderen zur unmittelbaren Befriedigung menschlicher Bedürfnisse tauglichen Gütern, auch Quantitäten von Mehl, Brennstoffen, Salz; wir

hiezu geeignet sind. In gleicher Weise verhält es sich aber mit tausend anderen Dingen, die ohne die Tauglichkeit zu besitzen, in unmittelbarer Weise menschliche Bedürfnisse zu befriedigen, doch zur Hervorbringung von Gütern erster Ordnung dienen und so in einen mittelbaren Causal-Zusammenhang mit der Befriedigung menschlicher Bedürfnisse gesetzt werden können. Es ist aber damit zugleich auch dargethan, dass das Verhältniss, welches die Güterqualität dieser und ähnlicher Dinge, die wir Güter zweiter Ordnung nennen, begründet, seinem Wesen nach ganz dasselbe ist, wie das der Güter erster Ordnung, denn der hier obwaltende Unterschied, dass die Güter erster Ordnung in unmittelbarer, die Güter zweiter Ordnung aber in mittelbarer Causal-Beziehung zur Befriedigung unserer Bedürfnisse stehen, bewirkt keinen Unterschied in dem Wesen jenes Verhältnisses, weil die Voraussetzung der Güterqualität wohl der Causal-Zusammenhang, nicht aber nothwendigerweise der unvermittelte Causalnexus zwischen den Dingen und der Befriedigung menschlicher Bedürfnisse ist.

Goods of 1st, 2nd, 3rd, etc. order

Carl Menger (1840—1921)

2.

The Causal Connections Between Goods

Our well-being at any given time, to the extent that it depends upon the satisfaction of our needs, is assured if we have at our disposal the goods required for their direct satisfaction. If, for example, we have the necessary amount of bread, we are in a position to satisfy our need for food directly. The causal connection between bread and the satisfaction of one of our needs is thus a direct one, and a testing of the goods-character of bread according to the principles laid down in the preceding section presents no difficulty. The same applies to all other goods that may be used directly for the satisfaction of our needs, such as beverages, clothes, jewelry, etc.

But we have not yet exhausted the list of things whose goods-character we recognize. For in addition to goods that serve our needs directly (and which will, for the sake of brevity, henceforth be called "goods of first order") we find a large number of other things in our economy that cannot be put in any direct causal connection with the satisfaction of our needs, but which possess goods-character no less certainly than goods of first order. In our markets, next to bread and other goods capable of satisfying human needs directly, we also see quantities of flour, fuel, and salt. We find that implements and tools for the production of bread, and the skilled labor services necessary for their use, are regularly traded. All these things, or at any rate by far the greater number of them, are incapable of satisfying human needs in any direct way—for what human need could be satis-fied by a specific labor service of a journeyman baker, by a baking utensil, or even by a quantity of ordinary flour? That these things are nevertheless treated as goods in human economy, just like goods of first order, is due to the fact that they serve to produce bread and other goods of first order, and hence are indirectly, even if not directly, capable of satisfying human needs. The same is true of thousands of other things that do not have the capacity to satisfy human needs directly, but which are nevertheless used for the production of goods of first order, and can thus be put in an indirect causal connection with the satisfaction of human needs. These considerations prove that the relationship responsible for the goods-character of these things, which we will call goods of *second* order, is fundamentally the same as that of goods of first order. The fact that goods of first order have a direct and goods of second order an indirect causal relation with the satisfaction of our needs gives rise to no difference in the essence of that relationship, since the requirement for the acquisition of goods-character is the existence of some causal connection, but not necessarily one that is direct, between things and the satisfaction of human needs.

At this point, it could easily be shown that even with these goods we have not exhausted the list of things whose goods-character we recognize, and that, to continue our earlier example, the grain mills, wheat, rye, and labor services applied to the production of flour, etc., appear as goods of *third* order, while the fields, the instruments and appliances necessary for their cultivation, and the specific labor services of farmers, appear as goods of *fourth* order. I think, however, that the idea I have been presenting is already sufficiently clear.

