Measuring Economic Welfare in Family Household Production: Theory, Contingent Evaluation and Tort Compensation

by

Teong Ewe Quah

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to the required standard.

[redacted]

Dr. Malcolm Rutherford

[redacted]

Dr. Leonard Laudadio

[redacted]

Dr. Lorne Rosenblood

[redacted]

Prof. James Cassels

UNIVERSITY OF VICTORIA

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Supervisor: Professor Malcolm Rutherford

ABSTRACT

The 'New Home Economics' literature is now an established part of economic theory. Market purchased goods aside, the time and efforts of household members are now recognized as important inputs used in this production process. The literature, however, does not deal extensively with the measurement of benefits received by the household from having household production. The thesis presents a method of valuing household production designed specifically for the many issues involving welfare and tort compensation--the settlement of legal disputes as to the amount of compensation required for losses in household production services due to wrongful injury or death. It is argued here that the appropriate measure of household welfare from household production consistent with standard welfare economics is the net value measurement from current levels of provision and that compensation for a tort induced loss of household production requires the original level of net benefits enjoyed by the household be restored. This is shown to be equivalent to the compensating variation measure of consumer surplus where the initial level of utility is maintained. Moreover, it is shown that legal rules of compensation are also consistent with this welfare criteria. Competing approaches--replacement cost and opportunity cost methods--do not measure this welfare loss consistent with both the economic and judicial rules of compensation. Estimates of time devoted to household production and the economic value of the

benefits produced are derived using a contingent evaluation technique applied to a modest exploratory study involving 60 households.

Examiners: [redacted]

Dr. Malcolm Rutherford

[redacted]

Dr. Leonard Laudadio

[redacted]

Dr. Lorne Rosenblood

[redacted]

Prof. James Cassels

CONTENTS

Page

LIST OF TABLES

LIST OF ILLUSTRATIONS

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Euston Quah
University of Victoria

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DEDICATION

To my families in Penang
and in Vancouver.

Economists are (recently) only beginning to attribute to the family the same dominant role in society traditionally attributed to it by sociologists, anthropologists and psychologists. Whereas the theory of the firm is basically no different than it was thirty years ago, the household has been transformed from a sterile field in economics into one of the most exciting and promising areas.

Gary S. Becker, 1976

CHAPTER 1

Introduction

The economics of the household has never received more attention than in recent times. Recent developments have shifted the view of the family from that of a consumptive unit to that of a productive unit in society. The 'New Home Economics', as it is sometimes referred to, treats the household as a firm engaged in the home production of utility-yielding commodities, using market purchased goods and the time of family members as factor inputs (Michael and Becker, 1973; Becker, 1976; Gronau, 1977, 1980; Peskins, 1982).[1] Despite the recognition of the productive role of the household, the amount of time and effort associated with household production continues to be a subject of much discussion (Walker, 1976; Vanek, 1974; Hedges and Barnett, 1972; Leibowitz, 1972; Proulx, 1978). Even more controversial are the many and various attempts to provide a valuation of household production and apply that valuation to National Income Accounting or G.N.P. (Nordhaus and Tobin, 1973; Sirageldin, 1969; Hawrylyshyn, 1978; Peskins, 1982), Matrimonial Property Settlements (Kome 1982; Kay, 1979; Hefferan, 1982) and Tort Litigations--the assessments of damages and compensation for the loss of household production services due to wrongful injury or death (Komesar, 1974; Pyun, 1969; Rosen, 1974; MacIsaac, 1977; Yale, 1982).

Although many of these recent attempts at valuation serve to enrich the literature, there has been no convergence to any generally accepted method of estimation. In fact, many of the quantitative

results appear to be widely regarded as curiosities and poorly substantiated assertions, and, in some cases, obvious flaws exist. A major problem is to be found in a confusion over what is to be measured and for what purpose. If the objective of valuation is toward national income accounting, then to be consistent with marketed outputs measurement, market prices are appropriate. However, for many welfare and compensation issues, as in tort litigations, the appropriate measurement is one of consumer's surplus or net benefit measures. The appropriate measures or values are thus sensitive to such varied objectives. Also, difficulties exist with the definition of household production, particularly the identification of production and consumption activities within the home and the separation of joint production and simultaneous activities.

The purpose of this thesis is to present a method of valuing household production designed specifically for the many issues involving tort compensation. The thesis will, first, derive a welfare measure of household production, based on the concept of net value--the extent households benefit from having such a provision, over and above their opportunity cost at the margin; and second, apply this measure in the case of the loss of household production services to a given family, due to the injury or death of the spouse normally occupied in the performance of these services. The method, which is consistent with standard welfare economics, is applied together with contingent evaluation techniques, a direct demand revealing process involving the creation of a hypothetical market to obtain the relevant

estimates. Estimates of time devoted to household production and its economic value are derived to illustrate how the contingent evaluation technique may be applied and the range of values that might be found with the use of such procedures. In all, the thesis takes a welfare approach to household production measurement, since, household production is, after all, the creation of goods and services by household members for their own benefit.

The thesis is organized as follows: Chapter 2 deals with some of the methodological problems inherent in any research on household production, specifically, the definition given to household production, the measurement of joint production activities and the valuation of household production. Chapter 3, presents a model of household production showing the various ways of conceptualizing the household's problem and the measurement of economic welfare. This theoretical model is then applied to damage assessments in tort involving wrongful injury actions and death litigations in Chapter 4. It will be argued that the compensation sum for losses in household production services in the home due to wrongful death or injury of a household member consistent with economic theory lies in the restoration of the household's enjoyment of net benefits or utility level to the level prior to the accident. In Chapter 5, alternative bases of valuation such as replacement cost, opportunity cost and the Pyun Model (a widely-cited model in legal literature) are presented, analyzed and critically compared to the present model of household production. The extent to which each of these methods are accepted by courts of law in determining tort damages is examined in the same Chapter. Chapter 6 describes the

use of contingent evaluation techniques for the valuation of non-market goods and the application of these techniques to the net value measurement of household production. The results of a modest exploratory study on the values that most appropriately seem to be of issue and their magnitudes, using such contingent evaluation techniques are presented. The final chapter--Chapter 7--provides a summary of the methodology, findings and arguments for use of the proposed method in aspects of welfare measurement in household production and in compensation.

Footnotes: Chapter 1

1. Actually, as early as 1934, Margaret Reid, a consumer economist argued in her book, the Economics of Household Production, that the household is not merely a consumer of goods and services, but also a producer of them. These goods and services, termed household commodities, may take a variety of forms: cooked meals, cleaned floors, disciplined and well-mannered children are examples. Reid's work, unfortunately went largely unnoticed by the economics profession until revived by Becker and the proponents of the 'New Home Economics'. In extending Reid's thesis, for example, Becker argues that market goods by themselves, such as raw food, laundry detergents and vacuum cleaners do not provide direct sources of utility, but only indirect utility. It is only when such market goods are combined with household's non-market time and effort to produce household commodities, will the latter yield direct utility.

CHAPTER 2

Problems in Household Production Research

Most of the difficulties encountered in household production research on the amount of time[1] used and its economic value lie, first, in the fact that no records are kept on such time consumption, and, second, that the amounts taken by households are generally not purchased in market transactions where prices would then indicate their value at the margin. Household production is normally provided by members of the same household consuming the services, with the time allocated to this purpose determined largely by other demands on their time and energy and by the utilities and disutilities attributed to providing and consuming these services relative to those associated with market and non-market alternatives. As a result of these peculiarities in the circumstances of household production and consumption, there are no readily available output measures and no market prices to indicate economic values. Of course, the lack of a market mechanism and market price in no way makes these services any less economically significant. The fact that people are willing to forgo other goods and services in order to enjoy the benefits of their provision clearly establishes a value to household production. Since such values are not registered in market prices, household production research necessitates their imputation through some indirect means. However, the success of these indirect methods in deriving such values will depend on the definition given to household production; the method

of dealing with joint production activities; and the consistency with economic theory in deriving such estimates. We now discuss each of these problems in turn.

1.1 Definition of Household Production

Problems of definition add difficulties to obtaining accurate assessments. Even with careful precautions in survey design, as in time-budget studies, concerning what is and is not to be included, people's responses can deviate widely depending on how they perceive the different household activities. For some, cooking, chopping fire-place wood and gardening may be viewed as pleasures or hobbies, while others look on them as differing little from cleaning, ironing and washing. In other words, how do we distinguish between household work and leisure? A number of economists associated with the New Home Economics, including Becker, are prepared to define household production in terms of the household commodities produced. This, however, does not solve the problem, since the notion of household commodities within the context of the New Home Economics is too all-encompassing. This is to say that these commodities can be anything ranging from cooked meals to religious accomplishments and sleeping,[2] clearly an unsatisfactory definition.

The famous Walker and Woods' time-budget studies on housework have employed the definition of household production to be those "Purposeful activities performed in individual households to create the goods and services that make it possible for a family to function as a family".[3] Such a definition is, however, too vague to be of any

meaningful use, with the result that very large amounts of time devoted to household production were reported by households.[4] Although all of these time-budget studies almost certainly list the various categories of household activities that are considered by the authors as having satisfied their definition of housework, the inclusion of a 'miscellaneous' category often results in the larger number of hours reported.

Attempts by other authors on the subject of definition of household production also run into problems. Gronau, for example, defines household production as similar to market production, in that, work at home carries the same disutility (utility) as that of work in the market. His argument goes as follows:

> An intuitive distinction between work at home (i.e., home production time) and leisure (i.e., home consumption time) is that work at home (like work in the market) is something one would rather have somebody else do for one (if the cost were low enough), while it would be almost impossible to enjoy leisure through a surrogate.[5]

The problem with Gronau's definition is that it implicitly assumes that work, whether performed in the market or in the home is unpleasant, whereas in reality, people do enjoy at least some aspects of their jobs and experience the relative differences in utilities and disutilities between jobs.[6] Despite this shortcoming, Gronau's definition is certainly an improvement over Becker's as it makes possible the identification of production from consumption (or leisure) activities in the home.

Based on the same idea is Hawrylshyn's Third-Person Criterion definition of household production. According to this criterion,

household work is defined as: "Those economic services produced in the household and outside the market, but which could be produced by a third-person hired on the market without changing their utility to the members of the household."[7] To use Hawrylyshyn's examples, the satisfaction or utility that a household gets from having a clean floor is not much reduced by the fact that that work was done by another person outside of the household. The same however, cannot be said of attending a symphony concert as the household cannot truly benefit (in terms of utility gain) from not attending the concert but paying someone outside of the household to attend on its behalf. Hawrylyshyn's definition makes it possible to account for all the production activities in the home which have market substitutes.[8] It is, however, customary to exclude conjugal relations.

Both Hawrylyshyn's and Gronau's definition of household production, place emphasis on whether activities normally performed by household members can be performed by someone outside of the household.[9] While recognized as imperfect, as the definition may not cover all the household tasks performed by households, it is certainly an improvement over those definitions that are ambiguous. This thesis adopts the same approach as Hawrylyshyn and Gronau by defining household production activities as those that could be done to prescribed specifications and to the benefit of the household by someone outside of the household. Thus, making a cup of coffee and cleaning the floor are clearly included, while watching television and sleeping are not. The value of household production is thus seen as being

derived from having it done and not by having it done by any particular individual or member of the family. Except for possible quality differences and, of course, abstracting from any benefits of consortium--the companionship and conjugal relations aspects of non-market time--the value of the output and, therefore, of the benefits is not attributable to the input of any particular individual or individuals.

