GOSSEN AS A PIONEER OF
GENERAL EQUILIBRIUM THEORY

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(Preliminary Version Not for Quotation)

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Gossen as a Pioneer of General Equilibrium Theory

Hermann Heinrich Gossen (1810 - 1858) has only one claim to economic fame - his book Entwicklung der Gesetze des Menschlichen Verkehrs und der Daraus Fließenden Regeln für Menschliches Handeln (Vieweg, Brunswick, 1854) - but the claim is a substantial one. Gossen is now well known as a precursor of marginal utility theory, but his book has been little read, outside Germany at least. The imminent appearance of a translation of Gossen's text into English by Rudolph Blitz of Vanderbilt University (MIT Press, Cambridge, 1983), under the title The Laws of Human Relations and the Rules of Human Action Derived Therefrom, will permit this neglect to be remedied and should lead to a better appreciation of Gossen's contribution. The present paper focusses on one particular aspect of Gossen's work, his contributions to the theory of the economic interaction of individual economic agents. I will argue that, in a vestigial way at least, Gossen had a clear comprehension of general equilibrium notions and made a start on the program which Walras was to follow up so exhaustively. Because the Blitz text is till unpublished, I have refrained from making quotations from it and merely give my own paraphrase and interpretation of Gossen. I hope to provide fuller documentation in a subsequent version. Unless otherwise indicated, all page references are to the Blitz text.

I start in Section I with a brief account of Gossen's life and the reception of his work. Section II then gives an outline statement of his theory of the isolated individual or (as he explicitly observes p.54) Crusoe economics. Section III, the heart of the paper, describes Gossen's theory of the interaction of
individual agents. Section IV considers some extensions he made to cover joint demand, derived demand, and saving. Finally, Section V considers Walras' reaction to Gossen and draws some general conclusions about the latter's contribution.

I: Gossen's Life and the Reception of his Work

Gossen was born at Düren in the Rhineland, then under French control. His father, who had served as a tax collector for Napoleon, later transferred to the same position under the Prussian government, but retired in 1824 to take up agriculture. Gossen entered the University of Bonn in the Fall of 1829. He had an inclination towards mathematics, but his father pressed him to study law and enter the Prussian government service, which he reluctantly did, describing himself on the title page of his book as "Retired Assessor of the Kingdom of Prussia". He left government service in 1847 on the death of his father (which must have left him financially independent) and went to Berlin, becoming a sympathetic but inactive supporter of the 1848 revolution. He became a partner in a general insurance company, moving to Cologne in 1849 to manage hail and livestock coverage, and planning a life insurance business. In 1859, however, he withdrew from these operations, which had been financially unsuccessful, and devoted himself to presenting his economic ideas in systematic form, living in seclusion in Cologne with his two sisters. His book was published in 1854 at his own expense but, despite his extravagant hopes that the book would revolutionize attitudes towards economic life and policy, it was a complete flop. The book received no notice of significance and the disappointed author, by now seriously ill with
tuberculosis, recalled the unsold copies with the intention of destroying them. He died in 1858 a disappointed and unworldly man, described by his nephew as "a man of idealistic and optimistic tendencies, lacking in practical sense and with little concern about his personal interests, very kindhearted and amiable, full of frankness, sincerity and probity, naive in demeanor and childlike, as it were, of a nature which opened him all hearts." A born economic crank, one might think, except that he was a superb economic theorist with a breathtaking surefootedness in analysis and was offering the blueprint of a new form of economic analysis anticipating much that was to be presented by Jervons, Menger and Walras almost twenty years later.

The book's failure is easy to understand, however. Sir Alexander Gray describes the situation well:

Gossen's book is indeed one of those that are made not to be read. It is repellant mathematical, with whole pages given over to symbols or to lists of numbers; even worse, it is chaotic; worse still, one can hardly escape the impression that the author had a bee, or several bees, in his bonnet. The reviewers of 1854 are hardly to be blamed if they left Gossen to languish in the list of 'Books received'.

And so matters rested for almost a quarter of a century.