Goods of 1st, 2nd, 3rd, etc. order

Carl Menger (1840—1921)

Die zehn Scalen, die sich solcherart ergeben, sind in dem Folgenden veranschaulicht:

I	II	III	IV	V	VI	VII	VIII	IX	X
10	9	8	7	6	5	4	3	2	1
9	8	7	6	5	4	3	2	1	0
8	7	6	5	4	3	2	1	0	
7	6	5	4	3	2	1	0		
6	5	4	3	2	1	0			
5	4	3	2	1	0				
4	3	2	1	0					
3	2	1	0						
2	1	0							
1	0								
0									

Carl Menger (1840—1921)

The ten scales obtained in this way are given in the following table:[8]

I	II	III	IV	V	VI	VII	VIII	IX
10	9	8	7	6	5	4	3	2
9	8	7	6	5	4	3	2	1
8	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0	
6	5	4	3	2	1	0		
5	4	3	2	1	0			
4	3	2	1	0				
3	2	1	0					
2	1	0						
1	0							
0								

Suppose that the scale in column I expresses the importance to some one individual of satisfaction of his need for food, this importance diminishing according to the degree of satisfaction already attained, and that the scale in column V expresses similarly the importance of his need for tobacco. It is evident that satisfaction of his need for food, up to a certain degree of completeness, has a decidedly higher importance to this individual than satisfaction of his need for tobacco. But if his need for food is already satisfied up to a certain degree of completeness (if, for example, a further satisfaction of his need for food has only the importance to him that we designated numerically by the figure 6), consumption of tobacco begins to have the same importance to him as further satisfaction of his need for food. The individual will therefore endeavor, from this point on, to bring the satisfaction of his need for tobacco into equilibrium with satisfaction of his need for food. Although satisfaction of his need for food in general has a substantially higher importance to the individual in question than satisfaction of his need for tobacco, with the progressive satisfaction of the former a stage nevertheless comes (as is illustrated in the table) at which further acts of satisfaction of his need for food have a smaller

Carl Menger (1840—1921)

DIE

IRRTHÜMER DES HISTORISMUS

IN DER

DEUTSCHEN NATIONALÖKONOMIE.

Von

D⁎ CARL MENGER,
o. ö. PROFESSOR DER STAATSWISSENSCHAFTEN AN DER WIENER UNIVERSITÄT.

WIEN, 1884.
ALFRED HÖLDER,
K. K. HOF- UND UNIVERSITÄTS-BUCHHÄNDLER,
ROTHENTHURMSTRASSE 15.

Untersuchungen

über die

Methode der Socialwissenschaften,

und der

Politischen Oekonomie

insbesondere.

Von

Dr. Carl Menger,
o. ö. Professor der Staatswissenschaften an der Wiener Universität.

Leipzig,
Verlag von Duncker & Humblot.
1883.

ZUR KRITIK

DER

POLITISCHEN OEKONOMIE.

Von

PROF. KARL MENGER.

WIEN, 1887.
ALFRED HÖLDER,
K. K. HOF- UND UNIVERSITÄTS-BUCHHÄNDLER,
ROTHENTHURMSTRASSE 15.

Carl Menger (1840—1921)

Die Schriften von K. Menger und W. Dilthey zur Methodologie der Staats- und Sozial-Wissenschaften [1].
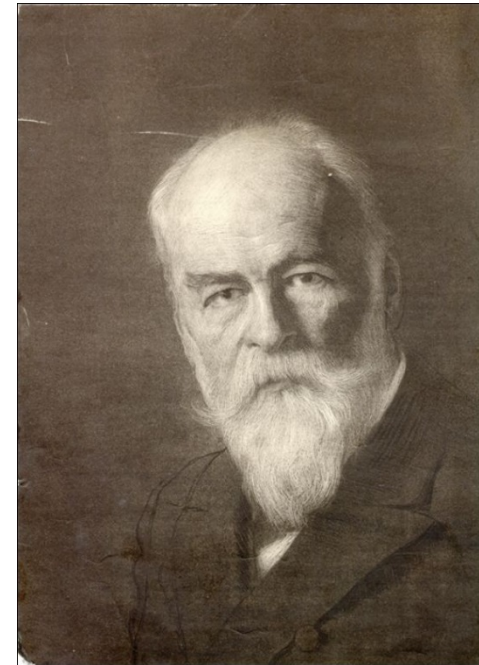
(1888.)

Die zwei Schriften, die ich hier nenne, liegen nach Richtung, Geistesart und Individualität der Autoren außerordentlich weit auseinander. Sie kamen für mich zunächst in die äußere Verbindung, daß ich sie beide in dem Augenblicke erhielt, als ich mich rüstete, nach längerer Unterbrechung meine Vorlesung über Methodologie der Staatswissenschaften wieder zu halten, und so Veranlassung nahm, sie beide nach einander zu lesen. Und da immerhin die innere Verbindung vorliegt, daß sie beide unseren Wissenschaften die Wege ebnen und weisen wollen, so schien es mir angezeigt, über sie zusammen zu berichten, wenn auch überwiegend in der bescheidenen Form einer Inhaltsanzeige, da mir zu einer erschöpfenden Besprechung und Erörterung der von beiden Schriftstellern aufgeworfenen Probleme die Zeit und bezüglich des Diltheyschen Buches auch noch manches andere fehlt. Nur bei Menger kann ich die Polemik nicht ganz zurückhalten, da seine Angriffe mich teilweise persönlich mittreffen.