The major concerns in household production research are on, what households produce for themselves for their own benefit, the number of hours devoted to its production, and the value households place on such production. A clear definition of what constitutes household production is required to avoid any ambiguity concerning what is meant by the term 'household work' and if any meaningful set of estimates on the quantity and economic value of household production are to be derived.

1.2 Measurement of Joint-Production Activities

A second major problem in household production research concerns the measurement of multiple activities which occur simultaneously within the household. Some tasks, such as laundry and caring for children can often be done concurrently with other activities, raising ambiguities of how such time is to be reported.

One method commonly used is simply to allow for these simultaneous activities, in that, time is counted twice for any two activities performed simultaneously. Similarly, if a household member performs three activities together, then the time common to all three

activities is multiplied by three.

A major problem with such a method is that, it can lead to a gross exaggeration of the total amount of time spent performing household work. It is thus quite possible for households to report that they spend more than 168 hours a week performing household chores. Such overstatements of time devoted to household work usually arise when it is the case that while performing one activity, the individual gives only intermittent attention to the other. Thus, for example, a household member may be doing some cooking, while occasionally glancing over or tending a child. The latter activity could hardly be given the same amount of time as the former.

A more accurate method of accounting for time use in households where joint production activities are concerned, is to ascribe the time entirely to the major task. In other words, time is recorded only for the major household task performed and the other activity is ignored. This appears to be a better solution to accounting of such time where simultaneous activities are involved. At least, the method works within the framework of a 168 hour week constraint, so that a micro-allocation of time for market work, homework and leisure, can be derived and the implications of such an allocation of time for the different households easily drawn.

1.3 Valuation Problems and Consistency with Economic Theory

Valuation methods that will produce meaningful estimates (i.e. consistent with economic theory) comprise the third major problem in household production research. The problem arises because

household production activities occur outside the market with the result that there are no prices to indicate the value of such outputs. Economic valuations, of necessity, are dependent on indirect means of imputing value measures. Just because this production is an extra-market activity does not imply that the goods and services produced have no value. Households clearly value them and demonstrate this by willingly giving up other goods and services in order to enjoy the benefits of their provision.

The problem, however, is not whether household production has value or no value, but rather is one of the appropriate method of valuation. The appropriate method will, in turn, depend critically on the purpose of the valuation: whether it is for national income accounting, matrimonial property settlements or the valuation for compensation questions. Furthermore, the most common methods of valuation (foregone wages and replacement cost) are not always appropriate.

The valuation of household production may be based on marginal values, total values or net values, depending on the purpose of the valuation exercise. Thus, if the purpose of valuation is toward national income accounting or G.N.P., then the appropriate measurement is one of marginal valuation. This is because, conventionally, the value of each economic good for G.N.P. purposes is taken to be equal to its market price or in other words, valuation at the margin. In the case of household production, this would be the value households place on the last hour performed in household production.[10] Consistent with G.N.P. calculations, the product of this marginal value and

the total number of hours performed by the respective households, establishes the total value of household production.

Of increasing practical importance is the valuation of household production for use in matrimonial property settlements. Very often, the division of matrimonial assets and properties are based on respective spousal contribution to the home. Such contributions are based on two sources--(1) income and earning capacity and (2) household production. The contribution made by a spouse to the household in terms of household care and provision, may be interpreted as the foregoing of other activities--earning income, pursuing leisure or other non-remunerative activities--which he or she could have engaged in.

In this case, it can be argued that since time is required for household production, the relevant economic valuation of the time spent in housework can be derived from the values that are foregone by not putting the time to alternative uses. Thus, the time spent in household production has a cost--an opportunity cost--in terms of what has been given up. If it is taken that the spouse who provides these services incurs the opportunity cost, then the total opportunity costs of housework less his or her own consumption of the benefits produced, is the appropriate measure of the sacrifice made by this spouse to the household. Of course, this is not to say that the other spouse who undertakes market work and contributes to household monetary income has no opportunity cost. It is a weighting of their respective contributions and a measure of their respective

'sacrifices' in terms of opportunity costs less their own consumption of the benefits produced that would seem to yield the better estimate, and hence the more appropriate accounting for such purposes of matrimonial property settlements. Of course, there are other important considerations[11] which must be brought into such a calculation, but this is beyond the scope and theme of this thesis.

A third use in deriving estimates of the value of household production and to which this thesis primarily addresses, is in the area of tort litigations[12]--the settlement of legal disputes as to the amount of compensation required for losses in household production services due to wrongful injury or death. This is clearly a welfare question. What is involved, is the degree to which family welfare is affected as a result of the given tort. Thus, the appropriate measure for such compensation questions involving welfare loss through disability or death of a family member who provided household services is the amount required to restore the household's total net benefit position (or net value) to the level enjoyed prior to the accident. The literature on compensation questions most often uses either an opportunity cost measure or a replacement cost measure of the compensation required. As will be shown in a later chapter, both of these methods are inappropriate.

In sum, matrimonial disputes involving opportunities foregone involve different measures as do attempts to value housework for national income accounting purposes and tort litigations. A clear specification of the purpose of valuation is clearly warranted. Unless this is so the measurements used will be seriously in error.

Footnotes: Chapter 2

1. Most attempts to assess the amount of household services produced by households have relied on respondents' recall of time devoted to such purposes. A typical survey poses questions to a member of the household asking for an estimate of the average number of hours that the person thinks are spent either on individual tasks such as meal preparation, laundry and other household chores or, on the total amount of time devoted to all such chores on a daily or weekly basis. A major weakness of these methods is that people are not likely to have any accurate awareness of the amount of time allocated to household production activities. Unlike monetary expenditures on various budget categories, few people have any reason to keep such mental tabulations. The estimation is made even more difficult by the fact that while a disproportionate amount of the household chores may be performed by one person, some such work is usually done by nearly all household members (see Quah and Knetsch, 1983).
2. Sleeping, for example, requires a bed, pillows and some time requirement be it half-an-hour or 8 hours.
3. See Kathryn E. Walker and Margaret E. Woods, 1976.
4. For example, American housewives were reported to spend on the average, about 8 hours performing household chores in any one day!
5. See Rueben Gronau, 1977.
6. Gronau is careful to note that his formulations "implicitly assume that work, whether in the market or in the

non-market sector, carries no utility (or disutility)", and "even casual observations would indicate that this assumption is wrong" (Ibid).

7. See Hawrylyshyn, 1978.

8. Market substitutes are taken to mean replacements--the possibility of someone outside of the household performing the job or work that is normally done by members of the household.

9. Beutler and Owen, provided a categorical approach to household production definition, by designing a four-part questionnaire that attempts to differentiate household activities into 3 types:
(i) Household production where this consists of unpaid activities in the home that could be replaced by market substitutes.
(ii) Non-replaceable household production where these are activities in the home and performed by household members, that cannot be replaced by the hiring of someone outside of the household i.e. no market equivalents, and,
(iii) Consumption activities.
(See I.F. Beutler and A.J. Owen, 1980).

10. Assuming no external effects, this value at the margin also reflects the true marginal opportunity costs in production.

11. It might be argued that the opportunity cost of the spouse who spends most of his or her lifetime on household production falls over this time as it becomes harder to participate in market work due to a depreciation of skills. In such cases, the total

opportunity costs incurred by the spouse would be seriously underestimated and an adjustment is clearly warranted to reflect the present value of the opportunities foregone at the time the decision to forego them was made.

12. A tort is a civil wrong as distinct from breach of contract or breach of trust. Examples of tort include trespass, negligence and nuisance.

CHAPTER 3

Modelling Household Production

1.1 The New Home Economics

Gary Becker's theory of the allocation of time[1] and Kelvin Lancaster's 'goods characteristics' approach[2] to consumer behaviour now form an important part of modern microeconomic theory. The notion held in traditional microeconomics that households only consume was rejected and an alternative approach, now called the household production model, was advanced. The approach derives from the observation that households frequently purchase market goods that do not yield direct utility, but are combined with household time and effort to produce some goods and service flows, termed household commodities which the household values. The Becker-Lancaster Utility Function[3] can be written as follows:

$$\text{Maximize } U = u(Z_1, Z_2, \ldots Z_n) \qquad (1)$$

$$\text{where} \quad Z_i = Z_i(X_i, t_i, E) \qquad (2)$$

$$\text{subject to} \quad T = t_w + \sum_{i=1}^{n} t_i \qquad (3)$$

$$\text{and} \quad I = \sum_{i=1}^{n} P_i X_i \qquad (4)$$

where Z_i = the services or quantity of the household commodity i, t_w = time spent in the labour market, t_i = time spent in producing household commodity i, P_i and X_i are the price and quantity of the market

purchased goods used in producing household commodity Z_i and, E, represents the existing technology in production. Whereas (1) is the household's utility function, (2) represents the household's production function, (3) and (4) are the time and income constraints respectively. As it turns out, (3) and (4) can be combined into a single resource constraint representing the household's full income,[4] yielding:

$$S = {}_{W}T + V = \sum_{i=1}^{n} (Wt_i + P_i X_i) \qquad (5)$$

where W = wage rate from market employment

V = non-wage income

Thus, the household's problem is to maximize their utility function, (1), subject to their full income constraint, (5). The solution to this maximization problem is via the standard Lagrangian form:

$$L = u(Z_1, Z_2, \ldots Z_n) + \lambda(S - \sum_{i-1}^{n} (Wt_i + P_i X_i)) \qquad (6)$$

The Lagrangian expression, (6), in other words, provides for the solution of the household's allocation problem. For example, maximization of the household's utility from household production with respect to the household commodities produced yields:

$$\frac{MU_i}{MU_j} = \frac{W\frac{dt_i}{dZ_i} + P\frac{dX_i}{dZ_i}}{W\frac{dt_i}{dZ_j} + P\frac{dX_j}{dZ_j}} = \frac{\Omega_i}{\Omega_j} \qquad (7)$$

where MU_i and MU_j are the marginal utilities derived from commodities i and j respectively; Ω_i and Ω_j represent respectively the marginal

cost incurred by producing i and j which are in turn, determined by the shadow prices of market inputs (P) and time inputs (W). These shadow prices are inputed since household commodities are not purchased and sold in the market and therefore no observed prices are available. The amount of time taken to produce one additional unit of commodity Z_i is shown by the derivative $\frac{dt_i}{dZ_i}$, while the amount of market goods used to produce one additional unit of commodity Z_i is the derivative $\frac{dX_i}{dZ_i}$. Equation (7) thus shows that in order to maximize the household's utility from household production, the ratio of the marginal utilities of any two household commodities should equal the ratio of their marginal costs in production.