In 1878, while preparing a second edition of his *Theory of Political Economy*, the first edition of which had appeared in 1871, Jevons sought to develop a list of earlier works having adopted a mathematical approach to economics. His Manchester colleague, Robert Adamson, brought to his attention the existence of Gossen's work, which had been cursorily mentioned in Julius Kautz's, *Theorie und Geschichte der National-Oekonomie* (Vienna, 1858-60). In August 1878 Adamson secured a copy and made a synopsis of the argument for Jevons, who was unable to read the original German. Jevons immediately
conceded priority to Gossen for many of the ideas presented in the *Theory of Political Economy* and made handsome acknowledgement in the preface to the second edition when that appeared in 1879. He also brought the work to the attention of Walras who, concerned for his own claims to priority, energetically sought a copy and prepared a full translation into French (which was never published). Walras waited until 1885 to present his considered assessment of Gossen, one highly favourable albeit stoutly defending Walras' own priority on important points. He noted that:

Gossen claimed the glory of Copernicus, which is due to him because of his concept of the mathematical equilibrium of the economic world. In my opinion he combines the glory of Copernicus with that of Newton because of his solution of the social question. I have nothing else to say to express my opinion of his merits.\(^5\)

Since that era Gossen has received recognition as a precursor of marginal utility economics in almost all histories of economics, yet the treatment is usually superficial and apparently without benefit of first hand knowledge of the text. In the many years since Walras wrote there does not appear to have been a single English-language article devoted to Gossen. Such neglect after such high praise from Jevons and Walras is remarkable indeed.

II: Gossen's Theory of the Isolated Individual

Gossen endows the typical individual with a utility function of form\(^6\)

\[
W = \sum_{i=1}^{s} u_i(x_i) + v(\sum_{i=1}^{s} n_i)
\]

where

- \(W\) = flow of utility ("life pleasure") per period
- \(x_i\) = flow of consumption of good \(i\) per period
- \(n_i\) = time spent per period in producing good \(i\).
The technology the individual faces is of the simplest possible variety converting labor time into a flow of goods according to a fixed proportionality factor so that:

\[ x_i = \lambda \xi_i n_i \]

where \( \lambda \) is a general-efficiency component relating to the individual and \( \xi_i \) is a good-specific component. Substituting from (2) into (1) and then maximizing \( w \) by choice of \( n_1, n_2 \ldots n_s \) gives the first-order conditions:

\[ \frac{\partial}{\partial n_i} \left( \lambda \xi_i u_i' \right) = -v' \left( \sum_{i=1}^{s} n_i \right), \quad i = 1 \ldots s. \]

Gossen simplifies by taking a linear approximation to the \( v' \) function and a piecewise-linear approximation to each of the \( u_i' \) (or \( \hat{u_i}' \)) functions so that:

\[
\begin{align*}
  v'(n) &= \gamma - \delta n; \quad \gamma, \delta > 0; \quad n \equiv \sum_{i=1}^{s} n_i \\
  \hat{u}_i'(n_i) &= \max \left\{ \sigma_i - \beta_i n_i, 0 \right\}; \quad \sigma_i, \beta_i > 0
\end{align*}
\]

He is quite clear (p.11) that these are simplifications, adopted merely for analytical convenience and that their adequacy remains an empirical question. (On the other hand, the additive separability of (1) remains unquestioned). Linearity analogous to that in (4) is maintained throughout Gossen's book, and it is this parametrization which permits his tediously prolonged algebraic and numerical analysis.

The conditions (4) imply that the marginal utility of labor is initially positive but decreases with the total amount of labor time, \( n \), applied, eventually becoming negative. Similarly, the marginal utility of each commodity is initially positive, but is
uniformly decreasing and eventually falls to and remains at zero once a saturation amount is obtained (Gossen implicitly assumes free disposal throughout). There is no allocation problem if the individual can produce the saturation amount of every commodity with an amount of labour which still remains pleasurable at the margin. But normally he will have to decide how much onerous labor to undertake and how his labor should be allocated in producing limited amounts of the various possible goods or pleasures. The marginal conditions implied in (3) are obviously that the marginal utility of the "last atom" of labor should be the same whichever pleasure it is devoted to, and that this common marginal utility should equal the marginal disutility of labor. Figure 1, essentially Gossen's (p.48), displays the optimum, $U'$ being the horizontal sum of the $u'_i$ functions and the shaded area being the maximum attainable level of $W$. The figure is, of course, essentially identical to that provided in 1871 by Jevons in his Theory of Political Economy.