[1] Menger, Dr. Karl, ordentlicher öff. Professor der Staatswissenschaften an der Wiener Universität, Untersuchungen über die Methode der Sozialwissenschaften und der politischen Ökonomie insbesondere. Leipzig 1883, Duncker & Humblot.
Dilthey, Wilhelm, Prof. der Philosophie an der Universität Berlin, Einleitung in die Geisteswissenschaften, Versuch einer Grundlegung für das Studium der Gesellschaft und der Geschichte. Erster Band. Leipzig 1883, Duncker & Humblot.

18*

Gustav von Schmoller (1838 – 1917)

Methodenstreit

Léon Walras (1834-1910)

Léon Walras (1834-1910)

ÉLÉMENTS

D'ÉCONOMIE POLITIQUE

PURE

OU

THÉORIE DE LA RICHESSE SOCIALE

PAR

LÉON WALRAS

Professeur d'Economie politique à l'Académie de Lausanne.

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Léon Walras (1834-1910)

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Léon Walras (1834-1910)

L'ÉCONOMIE POLITIQUE
ET
LA JUSTICE

EXAMEN CRITIQUE ET RÉFUTATION DES DOCTRINES ÉCONOMIQUES

M. P.-J. PROUDHON

PRÉCÉDÉS D'UNE
INTRODUCTION A L'ÉTUDE DE LA QUESTION SOCIALE

PAR
LÉON WALRAS

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Rue Richelieu, 14.
1860

DE L'IMPOT

DANS LE CANTON DE VAUD

PAR
LÉON WALRAS

MÉMOIRE

Auquel un quatrième accessit a été décerné ensuite du Concours ouvert par le Conseil d'Etat du canton de Vaud sur les questions relatives à l'impôt.
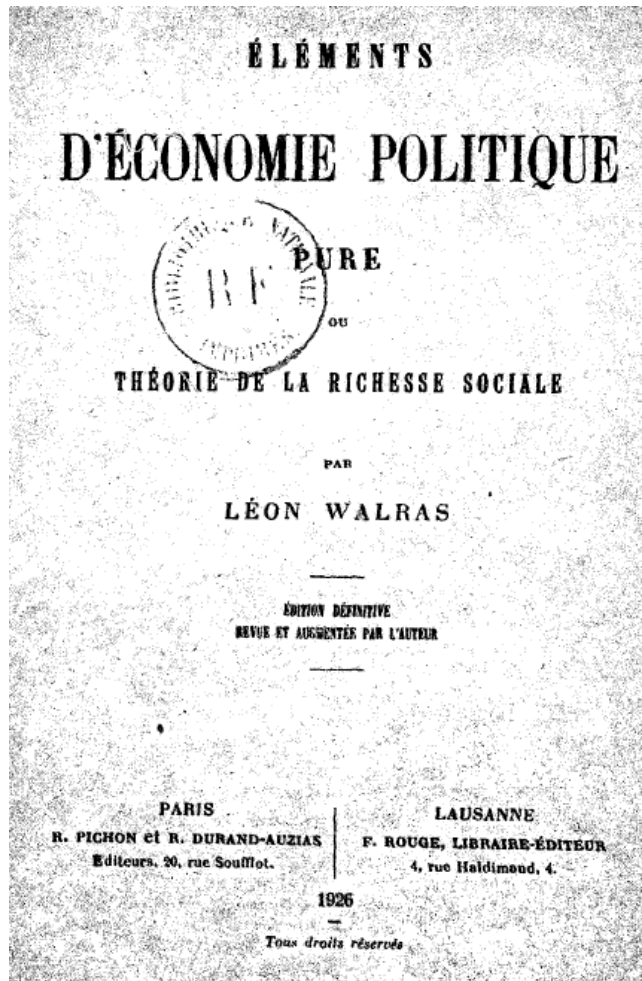
LAUSANNE
IMPRIMERIE DE LOUIS VINCENT
RUE DU PRÉ, 33
1861

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L'IMPOT

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RUE RICHELIEU, 14.
1861

Léon Walras (1834-1910)