It is also possible to derive the optimal use of amounts of inputs into the household production process such that maximum utility in terms of maximum output can be achieved. Differentiating (6) with respect to time and market inputs yields (where k, l ≡ x, t)

$$\frac{\frac{\partial U}{\partial Z_i}\frac{\partial Z_i}{\partial f_{ik}}}{\frac{\partial U}{\partial Z_j}\frac{\partial Z_j}{\partial f_{jl}}} = \frac{MU_i\ MPP_{ik}}{MU_j\ MPP_{jl}} = \frac{P_{f_{ik}}}{P_{f_{jl}}} \qquad (8)$$

where MPP_{ik} and MPP_{jl} are the marginal physical products of factors k and l in the production of household commodities i and j respectively; f_{ik} and f_{jl}, represent respectively the amounts of the factors k and l used in producing i and j; $P_{f_{ik}}$ and $P_{f_{jl}}$ are the prices of the two

factors k and l. Thus, Equation (8) shows that when the same household commodity is produced such that $Z_i = Z_j$, then, in order to maximize output, the ratio of the marginal products of the two factors should equal their factor prices ratio. If on the other hand, the same factor is used in the production of different household commodities such that k=l, then the factor will be allocated across the different household committees in such a way that the marginal utility values of the factor's marginal products are equal.

Granted that the household production function above yields a variety of interesting results but at the same time, extreme difficulties exist in estimating the magnitudes of many of the critical variables in the model. Apart from the definitional problem of household commodities[5], it is also not clear what the units of measurement of output are, let alone comparing the different amounts of household commodities that are produced. Even more problemsome is how to operationalize and measure the marginal productivity of the factor inputs used in household production. Difficulties also exist in trying to estimate the shadow price of time for household members since in household production, what is involved is essentially non-market time. Using market wage rates as proxies for non-market time valuation is unsatisfactory (see Chapter 5). Although these and other difficulties to a large extent complicate empirical work, it cannot be denied that a major contribution to economic theory has already been made. Of immediate significance of the New Home Economics is that it clearly considers non-market activities within the home as contributing to

utility, and hence having economic value just as those commodities--goods and services--purchased in the market.

An alternative model of household production that makes use of the New Home Economics but that would avoid some of the difficulties mentioned above and which would allow for the measurement of households' economic welfare from household production is now presented.

1.2 The Present Model

The New Home Economics regards the family as a small firm involved in the production and consumption of utility-yielding household commodities and using time and market purchased goods as factor inputs. Time, however, is the ultimate scarce resource, and, according to Becker, the household will allocate its time among market work, leisure and homework in such a way as to maximize net value. It is therefore assumed that this allocation of time involves a joint-decision making process with the different potential and actual wage rates of household members, the family utility function and the difference in the productivity of work of household members as decision variables. For the household, it is the family's utility that is maximized.[6]

Household production is normally provided by members of the same household, producing and consuming the goods and services with the time allocated to this purpose determined largely by other uses of their time and effort, and the utilities and disutilities of such production and consumption. The amount of goods and services actually produced and consumed in the home will, of course, vary from household to household depending on their own circumstances, and from one time

period to another.[7] Since a large portion of the inputs or resources used in household production is time, household activities can thus be quantified in terms of time, and correspondingly, the benefits from consuming home produced goods and services can also be measured in terms of time, to which a dollar value is then inputed.[8]

The model of household production suggested here consists of two variations where (i) the households fend for themselves in terms of household production and there are no market replacement services available such as domestic maid services (termed the Non-Replacement World) and, (ii) market replacement household services are available and households can purchase them (termed the Replacement World).

a. The Non-Replacement World

The non-replacement world is characterized by the absence of market substitutes for household services such as domestic or home-maker services and that all households self-provide for themselves in terms of household production.[9] A model of household production given these circumstances is presented in Figure 1. To simplify matters the amount of time spent on leisure activities is taken as a given.

Figure 1(c) shows a downward-sloping 45^{o} line to illustrate the full employment of the household's total (fixed) time resources either to engage in market production, thereby producing market income or to engage in household production, thereby producing household commodities. Thus, if no household production takes place within the household, then up to a maximum of $n168-\bar{L}$ hours a week may be used to produce market income (shown leftward from the origin, 0 to T_W) where $\bar{L}$ represents some fixed hours that the household spends on leisure per week and n

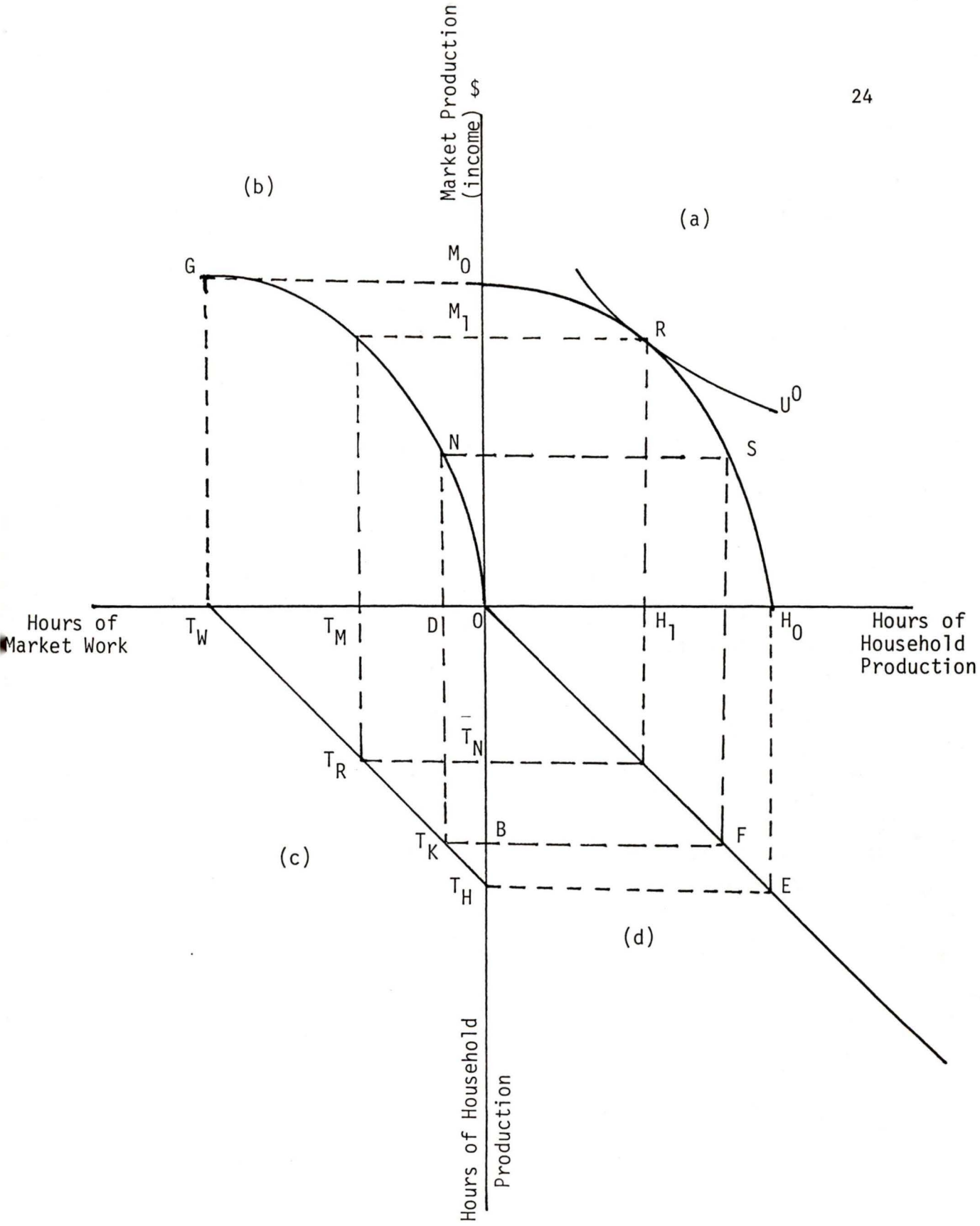
Market Production (income) $
(b)
(a)
G
M_0
M_1
R
U^0
N
S
Hours of Market Work
T_W
T_M
D
O
H_1
H_0
Hours of Household Production
$\bar{T}_N$
T_R
B
F
T_K
(c)
T_H
E
(d)
Hours of Household Production

Figure 1

is the number of household members.[10] Similarly, if no market production takes place, then the maximum amount of time the household can spend on household production is again n168-$\bar{L}$ hours in any given week (measured downward from the origin, 0 to T_H). The line $T_W T_H$ is thus a time-constraint line such that:

$$\sum_{i=1}^{n} T_{H_i} + \sum_{i=1}^{n} T_{W_i} = nT - \sum_{i=1}^{n} L_i$$

But $$\sum_{i=1}^{n} L_i = \bar{L}$$

$$\sum_{i=1}^{n} T_{H_i} + \sum_{i=1}^{n} T_{W_i} = nT-\bar{L} \qquad (1)$$

where L_i represents the number of hours taken up by leisure of the i_{th} household member.

The income or market productivity curve shown in Figure 1(b) is concave indicating diminishing returns to market income since household members have different earning capacities in the market--some household members are more suited in household production than in market or income production. Thus, those household members with higher income generating capacity from market production will spend most if not all of their time in market work (at least they will be the ones that the household will choose to put to market work first) relative to those members with lower market income generating capacity. If the latter household members were also put to market production together with those of the former thereby raising total household time spent in

market production, the marginal increase in household income falls i.e.

$$\frac{\partial Y}{\alpha T_W} > 0 \qquad (2)$$

$$\frac{\partial^2 Y}{\partial T_W^2} < 0 \qquad (3)$$

where Y is total household income. Thus (2) denotes positive marginal household income and (3) exhibits diminishing marginal household income.

In Figure 1(d), a 45^o mirror line is drawn to reflect the time allocated to household production (Figure 1(c)) to Figure 1(a), showing the household's production possibilities curve between hours of household production and market income. The production possibilities curve (also called the transformation curve) given by M_0H_0 shows the maximum amounts of each commodity (market production expressed in terms of market income and household production expressed in hours of homework) the household can obtain at a given point of time. M_0 (equal to T_WG in Figure 1(b)), shows the maximum amount of market income that the given household can expect to receive if it devotes all its time resources into outside work. H_0 (equal to T_HE in Figure 1(d)) on the other hand, shows the maximum amount of household production (as measured by time) that the same household can expect to receive if it devotes all its time resources into homework. Any intermediate allocation of time, such as T_K in Figure 1(c), results in market income DN in Figure 1(b) and in household production BF in Figure 1(d), which

is shown as point S on the transformation curve in Figure 1(a). Other points can be derived in a similar fashion (e.g., time allocation T_R yields combination bundle R on the transformation curve--by completing the rectangle). Now, consider the movement from S to R that accompanies the time reallocation from T_K to T_R. As more household time is poured into the market sector, diminishing returns to income decrease household members time productivity at the margin. Thus, the relative cost of producing more market income rises--the transformation curve is concave. Dimishing returns lead to increasing opportunity costs. Similarly if more hours are spent in household production--the reverse reallocation of time from T_R to T_K--the opportunity cost of these additional hours rises because the time of the more income productive household members is being put to less favourable use. The production possibilities curve is thus concave denoting higher marginal opportunity costs in shifting resources in terms of time from one production to another.