Gossen undertakes (pp.57-92) an exhaustive comparative-static analysis of the ways in which the optimally-selected variables respond to changes in the various parameters of the utility function and technology. But since he undertakes a similar and more interesting analysis for the price-taking individual (see below) comment on his first version seems unnecessary.

At this point, then, Gossen has given a very thorough and impeccably logical treatment of the behaviour of the isolated individual. It remains to embed this individual in a society where he may interact with his fellows.

The fundamental basis for economic interaction between individuals is found in the possibility of exchange. Gossen commences by postulating two individuals, each endowed with an above-saturation amount of a different good. If trade in the two goods is admitted on one-for-one terms then individual A's utility-maximizing trade is shown in Figure 2 (p.98). A, who is endowed with $O_b$ of good 1, wishes to give up the amount $c_b$ in exchange for a like amount of good 2. The shaded area measures the total utility A obtains should this desired trade be consummated. It obviously exceeds the area (triangle Oed) measuring total utility in the absence of exchange. Analogously, facing the same terms, individual B, who is endowed with good 2, will have a certain desired trade in the opposite direction. It is unlikely, however, that the desired trades of A and B will agree exactly. Gossen now demonstrates (p.99) that, starting at a point where further trade on one-for-one terms is desired by only one of the two parties, the total utility of each may be further increased if the still-unsatisfied party offers additional trade on terms less favourable to himself. 8

At this point, one might expect Gossen to have anticipated Jevons' "equation of exchange" by finding that particular uniform rate of exchange at which the desired trades of both parties coincide. But he does not take this path, contenting himself with the observation (p.100) that the final outcome will depend on the particular circumstances of the case. This omission is not entirely regrettable, for Jevons' conjunction of bilateral bargaining and price-taking behaviour was unsatisfactory. It may be (although there is little indication either way) that Gossen sensed the indeterminacy of
bilateral exchange.\textsuperscript{9} He does observe that there can be a limit to the amount an individual will be willing to trade on any terms. Figure 3a shows Gossen's derivation of this (p.100), the individual endowed with good 1 never being willing to retain less than \(Oa\), such that the area of triangle afg equals the utility the individual would obtain from saturation consumption of good 2. Figure 3b (not Gossen's) shows the location of point a in more familiar terms, where \(II'\) is the indifference curve passing through the individual's endowment point, \(e\), and \(Ob\), \(Oc\) are his saturation levels of consumption. Gossen's position is, essentially, that the individual will only accept trades moving his holding into the shaded area in Figure 3b. But rather than attempting to characterise the entire contract curve, as Edgeworth was to do subsequently, Gossen jumped straight (p.100) to the characterisation of that particular point on it which is the utilitarian optimum. Generalising to many individuals and goods he enunciates the theorem that the sum of individual utilities will be maximised in exchange when for every good the marginal utility of the "last atom" is the same to all individuals.

The mutual advantageousness of exchange permits the division of labour which allows each individual to specialise in producing only one good at a rate much in excess of his needs, exchanging the surplus for the other goods he desires. The basic assumption Gossen makes (pp.95,103) is that for any good the production coefficient relating output to labour input will be larger if the individual specialises in the production of that good rather than producing a variety of goods, and especially will exceed the "autarky" coefficients like equation (2). He explains this as a consequence, primarily, of limitations on the technical knowledge
an individual can acquire. The fundamental advantage of the division of labour he says (p.103) is that it permits every individual to enjoy the fruits of all technical knowledge without himself possessing more than a small fraction of it. The "autarky" coefficients (and more generally the various coefficients for different patterns of incomplete individual specialisation) retain latent significance, however, by setting limits to the rates at which individuals will exchange. There is always the option of producing a desired good oneself rather than obtaining it through trade (p.104).