ÉLÉMENTS

D'ÉCONOMIE POLITIQUE

PURE
OU

THÉORIE DE LA RICHESSE SOCIALE

PAR

LÉON WALRAS

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— XI

L'*économie politique pure* est essentiellement la théorie de la détermination des prix sous un régime hypothétique de libre concurrence absolue¹. L'ensemble de toutes les choses, matérielles ou immatérielles, qui sont susceptibles d'avoir un prix parce qu'elles sont *rares*, c'est-à-dire à la fois *utiles* et *limitées en quantité*, forme la *richesse sociale*. C'est pourquoi l'économie politique pure est aussi la *théorie de la richesse sociale.*

11ᵐᵉ LEÇON

Problème de l'échange de plusieurs marchandises entre elles.
Théorème de l'équilibre général.

Léon Walras (1834-1910)

Persons: $i=1,2,\ldots,n$
Goods: $j=1,2,\ldots,m$

Ainsi, nous sommes amenés à formuler de la manière sui-vante la loi d'établissement des prix d'équilibre dans le cas de l'échange de plusieurs marchandises entre elles avec interven-tion de numéraire : — *Plusieurs marchandises étant données, dont l'échange se fait avec intervention de numéraire, pour qu'il y ait équilibre du marché à leur égard, ou prix station-naire de toutes ces marchandises en numéraire, il faut et il suffit qu'à ces prix la demande effective de chaque marchandise soit égale à son offre effective. Lorsque cette égalité n'existe pas, il faut, pour arriver aux prix d'équilibre, une hausse du prix des marchandises dont la demande effective est supérieure à l'offre effective et une baisse du prix de celles dont l'offre effec-tive est supérieure à la demande effective.*

$$\overline{\mathbf{x}}^i = \left(\overline{x}_1^i \quad \ldots \quad \overline{x}_j^i \quad \ldots \quad \overline{x}_m^i \right)$$

Initial endowments of person i

Léon Walras (1834-1910)

$$\overline{\mathbf{X}} = \begin{bmatrix} \overline{x}_1^1 & \cdots & \overline{x}_j^1 & \cdots & \overline{x}_m^1 \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ \overline{x}_1^i & \cdots & \overline{x}_j^i & \cdots & \overline{x}_m^i \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ \overline{x}_1^n & \cdots & \overline{x}_j^n & \cdots & \overline{x}_m^n \end{bmatrix}$$

Crieur, auctioneer

$$\mathbf{p}^h = \begin{bmatrix} 1 & \cdots & p_j^h & \cdots & p_m^h \end{bmatrix}$$

Léon Walras (1834-1910)

$$\max_{x_j^i} U^i \left(x_1^i, \ldots, x_j^i \ldots, x_m^i \right)$$

$$subj. \quad \sum_{j=1}^{m} p_j^h \overline{x}_j^i \geq \sum_{1}^{m} p_j^h x_j^i$$

$$\overline{X}_j = \sum_{i=1}^{n} \overline{x}_j^i \neq X_j = \sum_{i=1}^{n} x_j^i$$

$$\mathbf{p}^k = \begin{bmatrix} 1 & \ldots & p_j^k & \ldots & p_m^k \end{bmatrix}$$

$$\overline{X}_j > X_j \Rightarrow p_j^h \downarrow$$

$$\overline{X}_j < X_j \Rightarrow p_j^h \uparrow$$

Tâtonnement
Numéraire

$$\mathbf{p}^* = \begin{bmatrix} 1 & \ldots & p_j^* & \ldots & p_m^* \end{bmatrix}$$

$$\overline{X}_j = \sum_{i=1}^{n} \overline{x}_j^i = X_j = \sum_{i=1}^{n} x_j^i \quad \forall j = 1, 2, \ldots, m$$

Léon Walras (1834-1910)

Entrepreneur: « Ni bénéfice, ni perte »

Bons (coupons, contingent contracts)

$$\max \pi^l = \sum_{j=1}^{m} p_j x_j^l - \sum_{k=1}^{q} p_k x_k^l = 0 \qquad \max U^i = \left(x_1^i, ..., x_j^i, ..., x_m^i \right)$$