The point R, represents a level of combination of these two activities--market production and household production--for which the household's utility is maximized. Specifically, point R is the optimal choice of production combination, since it falls on the production possibility boundary and touches the highest possible household indifference curve, U^0. At point R, the optimal combination of time used in market production and household production is T_R (shown in Figure 1(c)) or T_M hours in market work and T_N hours in homework. In Figure 1(a), the optimal amounts received are M_1 and H_1 respectively. The

marginal rate of transformation at point R is the ratio of the marginal opportunity cost of producing H_1 to the marginal opportunity cost of producing M_1, and since also at this point, the slope of the production possibilities curve is tangent to the household's utility function, then the maximization of utility requires:

$$MRT_{HM} = \frac{MC_{H_1}}{MC_{M_1}} = \frac{MU_{H_1}}{MU_{M_1}}$$

where MRT_{HM} is the marginal rate of transformation of household production for market production, MU_{H_1} and MU_{M_1} are the marginal utilities from household production and market production respectively, MC_{H_1} and MC_{M_1} are the respective marginal opportunity costs in household production and market production.

b. The Replacement World

The existence of market substitute services such as homemaker services, domestic servants or housekeepers, and, agencies like rent-a-mother and rent-a-wife, characterize the replacement world. If household production services are made available to the household at sufficiently attractive prices, the household would be induced to hire some hours from these replacements to substitute for some of the work currently being performed by household members.

Consider Figure 2. In Figures 2(b), 2(c) and 2(d), the same functions as Figures 1(b), 1(c) and 1(d) are represented, namely that 2(b) represents the income or market production function, 2(c), the

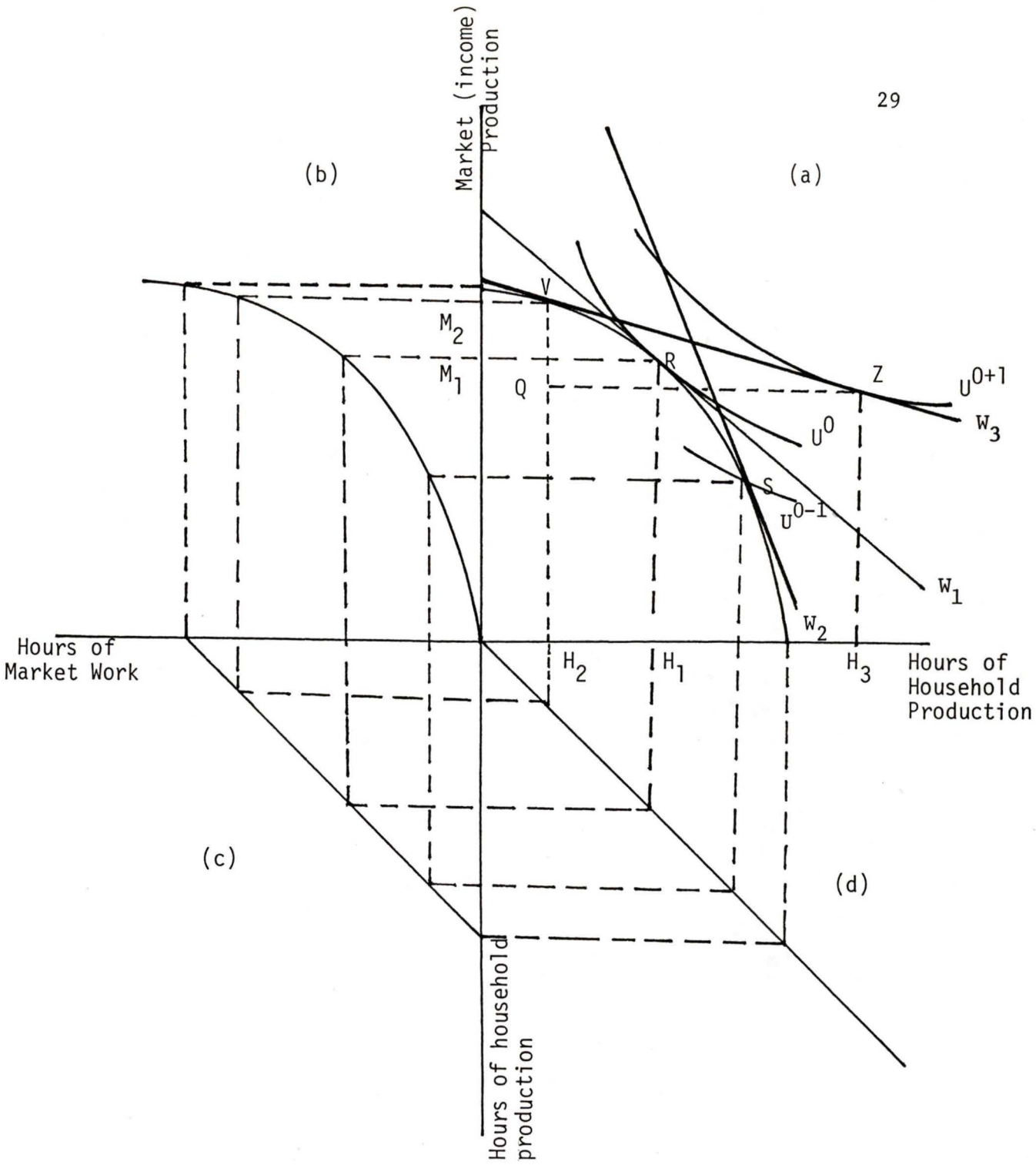
(b)
Market (income) Production
(a)
V
M2
M1
Q
R
Z
U0+1
W3
U0
S
U0-1
W1
W2
Hours of Market Work
H2
H1
H3
Hours of Household Production
(c)
(d)
Hours of household production

Figure 2

household's time constraint and 2(d), the reflector line. In a non-replacement world, the household's utility is maximized at point R where the household's production possibilities curve is tangent to the household's indifference curve, U^0 (Figure 2(a)). Assume that the slope of this mutual tangency at R is such that \$2 of market income exchange for 1 hour of household production, this rate of exchange being the household's own terms of trade. Now suppose that, the market wage rate for domestic replacements is such that \$1 of market income exchange for 1 hour of household production (w_3). The household can clearly make gains by hiring a domestic replacement, for, it need only give up \$1 of market income to acquire 1 hour of household production, whereas if it self-produces that additional 1 hour of household production, it has to sacrifice an amount of market income equal to \$2. There is, therefore, a clear incentive for the household to buy the additional hour of household production from a replacement than to self-produce for itself. But once the household starts to increase hours of household production hired from the replacement by giving up \$1 of market income for 1 hour of household production, the household begins to spend less hours in household production themselves and more household time is poured into market work such that more market income is now produced. This is shown by a movement along the transformation curve from initial (non-replacement) position R, upward until point V is reached, at which further movement is no longer profitable. For at point V, the household's own terms of trade between income or market production and household production are also equal to \$1 of

market income for 1 hour of household production, the replacement terms of trade.

At point V, the household produces M_2 of market income and self-produces H_2 level of household production. The replacement terms of trade, showing the relative price ratio between market production and household production (done by a replacement) is drawn as a straight line, W_3 and is tangent to the household's transformation curve at point V. This construction implies that at these replacement terms of trade household production and market income can be exchanged via the replacement terms of trade for any other points along the W_3 line. Thus given the favourable replacement terms of trade, W_3, the household will exchange collection V for a preferred collection Z. At point Z along W_3, the household self-produces H_2 level of household production and buys H_2H_3 number of hours of household production from a replacement. In exchange for H_2H_3 hours, the household gives up VQ amount of market income. The household now maximizes its utility at level U^{O+1} such that $U^{O+1} > U^{O}$.

Only if by sheer coincidence the replacement terms of trade is given by the replacement wage line W_1, will the household be indifferent to hiring replacements at the margin (the household's own terms of trade are equal to the replacement terms of trade at the margin). Of course, for infra-marginal hours the household gains from not hiring replacements since the household's opportunity cost of the infra-marginal hours that are self-performed is less than the replacement wage rate, W_1. This is to say that the

household sacrifices less in terms of market income foregone by self-producing household production for the infra-marginal hours than if the household were to hire replacements and give up market income in exchange for these services.

Finally, if the replacement terms of trade is given by the replacement wage line W_2, the household will choose not to hire replacements, for by hiring, the household will become worse-off.[11] The welfare or utility position of the household at point S for example, where S lies on the production possibilities frontier and is tangent to wage line W_2 is lower than that at point R (shown by drawing an indifference curve passing through S, given by U^{0-1} such that $U^{0-1} < U^{0}$). This, of course, presumes that the household cannot trade its own household production time at W_2.

The model of household production presented above, represents a possible way of conceptualizing the household's problem of maximizing household utility from household production. Not only does the Model proposed here allow for a common unit of measurement of household production by time, but also, the optimal allocation of time between market work and homework can be derived such that the household's utility from market and household production is maximized. Moreover, the Model provides for the alternative ways of analyzing the behaviour of the household in household production with and without replacement or outside help at various wage rates, an area commonly neglected by the New Home Economics and other existing formulations on modelling household production. Instead, existing formulations on household production tend to concentrate on the dichotomy between market work and

homework and the household's optimal allocation of time in these two sectors. Very little, if not, no attention is paid to the existence of market replacement workers to substitute for some of the household production currently performed by household members, which if included, a very different optimal allocation of time between home production and market production may result (consider the example given above when the replacement wage rate is W_3).

While modelling household production usually represents the first major part of household production research, the second major part is to provide a monetary estimate of the home produced goods and services--the value of household production.

1.3 Value of Household Production

Household production is usually seen to be of great importance to the welfare of households and even to be essential given that food needs preparation, children (if any) require care and some minimal level of cleanliness is necessary to maintain physical well-being. This is to suggest that people do value goods by some amount in excess of what they actually pay for them in market exchanges. It is common for consumers to be willing to pay an amount in excess, and often far in excess, of its market price. The availability at such prices allows consumers to enjoy a surplus from the exchange--they obtain something by paying only a portion of what they would be willing to sacrifice for the infra-marginal units. This surplus amount is, to the consumer, a gain from the exchange; the larger the surplus, the larger the gain. These gains are inappropriately termed welfare measures (also, net

benefit and consumers' surplus measures) in consumption. The willingness to pay would also likely vary over different numbers or quantities of the good. An individual might well be willing to pay a substantial sum for some small amount of a good, but would then sacrifice much less for successive added increments.

However, it clearly does not follow that the value of household production is infinite or beyond estimate. There are very finite limits to the value placed on household production even when it is acknowledged to be very important.

Some of the evaluation concerns can be illustrated with the somewhat analogous case of food. Availability of food is, as a practical matter, essential to survival and is clearly of great value to individuals and families. Still a family will likely spend a relatively small proportion of its budget for food. This is not to say that food is not important, it is still essential, but the economic value of any particular collections of food items--the weekly groceries, for example--is limited by the availability of substitute collections of food items.

Food has very great economic value because if forced, people would give up many, if not most, of other things in order to obtain it. That is, their willingness to sacrifice other goods is large as food is so important. However, because of ready substitutes, their willingness to pay for any particular food items is limited to far more modest sums. Thus the economic value of food may well be large, but the economic value of specific food items, which is normally the point at issue in any measurement exercise, is more accurately reflected in

the relatively small amounts that are paid for food supplies.

To the extent that substitutes are seen to be more compatible, the willingness to pay for the present good would be limited. And, conversely to the extent that substitutes are deemed to be poor or unavailable, the willingness to pay to obtain or retain the present good will be enhanced.

But even in the absence of good substitutes the ability and willingness of people to sacrifice other things for any good will be limited. The extent of the sacrifice will depend on how desirable they find the good, on how well they can get along without it, on the prices and availabilities of other goods, and on their wealth or incomes.