Again, Gossen jumps to the conditions for the utilitarian optimum for production and exchange. These are:

i) each individual must specialise according to comparative advantage,

ii) each good must have the same marginal utility for all individuals,

iii) each individual's marginal disutility of labour should equal the common marginal utility of his particular product multiplied by the output per unit of his labour.

Gossen attaches great normative significance to this optimum, believing it to be socially just, indeed divinely intended. But how is this utilitarian allocation of effort and consumption to be implemented? Gossen emphasises (p.106) that direct calculation, by which each individual infers his part from knowledge of the determining conditions for all, is quite beyond human capacity. Mankind would starve while attempting to perform the necessary prodigious computations. But in fact a decentralisation of decision making is possible and will occur through the establishment of a price system if individuals are left to pursue their own ends, entirely without regard to the wishes and intentions of others.

A price system is facilitated by agreement on a means of exchange in which all prices can be quoted and by which exchanges may be
mediated. Indeed, such mediation is essential if the division of labour is not to be hampered by the difficulty of locating a "double coincidence of wants" (p.107). Gossen envisages such a means of exchange emerging naturally in the guise of a highly durable good. He further enriches his theory by introducing locational specialisation as a concomitant of the division of labour. He envisages a number of "locations" (at least as many as there are individuals) ownership of which is distributed among the population. The completely-specialised production coefficient for individual \(i\) producing good \(j\) at location \(k\) is:

\[
\lambda^i_{k,j} \quad i = 1 \ldots r; \quad j = 1 \ldots s; \quad k = 1 \ldots t.
\]

That is, the location affects the individual's general efficiency but not (although this is far from crucial) his comparative advantage among commodities.

Gossen now faces each individual with a non-negative price for each commodity and a non-negative rent for each location, every individual seeing the same price for the same good and the same rent for the same location. The rents on the locations he owns promise individual \(i\) a combined rental income of \(R^i \geq 0\).

Each individual now determines his location, his occupation, his effort, and his consumption pattern by maximising utility given his rental income and the announced terms on which he can buy or sell goods or rent locations (including his own). Formally, individual \(i\)'s decision problem is:
maximise \[ \sum_{h=1}^{s} x^i_h u^i_h + v^i(n^i) \]
subject to
\[ \sum_{h=1}^{s} p_j x^i_h \leq p_j \lambda^i u^i_j + r^i - r_k \]
\[ j \in J = \{1, 2, \ldots, s\} \]
\[ k \in K = \{1, 2, \ldots, t\} \]

where
\[ x^i_h = \text{i's consumption of good } h \quad (h=1, \ldots, s) \]
\[ n^i = \text{i's effort} \]
\[ p_j = \text{price of good } j \quad (j=1, \ldots, s) \]
\[ r_k = \text{rental for location } k \quad (k=1, \ldots, t) \]

The choice of occupation is particularly simple. The individual chooses that occupation giving greatest revenue for a given effort, the ranking being the same for all locations. The marginal-utility functions continue to be given the specialised linear form (4), but can differ between individuals - although Gossen appears to believe they will tend to be similar for members of the same socio-economic group (pp.163,223). The usual marginal conditions (analogous to (3)) hold for the choice of levels for consumption and effort.

Gossen performs some interesting comparative-static analysis of the decision problem (6) (pp.121-132, 157-171). A price increase for a good, other than the one the individual produces, will cause more or less to be spent on the good as the individual's consumption of it is initially above or below half its saturation amount. If
more is spent on the good, less will be spent on other goods collectively but more effort will be supplied: the good is then classed by Gossen as a "necessity" for the individual. In the opposite case, where Gossen classifies the good as a luxury, all these effects are reversed. Similarly, an increase in the efficiency parameter $\lambda$ may increase or reduce the individual's supply of effort, but will tend to convert previous "luxuries" into "necessities". Gossen even calculates compensated responses by assuming an increased efficiency parameter to be accompanied by an addition to rent payable just sufficient to keep constant the individual's maximum attainable utility! He also considers (pp.145-51) the possibilities for estimating demand and marginal utility curves from price-quantity data so as to test the linearity assumption empirically.