Persons: $i=1,2,\ldots,n$

Goods: $j=1,2,\ldots,m$

Factors of production: $k=1,2,\ldots,q$

Entrepreneurs: $l=1,2,\ldots,r$

Subject to
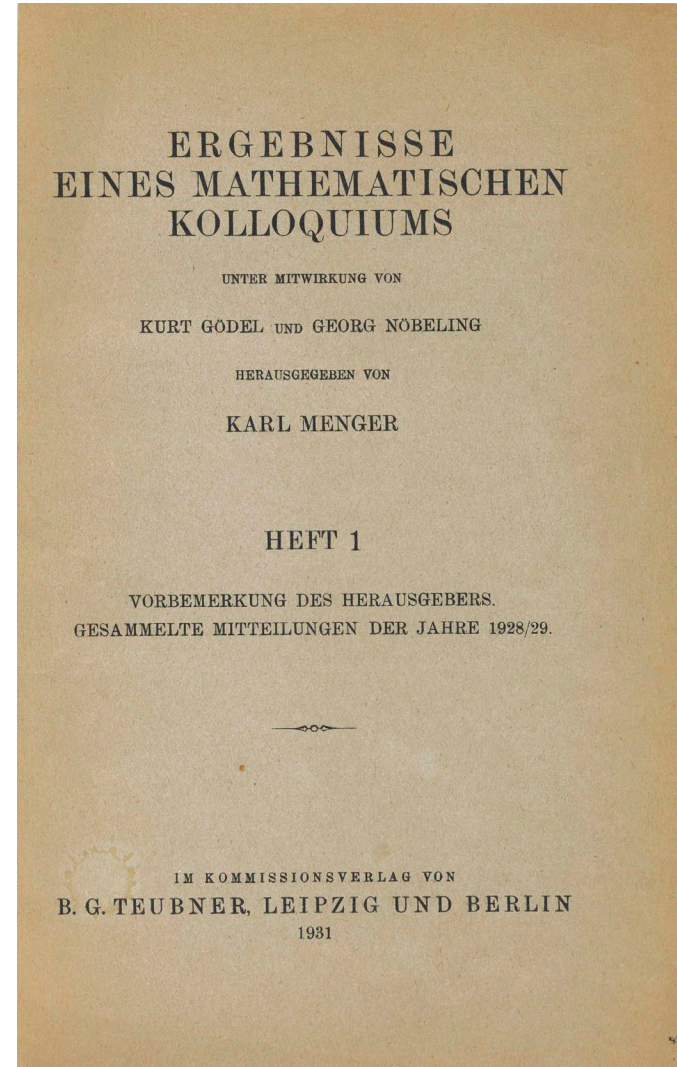
$$\sum_{j=1}^{m} p_j x_j^i \leq \sum_{k=1}^{q} p_k \overline{x}_k^i$$

Vienna Kolloquium 1928-1936

Karl Menger

Karl Menger
(1902-1985)

ERGEBNISSE
EINES MATHEMATISCHEN
KOLLOQUIUMS

UNTER MITWIRKUNG VON

KURT GÖDEL UND GEORG NÖBELING

HERAUSGEGEBEN VON

KARL MENGER

HEFT 1

VORBEMERKUNG DES HERAUSGEBERS.
GESAMMELTE MITTEILUNGEN DER JAHRE 1928/29.

IM KOMMISSIONSVERLAG VON
B. G. TEUBNER, LEIPZIG UND BERLIN
1931

Vienna Kolloquium 1928-1936

Abraham Wald
(1902-1950)

Kurt Gödel
(1906-1978)

John von Neumann
(1903-1957)

Karl Schlesinger
(1889 –1938)

Vienna Kolloquium 1928-1936

Wald: *Über die eindeutige positive Lösbarkeit der neuen Produktionsgleichungen.*

Theorem: *Das Gleichungssystem (Sch)*

$$r_i = \sum_{j=1}^{n} a_{ij} s_j + \ddot{u}_i \ (i=1,\ldots,m), \ \sigma_j = \sum_{i=1}^{m} a_{ij} \rho_i, \ \sigma_j = f_j(s_j), \ (j=1,\ldots,n),$$

in welchem die r_i und a_{ij}'' gegebene Zahlen, die f_j bekannte Funktionen, die $\ddot{u}_i, \rho_i, s_j, \sigma_j$ unbekannte Zahlen sind, besitzt, wenn folgende vier Annahmen gemacht werden:

1. $r_i > 0 \ (i=1,\ldots,m)$.

2. $a_{ij} \geqq 0 \ (i=1,\ldots,m; \ j=1,\ldots,n)$.

3. Zu jedem j $(j=1,\ldots,n)$ gibt es mindestens ein i $(i=1,\ldots,m)$, so daß $a_{ij} \neq 0$.

4. Für jede der Zahlen $j=1,\ldots,n$ ist die Funktion $f_j(s_j)$ für jeden positiven Wert von s_j definiert, nicht negativ, stetig und im schärferen Sinne monoton abnehmend, d. h. aus $s_j' < s_j$ folgt stets $f_j(s_j') > f_j(s_j)$; ferner gilt $\lim\limits_{s_j=0} f_j(s_j) = \infty$.