The notion of demand assumes that people will act according to their wants and desires so as to maximize their satisfaction, subject of course, to constraints of income and prices. All of the determinants of the economic value of any good or service would at least in principle, be reflected in the demand curve for the good. The valuation of the good, however, can be based on marginal, total and net values, depending on the purpose of valuation.

Since the maximum amount a person (household) is willing to pay for an additional unit of the good depends directly on the amount of utility the person (household) expects from consuming the marginal unit relative to alternatives available, goods with relatively high marginal utilities would be indicated by a high willingness to pay or to sacrifice for an additional unit of the good. Thus, while marginal

valuation refers to the incremental changes in value from having an additional unit of the good, total valuation is the sum of marginal values up to the amount or quantity actually consumed. But since very rarely are goods and services made available without cost--the opportunity cost in terms of foregone opportunities--whether in production or consumption circumstances or both, the correct measure of economic welfare is thus neither based on total valuation nor marginal valuation but on net valuation. The net value of a good is the difference between the total value and the total opportunity costs from consuming and/or producing the good at the margin. Putting it in another way, net value measures the amount of net benefits accruing to the person in the consumption and/or production of a good, where net benefits is the difference between total benefits and total costs.[12] Thus, unlike total values which do not account for the opportunity costs in the production and/or consumption of a good, net values take these into account and are appropriately termed welfare measures.

However, a caveat is in order. A measure of the economic welfare as calculated from an ordinary or Marshallian demand curve will be an overestimation if the good is non-inferior and an underestimation if the good is inferior. This is due to what is commonly referred to in the literature as the income effect problem. The income effect is that portion of the increase or decrease in quantity demanded of a good attributed to the change in real income. For the welfare of the individual (household) is no longer the same as before but is likely to be revised upwards if the good is normal and

downwards if the good is inferior. Thus, the marginal willingness-to-pay curve or demand curve of the individual (household), has to be drawn in such a way that moving along the curve would entail no welfare changes. This is to say that if the demand curve is derived by reference to the most the person is willing to pay for successive units of the good, it is essential to assume that he does indeed pay the maximum sum for the incremental units of the good--for otherwise, his welfare would change as we move along the demand curve. If the good is normal for example, the higher real income would lead to a higher marginal willingness to pay for successive units of the good so that at the margin, a higher level of welfare is reached than if real income remains constant. In applied economics however, it is generally assumed that the income effect is zero or negligible so that the measure of economic welfare derived from the Marshallian demand curve is a good enough approximation to the true economic welfare derived from a real-income held constant demand curve (also, the Hicksian demand curve).

Indeed, Harberger (1971) has suggested that for all practical purposes, the income effects should be regarded as small and that the Marshallian consumers' surplus be institutionalized as the correct measure of welfare and welfare changes.[13] The position is also reinforced by the empirical work of Willig (1976) when he concluded that:

> In most applications the error of approximation will be very small . . . . specific empirical criteria which can replace the apologetic caveats frequently employed by

> those who presently apply consumer's surplus . . . . the results imply that consumer's surplus is usually a very good approximation to the appropriate welfare measures.[14]

Thus, in the theoretical analysis presented here, it will be assumed that the income effects are zero such that the Marshallian measure of consumers' surplus or net value is equal to that of the Hicksian. However, in the empirical analysis that follows (Chapter 6), it appears that there were no problems with income effects after all.

Very much the same measure can be used for a household's evaluation of household production. With little doubt at least some minimal level of such services are important to members of a household. Successive quantities are, however, likely to be less important. As in the case of any other good or service that might be demanded by a household, a measure of the use or total value for household production is given by the maximum sacrifices that the household is willing to make to obtain it--their total willingness to pay. The extent in which households are willing to pay for household production would be expected to differ not only over varying levels of such production but also with other considerations such as the different opportunities to use their time for earning money incomes or to engage in other non-remunerative activities--their opportunity cost of time--and, with their tastes and distastes in performing household work. Households that have higher valued opportunities for use of their time, have higher incomes, have larger numbers of children and larger dwellings, or have greater aversions to household chores, might well be expected to

be willing to pay more to have such work performed. Estimation based on the demand curve for household production is theoretically the correct measure of the relevant use or total value of household production. The net value is then derived from the total value--households' total willingness to pay--less the total opportunity costs, households have to bear in order to have it. The particular circumstances and preferences of households would be reflected in such estimates.

The peculiarity of the provision of household production is that to a large extent, households themselves supply them. The economic value of the time spent in household production therefore provides a good indication of the economic value of the benefits produced--household commodities--using that time.[15] An indication of the expected gains and losses of varying levels of production effort to a household is illustrated in Figure 3a.

The marginal benefit (MB) and marginal cost (MC) curves (assumed here for convenience, linear and continuous) of a given household are shown in Figure 3a. The marginal benefit curve shows for instance, the additional gain from expanding further efforts and time to household production, decreasing as more and more hours are devoted to housework (diminishing marginal utility), eventually reaching zero marginal gain at point N. At point N, nothing could be gained by devoting an additional unit of time to the household production. The principle of declining marginal benefit simply indicates that for most households at least some level of household services are important, but successive quantities are, likely to be less important. This is consistent with the shape of the indifference curves drawn in Figures 1 and 2.

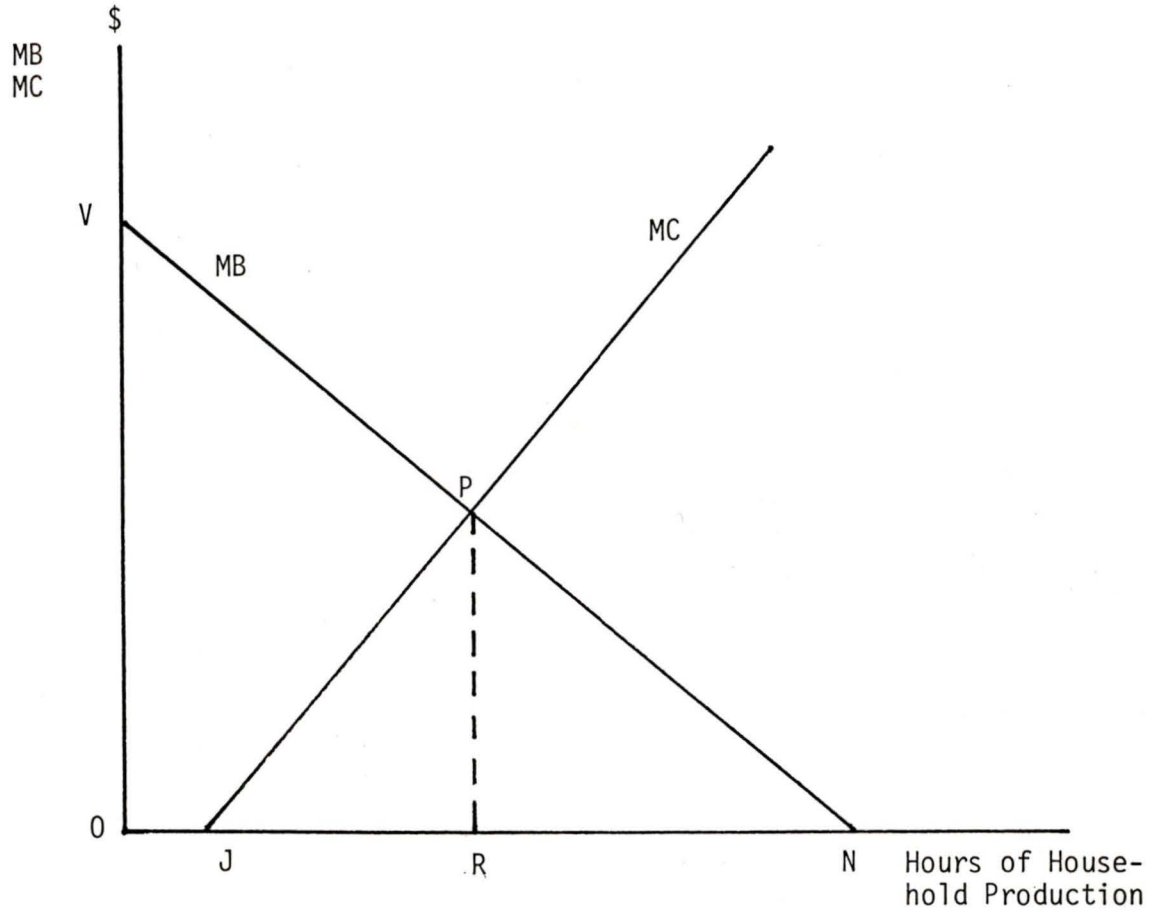

Figure 3a

Thus, marginal benefit is higher at lower levels of household production and lower at higher levels of household production. The position and slope of the marginal benefit curve would, of course, vary between households depending on the particular tastes and circumstances of each.

The marginal cost curve is shown to have a positive slope indicating higher additional costs as more time is employed in household production. These costs reflect household members' evaluation of the utilities and disutilities of alternative uses of time, including net gains from paid work, enjoyment from leisure and the pursuit of other non-remunerative activities. Households whose members have high opportunity costs for use of their time because of large earning capacities, or, a greater fondness for leisure, or both, would incur larger costs in devoting time to household production than households whose members have lower earning potentials or little use for leisure time. For most households, the marginal opportunity cost of performing housework are likely to be relatively small for some limited allocations of time to household production, and may even be zero, or negative, for some very small amount of time (this is shown as OJ hours in Figure 3a), but would probably increase for larger commitments. The rising marginal costs is the direct result of the rising marginal benefits of those goods and services that have been given up in order to consume the benefits from household production.[16] Alternatively, the rise in marginal costs corresponding to increased household time spent in household production is the result of putting the more

market productive household members with respect to the use of their time in household production. The return from market production yielding market income to the household of the marginal worker is higher than all the infra-marginal workers so that the increased time spent in household production is said to effect a rise in the household's marginal cost in household production.[17] This is consistent with the production possibility curve derived in Figures 1 and 2.

A household facing marginal costs and marginal benefits as indicated in Figure 3a, would devote OR hours to household production, each of these hours produces a gain which exceeds the added cost. Beyond OR hours, however, the costs in terms of opportunities given up outweigh the gains from further efforts. Even though the household would receive some benefits from further household production services, these would be left undone as the time and effort required are not worth the sacrifices that would be required--the time is more valuable in other uses where production of benefits is greater. In sum, the household would not be induced to work beyond OR hours. They would presumably continue to supply hours of household production up to the point where the added gains from further efforts is equal to the added cost of devoting more time and effort to this purpose. We observe that at OR hours, the total benefits--total value--from household production enjoyed by this household, is given by the area OVPR, while its total net benefits--or net value--is the area OVPJ. Since the marginal benefit curve is also the curve showing the amounts people are willing to pay for successive units of benefits derived from household production, it can be reinterpreted as the household's

demand curve for household production. Similarly, the marginal cost curve can be viewed as the household's supply curve, the area below the curve indicating total opportunity costs. Thus, the relevant measure of welfare in household production is given by the area above the household's supply curve but below its demand curve over the range of quantity taken. For this household, it is the area OVPJ--the relevant measure of total net benefits or net value from household production. We say that the household places a net value equal to OVPJ for having OR hours of household production. Also, by devoting OR hours to household production, the household maximizes their total welfare from household production, since, it is not possible to increase any further, their total welfare by devoting more or less hours to it.