These interesting matters are, however, tangential to our main theme, to which we must return. Having determined each individual's response to the given vectors of prices and rental rates, Gossen now in effect (p.109) aggregates the quantities demanded and supplied of each commodity and the rental demands for each location. In general, the arbitrary vectors will not happen to be market-clearing ones, so that there may be excess demands for some commodities and excess supplies of others. Similarly, there may be locations that more than one individual desire, to rent and other locations that no-one seeks. Zero-priced commodities in excess supply or zero-rental locations that no-one seeks call for no adjustment — the possibilities of free goods is integral to Gossen's approach (p.110). But in other cases, frustrated demanders will bid up prices or rental rates for commodities or locations in
excess demand, while frustrated suppliers will do the opposite where there is excess supply (p.110). Gossen envisages a short-run adjustment in which individuals do not alter their occupation (or presumably their location) and a long-run adjustment in which individuals seek new occupations (and presumably locations) as these become more profitable than their current ones. Gossen believes that, in both cases, the piecemeal adjustment of individual prices and rental rates in response to the direct pressures of excess demand and supply will produce convergence to market-clearing general equilibrium by a procedure he likens to successive approximation in mathematics (pp.173-5).

It must be said that Gossen does not attempt formal derivation or analysis of excess demand or supply functions and so, for instance, fails to derive Walras' Law. Nor does he lay much emphasis on the inter-market effects of price changes, tending to treat (explicitly in at least one case, p.111) the own-market consequences of a price change as the dominant ones - that is, in effect resorting to a partial-equilibrium analysis. Despite these limitations, there can be little doubt that Gossen grasped the broad features of a system of competitive general equilibrium. Indeed, he views the process of simultaneous market equilibration by multiple price adjustment as somewhat self-evident and a matter of common knowledge. His concern is to relate this process to a theory of individual behaviour via utility maximisation (p.110), essentially by providing microfoundations for market demand and supply functions. Gossen claims that a competitive equilibrium is a just one in the sense that each individual is compensated according to his contribution to others. The "sovereign" consumer allocates freely all his income, impartially
rewarding those who contribute to his pleasure without enquiring into their circumstances (pp.114-5). This is, of course, not equivalent to a claim that the competitive equilibrium coincides with the utilitarian optimum, and Wicksell has expressly denied that Gossen makes such a claim. But the entire structure of Gossen's argument tends to suggest his identification of the two, and the claim does appear in his closing passage - although this refers to the hypothetical situation after all his policy proposals have been introduced. These include land nationalisation, which might go some way to overcome the arbitrariness of wealth distribution (although Gossen argues for it mainly on allocational grounds). But he fails to recognise that differences in individual wealth, preferences and labour efficiencies will make it improbable that any competitive equilibrium will happen to also be the utilitarian optimum. I would view this as the most glaring failure of his work. As Edgeworth puts it:

Gossen is guilty of a fallacy to which mathematical economists are particularly liable: what may be called the "illicit process" from the principle of utility in economics to utilitarianism in the philosophy of conduct.

IV. Some Extensions.

Gossen sketches some possible extensions of his competitive theory, of which three will be briefly outlined.

i) Joint Demand (pp.113-114). Consumer goods providing direct pleasure are termed by Gossen "means of enjoyment" or "objects of the first category". "Objects of the second category" are also consumer goods, but they can give pleasure only when bundled in fixed ratio with others (pp.28-30). The equilibrium
Gossen envisages for a set of such second-category goods is one where consumers respond to the total cost of a bundle, while the prices of the individual components are neither more nor less than sufficient to keep the supply of that component at the level required to just meet consumer demand. Thus, Gossen's solution to the problem of price determination for jointly-demanded goods is essentially the same as that subsequently provided by Marshall.17

ii) Derived Demand (pp.112-113). Gossen terms all intermediate or producer goods "objects of the third category" (p.30). Again, he tends to assume these are applied according to fixed coefficients (although there are hints of possible substitutability) so that a producer of final goods has a joint demand for third-category goods. Gossen is not very successful in analysing the sequential interaction of final-good and producer-good markets, although his drift is clear and akin to Marshall's later treatment of the matter.18

iii) Saving (pp.133-139). The most interesting extension occurs when Gossen introduces trade in ownership rights to "locations". He postulates that each individual maximises an intertemporal utility function which is the sum of expected current and future one-period utilities, discounted for uncertainty. A purchaser of the right to rent a location must cut his current consumption expenditure by the amount of the necessary capital outlay and will receive a given future stream of extra rental income.19