Bericht über des Kolloquium 1934/35.

80. Kollcquium (6. XI. 1934).

Über die Produktionsgleichungen der ökonomischen Wertlehre (II. Mitteilung). Von A. Wald.

In der ersten Mitteilung in Heft 6, S. 12, dieser Ergebnisse (im Folgenden mit PI zitiert) wurde von einem modifizierten System der Walras-Casselschen Produktionsgleichungen unter gewissen Voraussetzungen eindeutige nicht-negative Lösbarkeit nachgewiesen. In dieser Mitteilung wird die Lösbarkeit schon unter viel schwächeren Voraussetzungen bewiesen.

74. Kolloquium. (19. III. 1934.)

Karl Schlesinger (Wien): *Über die Produktionsgleichungen der ökonomischen Wertlehre.*

Zur Bestimmung der Preise der Produktionsmittel und der herzustellenden Mengen von Produkten auf Grund der gegebenen Mengen der Produktionsmittel und bekannter Daten (betreffend erstens die Arten produktiver Verwendungen der Produktionsmittel und zweitens die Abhängigkeit der Preise der Produkte von den produzierten Produktmengen) hat **Walras** ein Gleichungssystem aufgestellt, welches durch **Cassel** in einer vereinfachten Form popularisiert worden ist. Sind $R_1, \ldots, R_m$ Produktionsmittel, durch deren verschiedene Kombination n Produkte $S_1, \ldots, S_n$ hergestellt werden können, und zwar derart, daß, um eine Einheit des Produktes S_j zu produzieren, a_{1j} Einheiten des Produktionsmittels R_1, a_{2j} Einheiten des Produktionsmittels $R_2, \ldots$ und a_{mj} Einheiten des Produktionsmittels R_m verwendet werden müssen (für $j=1,2,\ldots,n$), und weiß man, daß der Preis einer Einheit des Produktes S_j, falls s_1 Einheiten von $S_1, \ldots, s_n$ Einheiten von S_n produziert werden, $f_j(s_1, \ldots, s_n)$ beträgt, stehen ferner dem Produzenten r_i Einheiten des Produktionsmittels R_i zur Verfügung $(i=1,\ldots,m)$, so lauten die $m+2n$

Vienna Kolloquium 1928-1936

Über ein ökonomisches Gleichungssystem
und eine Verallgemeinerung
des Brouwerschen Fixpunktsatzes.

Von J. v. Neumann (Princeton, N. J.).

Der Gegenstand dieser Note ist die Auflösung eines typischen ökonomischen Gleichungssystems. Dasselbe hat die folgenden Eigenschaften:

(1) Die Güter werden nicht bloß aus den „natürlichen Produktionsfaktoren", sondern in erster Linie *auseinander* hergestellt, u. zw. können die Produktionsprozesse *zirkelhaft* sein, d. h. Gut G_1 wird mit Hilfe von Gut G_2 erzeugt, und G_2 mit Hilfe von G_1.
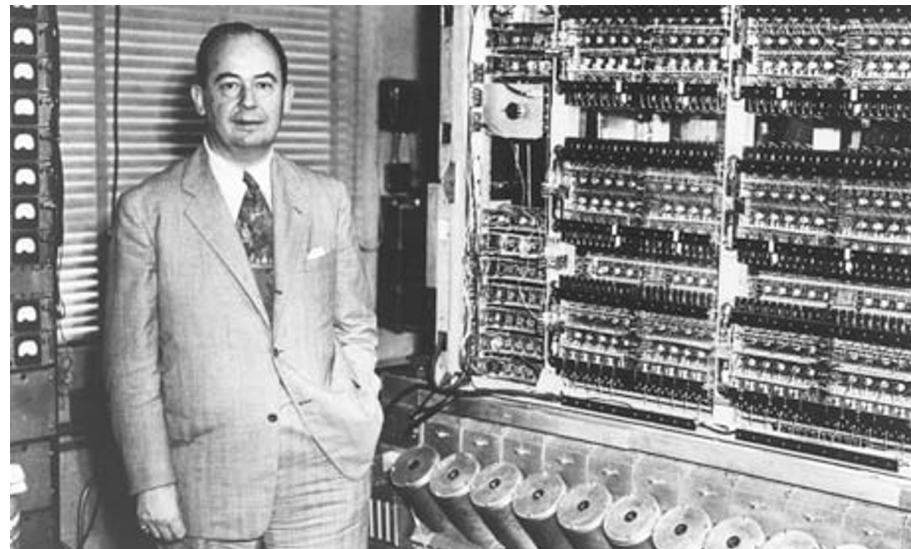
(2) Es sind unter Umständen mehr technisch mögliche Produktionsprozesse als Güter da. Die landläufige Methode des „Gleichungen-Abzählens" versagt also. Entscheidend ist vielmehr, herauszufinden, welche Prozesse wirklich Verwendung finden werden, und welche (als „unrentabel") nicht.