However, the above analysis of the value of time and therefore of the benefits from household production is only correct if one assumes a non-replacement world. In a replacement world, the net value from having household production is much greater if household production services are made available to the household at sufficiently attractive prices; such replacements may be substitutes for some of the work supplied by members of the household. Consider Figure 3b.

In terms of Figure 3b, at prices or wages above W_1, no replacement services will be purchased, for although the values may exceed the replacement cost for at least a portion of these hours, the household will find it more economical to supply the services themselves. The wage rate W_1 is above the household's marginal cost curve from 0 to R hours, which to the household would be more expensive (in terms

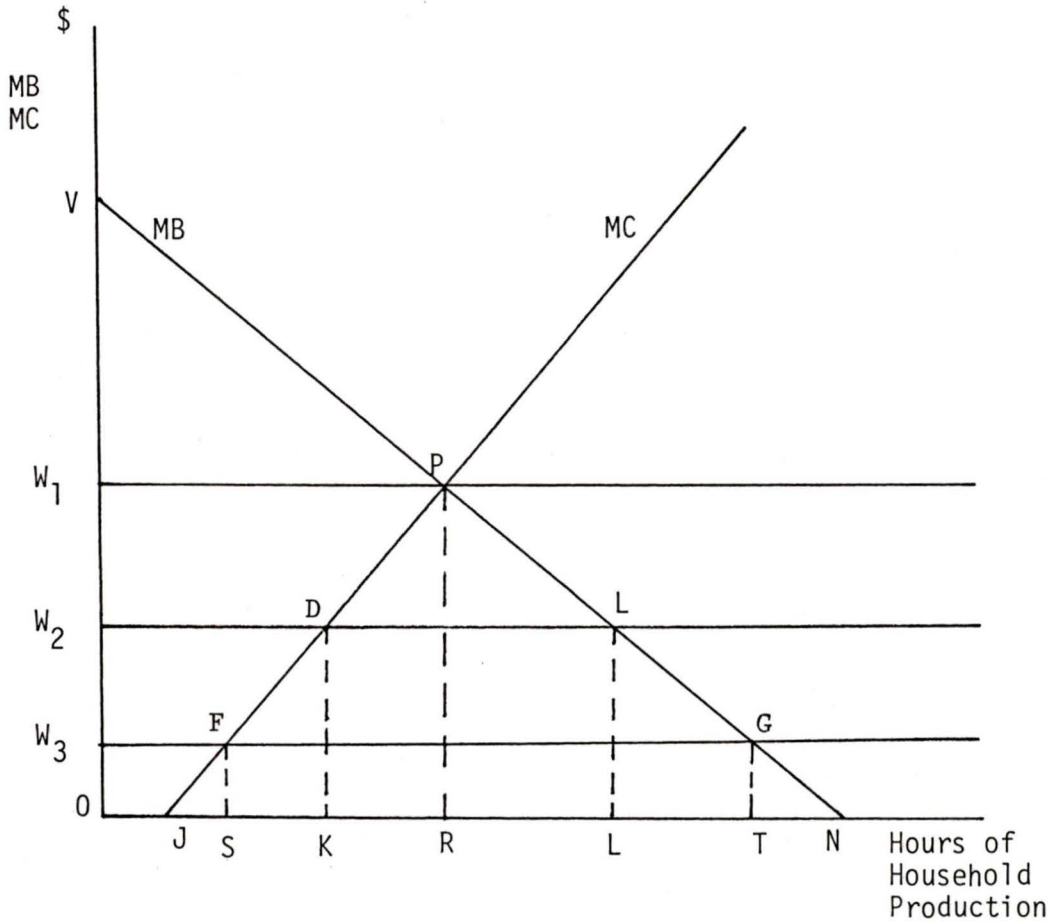
$
MB
MC
V
MB
MC
P
W1
D
L
W2
F
G
W3
0
J
S
K
R
L
T
N
Hours of
Household
Production

Figure 3b

of opportunity costs) to hire the replacement than if members of the household continue to provide for these services themselves. At a wage rate less than W_1, say W_2, the household is now willing to buy KL hours of household production services from this replacement, but continues to supply OK hours themselves. At this wage, KR of the original hours will be substituted, for this price is less than the cost of the members of the household supplying these hours. They will also purchase an additional RL hours at this price, for, the returns from these added hours of effort exceed the necessary outlays.

At lower prices, such as W_3, the household will reduce further their own supply of effort to OS and purchasing ST hours from this replacement. Finally at a zero price, the household will take JN hours as each of these hours has a positive return to them of providing valued services and allowing members of the household to allocate their time to other purposes. However, they will continue to provide OJ hours themselves for they either have a zero opportunity cost for this time or receive some satisfaction or utility from doing this amount of work. Again, all of this is consistent with the model presented in Section 1.2.

We have established that the correct value of household production is given by the household's total net benefits--net value--from household production. This represents the household's current level of enjoyment--welfare--from having household production over and above their supply cost. In a non-replacement world, the relevant area corresponding to a total net benefits is OVPJ for the given household (see Figure 3a). In a replacement world, unless the market wage rate

is W_1 or above, the area corresponding to total net benefits for the same households is not OVPJ but rather somewhat greater than OVPJ, the latter resulting from lower supply cost. This can be easily seen by referring back to Figure 3b. At wage rate W_1, the household hires no replacement and self-provides all OR hours, the total net benefits or net value is OVPJ. As the wage-rate drops to W_2, the household, for reasons explained earlier, buys KL hours of household services from a market replacement and self-performs OK hours. Total net benefits accruing to this household is no longer OVPJ but rather OVEDJ. This is because the household's marginal cost has been altered from OJP to OJDE. Similarly at wage rate W_3, the household enjoys OVGFJ of total net benefits.

The empirical estimation of the value of household production given the above theoretical analysis is left to Chapter 6. The next chapter shows how, with the aid of the theoretical model of household production and valuation presented here, can be used to resolve the many issues involving compensation in tort litigations.[18]

Footnotes: Chapter 3

1. Gary Becker, 1965.

2. Kelvin Lancaster, 1966.

3. Also see Michael and Becker, 1973.

4. Ibid, pp. 378-395.

5. See Chapter 2.

6. The transition from maximizing the welfare of the individual to the welfare of all members of the household is termed the 'Samuelsonian finesse' by Marc Nerlove who cites Samuelson:

> Where the family is concerned, the phenomenon of altruism inevitable raises its head: If we can speak at all of the indifference curves of any one member, we must admit that his tastes and marginal rates of contribution are contaminated by the goods that other members consume. These . . . external consumption effects are the essence of family life . . . Such problems of home economics are . . . of the same logical character as the general problem of government and social welfare. (And) . . . if within the family there can be assumed to take place an optimal reallocation of income so as to keep each member's dollar expenditure of equal ethical worth, then there can be derived for the whole family a set of well-behaved indifference contours relating the totals of what it consumes: the family can be said to act as if it maximizes such a group preference function.

See Marc Nerlove, 1974.

7. Outdoor activities, such as gardening, mowing and washing automobiles may be more frequent during the summer season than for example, during the winter season. Also, the hot season of the summer may call for more vacuuming arising from more dust being accumulated than it is for example, in winter. The increased activities may result in greater time spent in household production.
8. It is not feasible for example, to quantify household produced goods and services in all their variety, of one item in terms of another. This is the old problem of adding oranges and apples.
9. This, however, does not rule out things such as food deliveries, eating out or staying in a room and board type of accomodation.
10. Excluding non-legal employment age members.
11. It is assumed here in this and other cases, the household does not sell their time in household production at the market replacement wage rates so that the household does not move along the wage line in a reverse direction.
12. Since consumer demand curves can be looked upon as marginal benefit curves in so far as they relate to changes in total benefits arising from additional consumption of the same good or service, and that producer supply curves as marginal cost curves as they relate to changes in total costs arising from additional production of the same good or service, consumers will then consume and/or produce goods and services, only up to the point where the marginal conditions hold i.e. where the marginal benefit gained

from an extra unit of the good consumed or produced is equal to the marginal costs from consuming or producing that extra unit. Their total net value--total net benefits--is said to be maximized at that point. In the aggregate, the total net value of a good is the summation of consumers' surplus and producers' surplus, yielding the net social value.

13. Harberger, 1971.

14. Willig, 1976.

15. The assumption here is that, labour time is the only input and no attempt is made to measure the value of the capital or market goods used also as inputs.

16. Of course, one might argue a case for a horizontal or constant marginal cost curve, but this is ruled out except for the very short periods of time. The postulate of a horizontal marginal cost curve is inconsistent with the normal expectation i.e. as we have more and more of one good, the result is falling marginal benefits, but, as these benefits are the product of having less and less of other goods--the rising marginal benefits of those goods foregone--we are said to incur rising marginal costs for consuming the good which we are getting more of.

17. The reader will remember that this explains the shape of the household's production possibilities curve as well.

18. Note that no direct proposals are made to reform existing damage rules. The purpose here is to attempt a clarification of the meaning of the term compensation in economics and show the theoretical analysis behind cases of wrongful injury and wrongful death.

CHAPTER 4

Damage Assessments in Tort

Among the uses of deriving estimates of the value of household production is the area of tort litigations or the settlement of legal disputes as to the amount of compensation required for losses in household production services due to wrongful injury or death. In this chapter, I examine first, compensation to families in death actions (or when a household member has been totally disabled) and second, compensation to families in injury actions. The theoretical analysis behind both cases is not substantially different, the only difference being one of the degree of welfare loss. In both cases, the argument will be made that the appropriate sum of compensation should be one that restores the level of net benefits--net value--from household production enjoyed by the victim household to the level prior to the accident.

1.1 Wrongful Death

a. An Extreme Example

A very simple and extreme example is one in which the family member who normally provides all of the household services in the home gets killed or becomes totally disabled following an accident and that no other household member can perform the services due to other constraints. Assume that the household member concerned contributes only to household production and not to market production. The model of household production in a non-replacement world illustrated by Figure 3a in Chapter 3 is reproduced in Figure 4.