His current utility loss must be counterbalanced by his expected gain in future utilities. A seller has opposite incentives. Market equilibrium requires the entire existing stock of locations
to be held willingly, which calls for appropriate ratios of rental income to purchase price. Were all rentals perpetual and risk free, these ratios would be the same for all locations and would define a pure interest rate. Gossen goes on to suggest that resources might be employed in developing new rent-yielding locations, a real investment opportunity that would introduce productivity as well as time-preference considerations into interest rate determination. He fails to follow up this hint, but his theory still seems remarkably advanced for its day.

V. Concluding Remarks

Walras, in his assessment of Gossen's work, was forthright in seeking to establish his own claims to priority: "just as it is legitimate to take a chance with small amounts of money while playing whist, so it is permitted, in the pursuit of scientific truth, to derive additional satisfaction from the thought that one is going to attach his name to an important result. .... I myself have no pretension at all of being above human weakness and ordinarily play whist for chips". Naturally, therefore he emphasised the differences between his own and Gossen's contributions and believed that he could "protect the priority of a good part of my discoveries". He conceded Gossen's priority on the marginal-utility conception and analysis, but emphasised that when it came to the theory of exchange "neither Gossen nor Mr. Jevons has as much as touched the question of the determination of the equilibrium price of each of the two goods in terms of the other on the basis of an infinitely large number of exchangers". He continued:
Exchange under the mechanism of free competition is an operation which enables all exchangers to obtain the greatest satisfaction of their desires compatible with the condition that they turn over the goods which they sell, and receive the goods which they buy in common and identical proportion. In combining the second condition with the first, I have completed the foundation of the mathematical theory of exchange.  

Besides the unfairness to Jevons, this does permit Walras to set the rules of the competition he seeks to win. A similar tendency is revealed in the consideration of the respective contributions to production and distribution where, incontrovertibly, "neither Gossen nor Mr. Jevons has analyzed as completely as I the problem, of production and of price determination of productive services."  

He complained:

Gossen and Mr. Jevons always assume an individual or a group of individuals who turn out products, sometimes with labor alone, sometimes with labor and land combined, sometimes with labor and capital combined. They then investigate, usually with great ingenuity, the mathematical conditions of production, determined by the aim of maximization of pleasure and minimization of pain. Well, I for my part do not believe that these studies, ingenious and accomplished as they are, represent a definitive and fruitful advantage, because I consider the assumptions on which they were based as special, exceptional, and deviating from the general case. Their assumptions mirror the organisation of production on Robinson Crosoe's island: also, perhaps, production in isolation or under primitive conditions. This is not how production is carried on - I shall not say under our own socio-economic conditions, but under the abstract and ideal socio-economic conditions on which pure economics is based.

Now Walras was quite justified in observing that his own theorising was vastly superior in clarity and detail to Gossen's (or Jevons') fragmentary attempts to deal with market interaction. Yet on such matters what frequently proves crucial is the germinal conception rather than the detailed working out. Gossen was far from developing a fully-articulated general-equilibrium theory, and his treatment of distribution was particularly sketchy, but a general vision does show through which has much in common with that of Walras. Gossen's
work is remarkable for the way in which it anticipates aspects of all the seminal but dissimilar contributions Jevons, Menger and Walras made in the early 1870's. He shares with Jevons an emphasis on the mechanics of hedonism and the balancing of effort and benefit. With Menger, he shares an unremitting subjectivism, which always identifies value with marginal utility, and a vision of the imputation of value from final goods back to producer goods. But with Walras he shares a Copernican vision of a complex self-equilibrating multi-product many-person system of competitive equilibrium. He failed to carry the analysis of this vision as far as he might have done given more time and encouragement. But in significant ways he was closer in spirit to Walras, than either Jevons or Menger were. If he did not conquer the citadel of general-equilibrium theory he laid siege to it and mapped out its fortifications.
FOOTNOTES