Um (1), (2) ganz rein diskutieren zu können, werden wir andere Elemente der Situation weitgehend idealisieren. (Vgl. §§ **1** bis **2**) Von diesen Idealisationen sind die meisten unwesentlich, aber wir wollen darauf hier nicht eingehen.

Unsere Fragestellung führt zwingend zu einem System von Ungleichheiten (3)—(8') in § **3**, dessen Lösbarkeit gar nicht evident ist, d. h. durch *keinerlei qualitatives Argument bewiesen werden kann*. Der mathematische Beweis gelingt vielmehr erst mit Hilfe einer Verallgemeinerung des Brouwerschen Fixpunktssatzes, d. h. durch Verwendung recht tief liegender *topologischer* Tatsachen. Dieser verallgemeinerte Fixpunktsatz (der „Satz" von § **7**) ist auch an sich von Interesse.

Der Zusammenhang mit der Topologie mag zunächst recht überraschend sein, aber der Verf. glaubt, daß er in Problemen dieser Art naturgemäß ist. Das Auftreten eines gewissen „Minimax" Problems, wie es aus der Variationsrechnung wohlbekannt ist, ist der direkte Anlaß dazu. In unserem Problem ist das „Minimax" Problem in § **5** formuliert, es ist eng verwandt mit einem anderem, das in der Theorie der Gesellschaftsspiele auftritt. [Vgl. ^{2}) in § **6.**]

Eine direkte Interpretation der hierbei auftretenden Funktion $\Phi(X, Y)$ wäre sehr erwünscht. Ihre Rolle scheint jener der thermodynamischen Potentiale in der phänomenologischen Thermodynamik ähnlich zu sein und es ist zu vermuten, daß ihr auch in voller
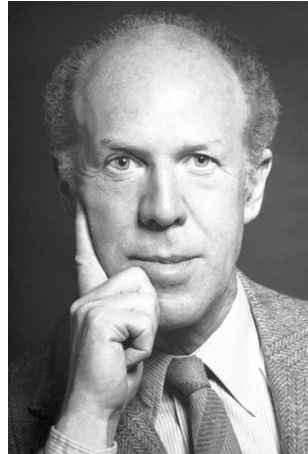
John von Neumann
(1903-1957)

Arrow-Debreu 1954

Kenneth J. Arrow
(1921 –2017)

Gérard Debreu
(1921-2004)

Cowles Foundation Paper 87

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EXISTENCE OF AN EQUILIBRIUM FOR A COMPETITIVE ECONOMY

BY KENNETH J. ARROW AND GERARD DEBREU[1]

A. Wald has presented a model of production and a model of exchange and proofs of the existence of an equilibrium for each of them. Here proofs of the existence of an equilibrium are given for an *integrated* model of production, exchange and consumption. In addition the assumptions made on the technologies of producers and the tastes of consumers are significantly weaker than Wald's. Finally a simplification of the structure of the proofs has been made possible through use of the concept of an abstract economy, a generalization of that of a game.
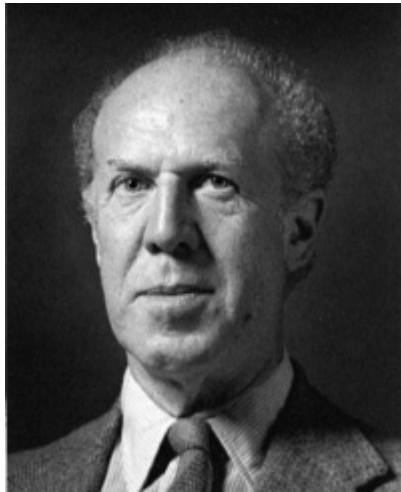
INTRODUCTION

L. WALRAS [24] first formulated the state of the economic system at any point of time as the solution of a system of simultaneous equations representing the demand for goods by consumers, the supply of goods by producers, and the equilibrium condition that supply equal demand on every market. It was assumed that each consumer acts so as to maximize his utility, each producer acts so as to maximize his profit, and perfect competition prevails, in the sense that each producer and consumer regards the prices paid and received as independent of his own choices. Walras did not, however, give any conclusive arguments to show that the equations, as given, have a solution.