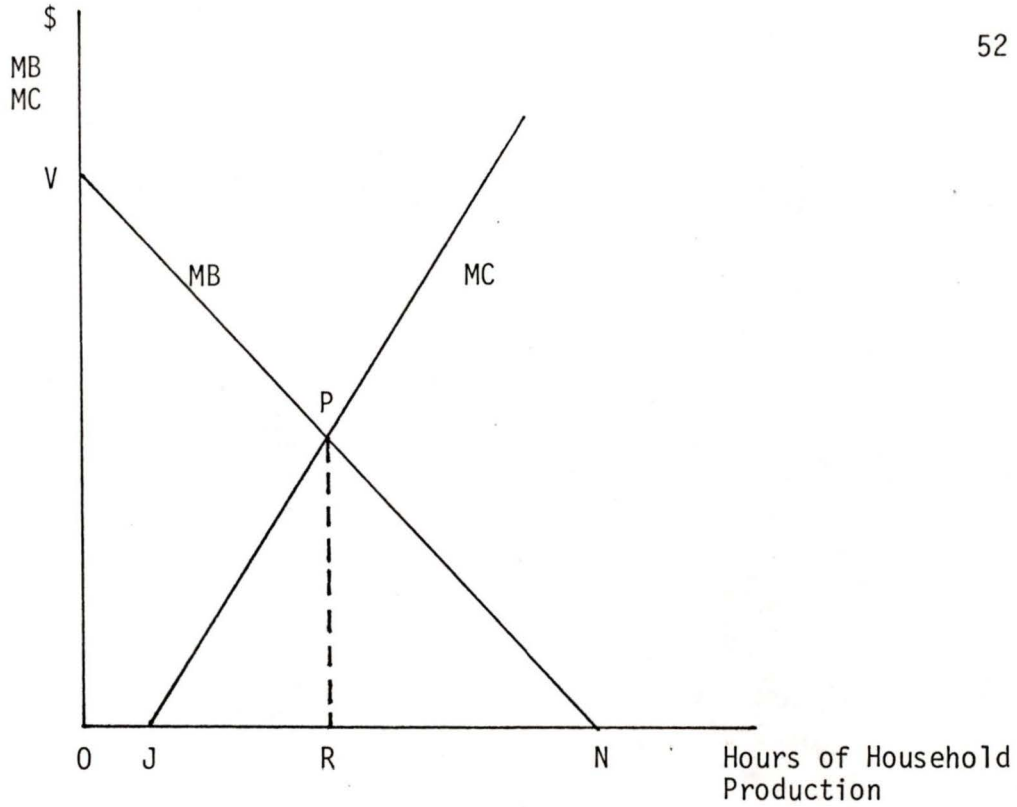

Figure 4

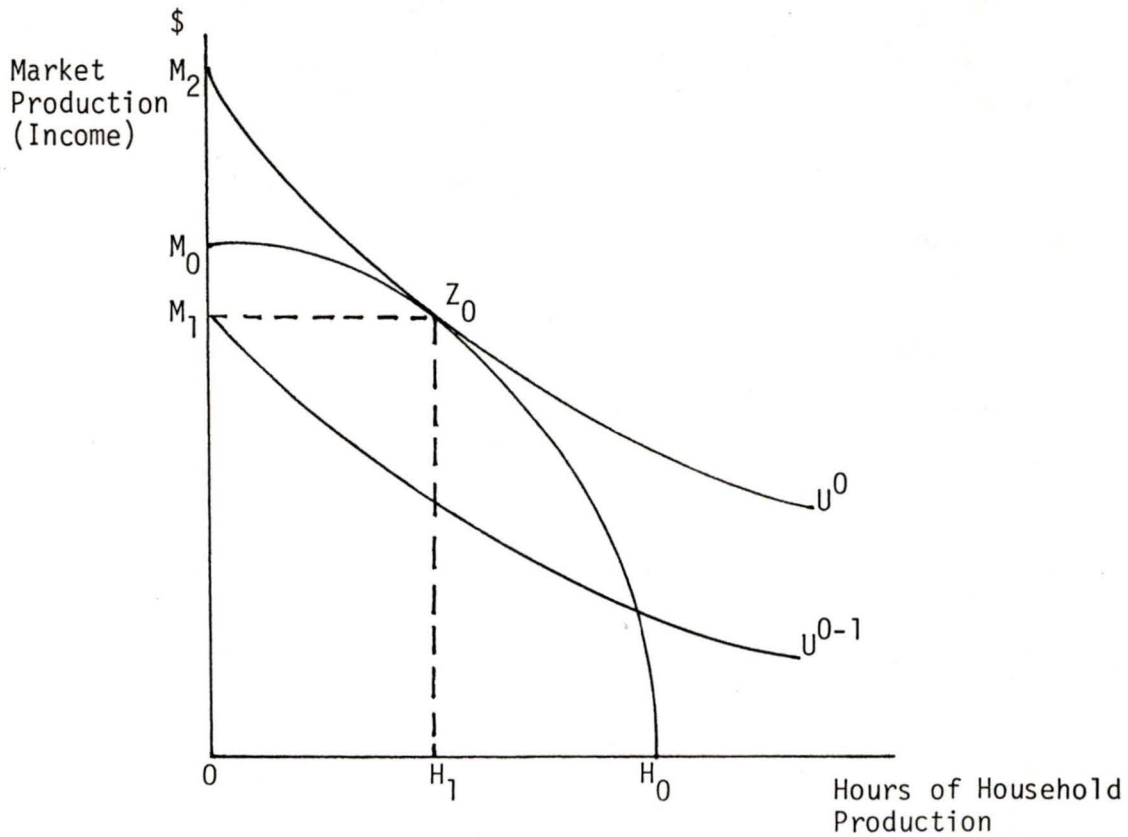

Figure 5

It is clear from Figure 4 that OR hours of previously performed household services are now lost. The household's marginal cost curve is, in effect vertical and is equal to OV. The amount of compensation required is simply OVPJ--the amount of net benefits lost. The amount OVPJ, when paid to the family, returns their level of welfare to that level enjoyed as before the accident.[1]

The same analysis can be put in terms of indifference curve analysis. In Figure 5, the household is shown originally to be at optimum position Z_0--receiving M_1 dollars in market income and spending H_1 hours in household production--with the household's utility maximized at level U^0. If no hours of household production can now be performed as a result of the accident, the household will be at point M_1, the maximum amount of market income produced and received by the other household members. But corresponding to this point M_1 is a lower welfare or utility level given by U^{0-1}. The minimum compensation sum therefore required to leave the household on its original level of utility is given by the vertical distance M_1M_2 (Point M_2 lies on the same household indifference curve as point Z_0). Stated otherwise, M_1M_2 is the minimum compensation necessary to leave the household's total net benefits--net value--from household production unchanged. The compensated sum M_1M_2 is thus equal to the amount OVPJ in Figure 4. It is assumed here and in the following cases that, there are no income effects so that the indifference curves U^0 and U^{0-1} are vertically parallel and the demand curve VN in Figure 4 is Hicksian.

The analysis is not much different when we consider compensation

in the case of wrongful death in a replacement world. Figures 6 and 7 illustrate this. In Figure 6, at wage rate W_1--the wage rate of market domestic workers--the household hires no replacement services and self-supplies OR hours themselves (MC < W_1 up to OR hours). By self-supplying OR hours, the household enjoys a level of net benefits from household production equal to OVPJ. After the accident, the household's marginal cost curve is vertical and is equal to OV. But because of the availability of market replacement services, the household's marginal cost curve is now OW_1P. Equating this marginal cost with the household's marginal benefit curve, the household hires OR hours of household services from the market replacement. Total net benefits after the accident is W_1VP. The loss in welfare is thus OVPJ - W_1VP or OW_1PJ.

In terms of Figure 7, the wage rate W_1 is shown as the wage line W_1 (the slope is the relative price-ratio between household replacement services and market production). Following the outcome of the accident where now, no household production services can be performed, the household is at point M_1. As before, point M_1 lies on the household's indifference curve U^{0-1} indicating a lower level of utility or welfare. However, since the household can purchase market replacement services to substitute for the lost household services at wage rate W_1, and since the household's marginal cost curve is now equal to the wage rate W_1, the household will be induced to hire OR hours from a market replacement, thereby reaching utility level U^2 where $U^{0-1} < U^2 < U^0$. But since this utility level U^2 is still lower than

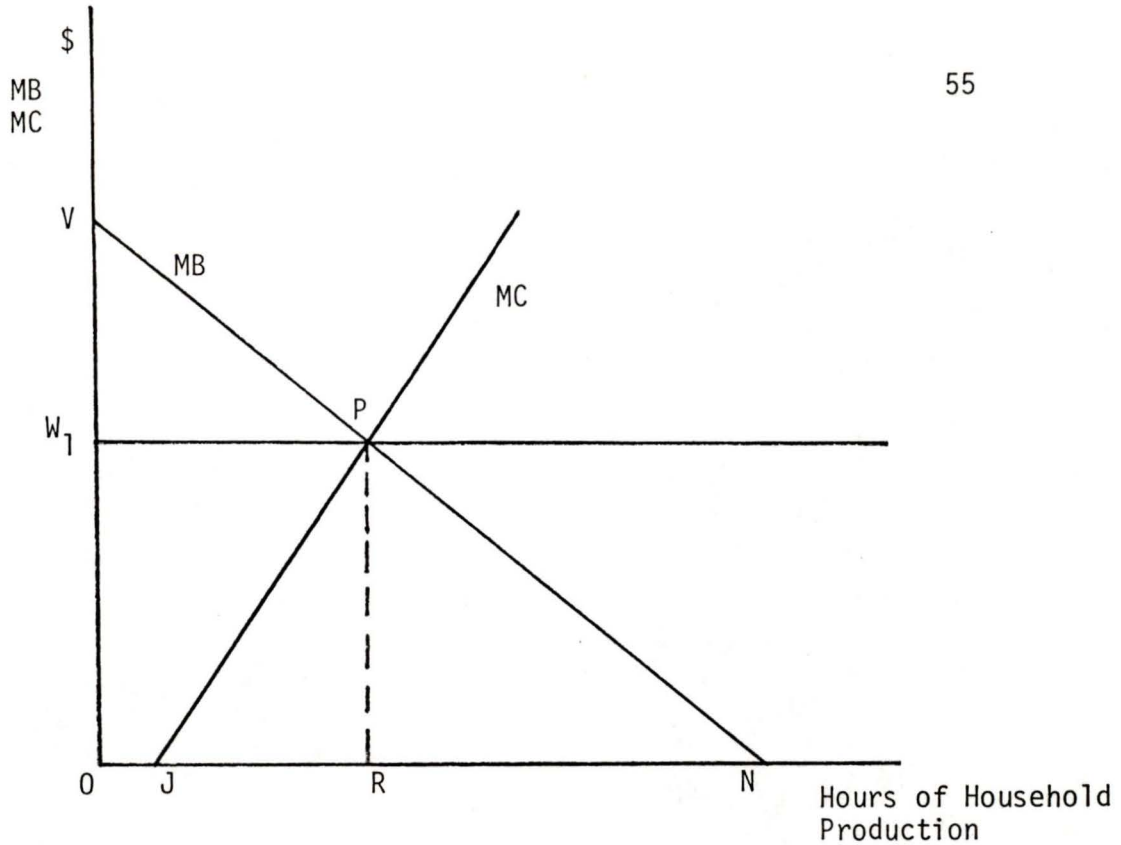

Figure 6

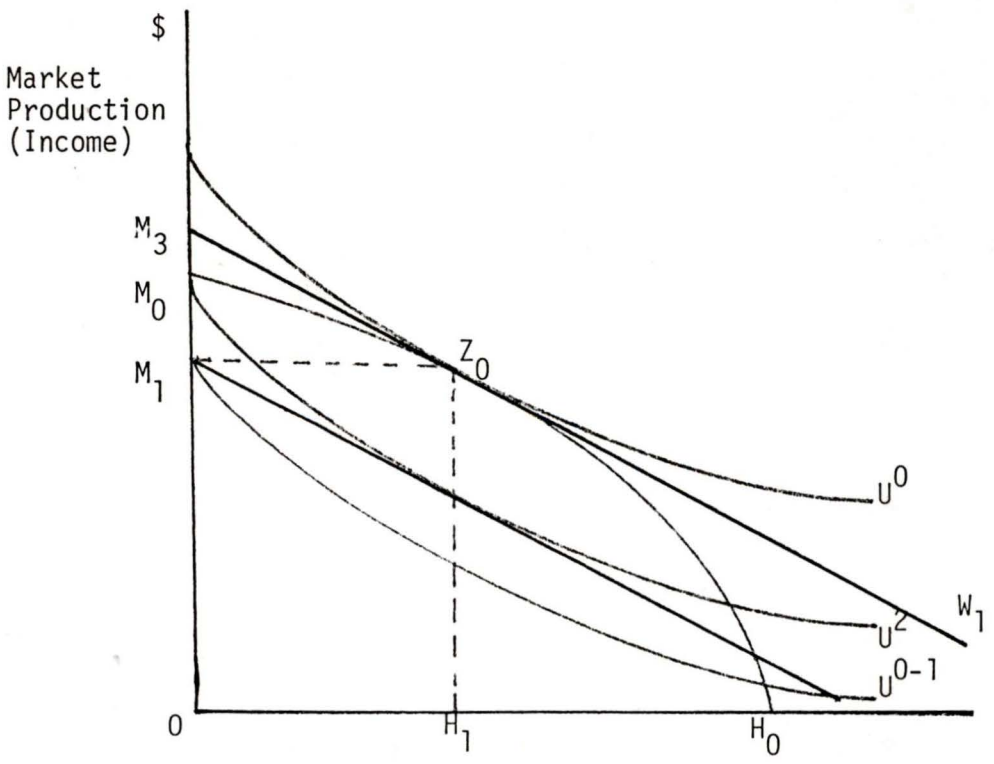

Figure 7

that the household enjoyed before the accident, the amount of compensation required is M_1M_3. Stated otherwise, M_1M_3, when paid to the household enables it to reach the same level of utility as before the accident. We note that this is equivalent to the compensating variation income measure of a welfare change. M_1M_3 is OW_1PJ in Figure 6, where both correctly measure the welfare loss to a household from household production, arising from wrongful death in a replacement world.