2. Walras, op.cit. p. 487.

3. Alexander Gray, The Development of Economic Doctrine: An Introductory Survey (Longmans Green, London, 1931) p. 337. Gossen, an ex-Catholic, retained an intense Deism and regarded himself as the chosen interpreter to man of God's laws for society. More to our purposes, he extravagantly presented himself in his preface as a new Copernicus come to bring tidings of all-embracing laws of human relations. And in a way he was. Since Gossen gave no references worth noting to other writers, the intellectual influences on his work are hard to discern. It is suspected that he was influenced by Bentham and perhaps Saint-Simon. See Hayek loc.cit.


5. Walras, op.cit., p. 485. For further details of Walras' reaction to Gossen see W.Jaffe (ed.) The Correspondence of Léon Walras and Related Papers (North Holland, Amsterdam, 1965 in three volumes); W.Jaffe (ed.) Léon Walras' Elements of Pure Economics (Allen and Unwin, London, 1954). Walras and Adamson differed diametrically in their judgement of Gossen's policy discussions, Adamson viewing them as "vague social speculations ... of inferior merit compared with the earlier portions of the treatise" while Walras found Gossen's theories of money, credit and property "perfectly lucid and precise" which indeed they are despite the extravagant phraseology. (See Walras, op.cit., pp. 466,482). For a careful analysis of Gossen's policy views, which amounted to an extreme programme for laissez faire, see W.Stark, The Ideal Foundations of Economic Thought (Kegan Paul, London, 1943).
6. No attempt is made in this and subsequent sections to conform to Gossen's notation and terminology. I attempt, rather, to convey the general character of his work.


8. This amounts, essentially, to a proof that the parties are not on the Edgeworth contract curve.

9. This was observed explicitly by Menger in 1871 and analysed in detail by Edgeworth in 1881. C. Menger, Grundsätze der Volkswirtschaftslehre, Vienna, 1871, translated as C. Menger Principles of Economics (Free Press, Glencoe, 1950); F.Y. Edgeworth, Mathematical Psychics (Kegan Paul, London, 1881).

10. p. 105. Condition i) is implied rather than stated by Gossen. He also implicitly assumes, as in the exchange case, that everyone consumes each commodity in positive amounts.

11. Thus, he clearly attaches cardinal significance and interpersonal comparability to the unit in which individual utilities are measured. Neither is implied by the additive separability of (1) which can survive arbitrary increasing linear transformations.

12. The following discussion compresses two separate stages of Gossen's development, rent only being introduced at a later stage (pp.117-132) and the discussion of its market determination being left somewhat implicit.

13. The distinction between "necessities" and "luxuries" is of course equivalent to that between commodities whose Marshallian demand elasticity is below or above unity. The response of market demand for a good to a price change depends on the proportion of individuals for whom that good is a luxury (p.162).


15. The competitive equilibrium will presumably be Pareto optimal, but Gossen shows no inkling of having grasped such a distinction. A feature of Gossen's welfare economics worth noting is that he does not take individual preferences as data. Instead, individuals are supposed to be able to develop their tastes (and their work efficiency) through training and exercise. His reform proposals give an important place to education, and presumably the utilitarian optimum calls for each individual's potential to be fully developed.


18. ibid.

19. Implicit here is the assumption that locations are the only available asset, which is not entirely consistent with the earlier assumption of a durable monetary good or with Gossen's references elsewhere to investment in tools and machinery (e.g. pp. 262, 274).


22. Ibid., p. 499. Walras is speaking here of the exchange of two commodities only. Menger's work appears to have been unknown to Walras until June 1883, as it had been to Jevons, but it is surprising that Walras makes no reference to him in his Gossen article.

23. Ibid., p. 480.

24. Ibid., p. 481.