The investigation of the existence of solutions is of interest both for descriptive and for normative economics. Descriptively, the view that the competitive model is a reasonably accurate description of reality, at least for certain purposes, presupposes that the equations describing the model are consistent with each other. Hence, one check on the empirical usefulness of the model is the prescription of the conditions under which the equations of competitive equilibrium have a solution.
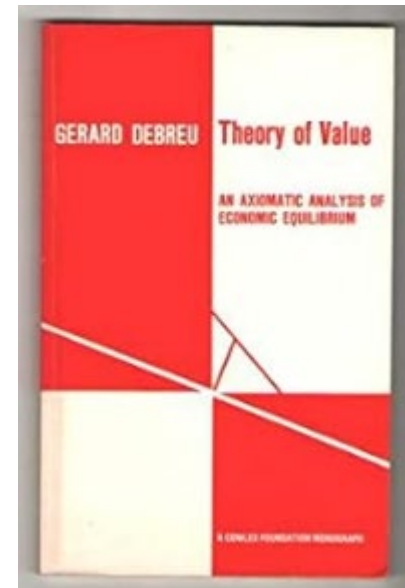
Gérard Debreu

Gérard Debreu
(1921-2004)

THEORY OF VALUE
An Axiomatic Analysis
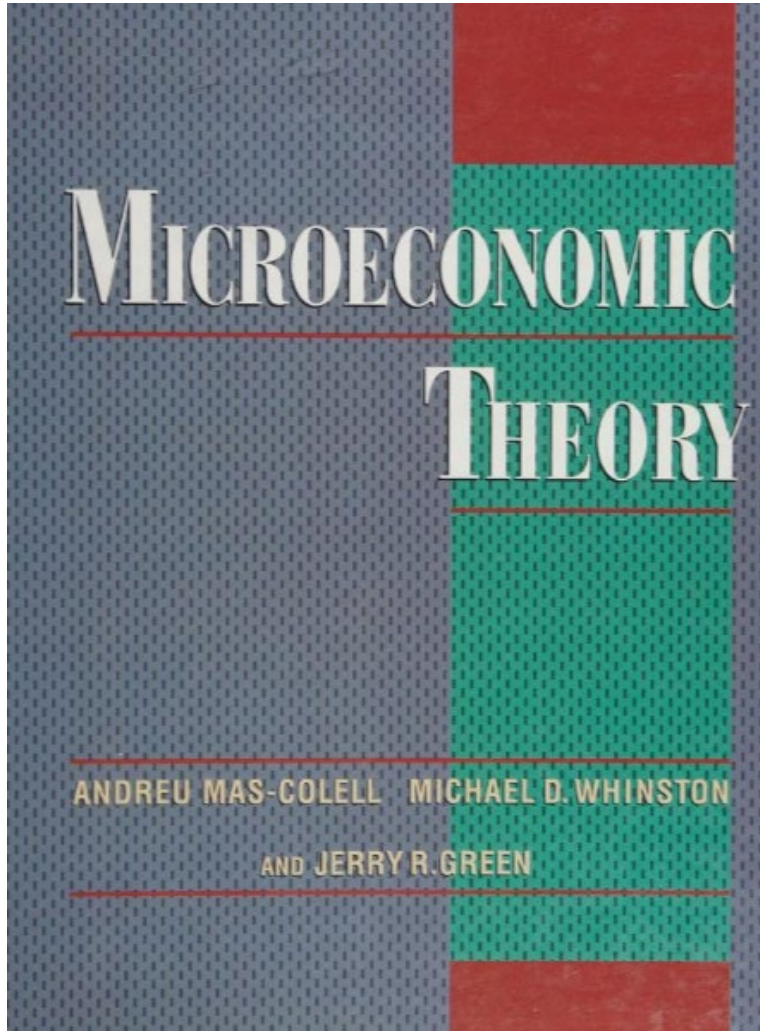Of Economic Equilibrium

GERARD DEBREU

NEW HAVEN AND LONDON, YALE UNIVERSITY PRESS

1959

General Equilibrium

Microeconomic
Theory

Andreu Mas-Colell   Michael D. Whinston

and

Jerry R. Green

New York   Oxford   OXFORD UNIVERSITY PRESS   1995

End of Lecture