The analysis is very much the same if instead the market wage rate of replacements is not W_1 but some wage above W_1. At a higher wage rate, households will be forced into lower indifference curves, demand less replacement services and therefore require a higher compensation.

b. A More Realistic Example

A more realistic example is one in which not all household production services are lost to the household following the total disability or death of a family member who normally provides these services. Some of the household production services will now be performed by other household members though at higher marginal opportunity cost for each hour performed. This is illustrated in Figures 8a and 8b.

Assume a non-replacement world. Prior to the accident, the household enjoys a level of net benefits equal to OVPJ with OR_1 hours of household production (Figure 8a). After the accident, less household production services would be performed by the household. This is reflected in the reduction in total hours worked at home from OR_1 to OR_2; the marginal cost curve is now steeper (MC_2) indicating higher additional cost for every hour spent on household production than

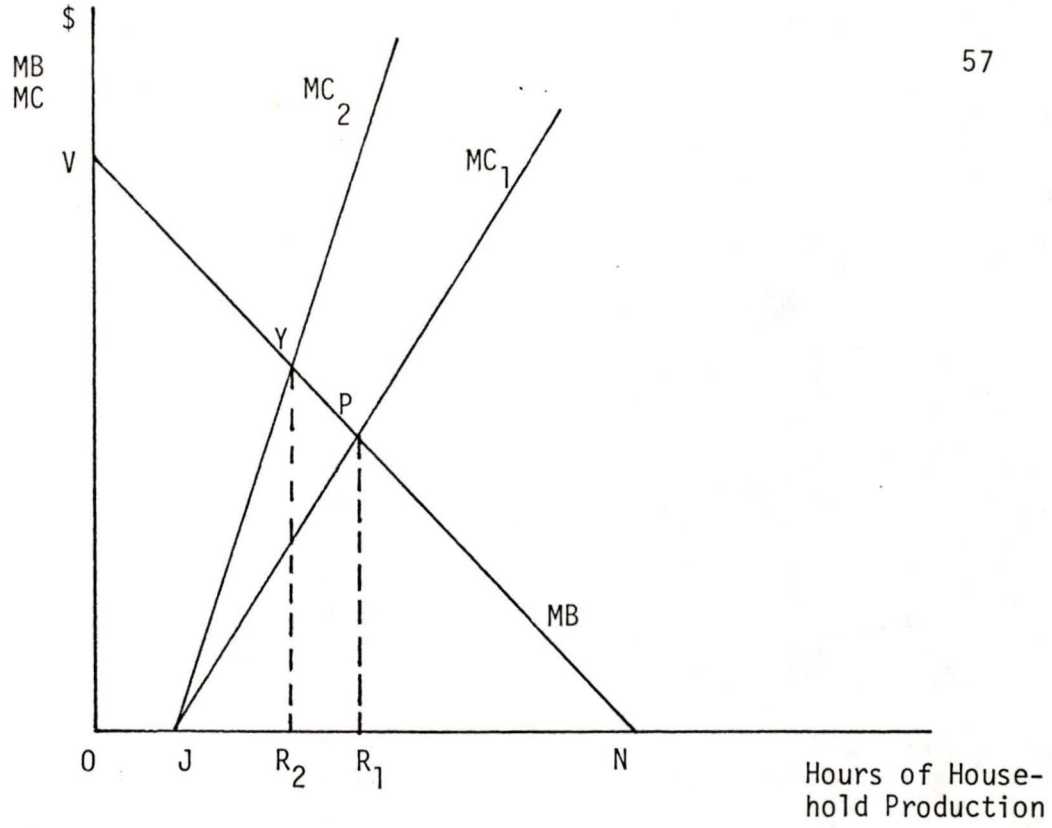

Figure 8a

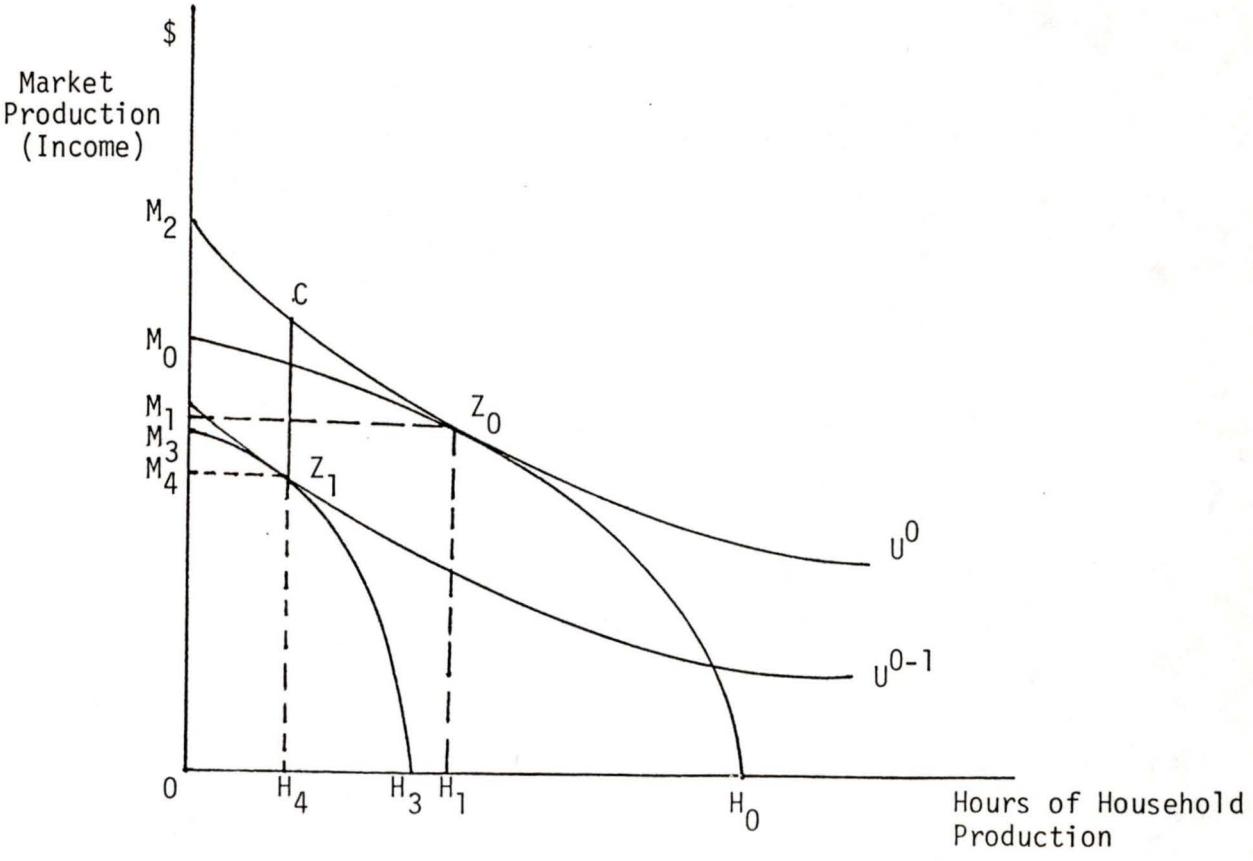

Figure 8b

before, the result of some other household member having to perform some of these services at higher marginal opportunity cost. Total net benefits or net value from having OR_2 amount of household production is OVYJ. The loss in welfare is thus OVPJ - OVYJ or JYP. This area JYP, represents the amount or value of the loss in household production services arising from wrongful death, the correct compensation required to restore the welfare of the household to its original level, OVPJ in a non-replacement world.

In Figure 8b, the household's initial welfare is shown to be at level U^0, enjoying H_1 level of household production. After the accident, the household's production possibilities frontier curve shifts downwards and to the left, indicating lower maximum amounts of both household production and market income that the household can now expect to receive. This is shown as a shift from M_0H_0 to M_3H_3. With revised marginal costs (MC_1 to MC_2 in Figure 8a), the household is now optimal at H_4 level of household production such that $H_4 < H_1$. But at H_4 level of household production, the household enjoys a lower level of welfare, U^{0-1}. As before, the assumption of no income effects imply that the indifference curves are vertically parallel; the amount of compensation therefore required to restore the household to its original level of welfare is the vertical distance, M_1M_2. Alternatively, since the indifference curves are vertically parallel, the household by producing at H_4 level of household production after the accident, would require CZ_1 (equal to M_1M_2) amount of compensation to increase its current lower utility level U^{0-1} to U^0, the household's original utility level.

The discussion above assumes the case of household production in a non-replacement world. In a replacement world however, because the household will choose to hire replacements whenever the marginal benefit is higher than the market hiring costs and/or its own marginal cost in household production is greater than the market replacement cost, the compensation required is less. Figures 9a and 9b depict the case of household production in a replacement world.

Figure 9a, shows that at wage rate equal to W_1, the household hires no replacement services and self-performs OR_1 hours of household production. The household's marginal cost curve is given by MC_1, the level of net benefits it currently enjoys is OVPJ. Following the wrongful death of the household member who normally provides the household services in the home, the marginal cost curve pivots to the left indicating higher cost in self-performing household services.[2] Faced with this new and higher marginal cost curve, MC_2, the services of a replacement are now attractive since a portion of the hours could now be performed by the substitute at lower cost. Accordingly, the household hires R_2R_1 hours of replacement services and self-performs OR_2 hours. Total net benefits or net value is now OVPZJ. The change in welfare is thus OVPJ - OVPZJ or the area JZP, the relevant measure for compensation.

The same notion of the relevant compensation is depicted in Figure 9b. The household is originally at point Z_0, where its production possibilities boundary touches the highest indifference curve or utility attainable, U^0. This utility level U^0, corresponds to the

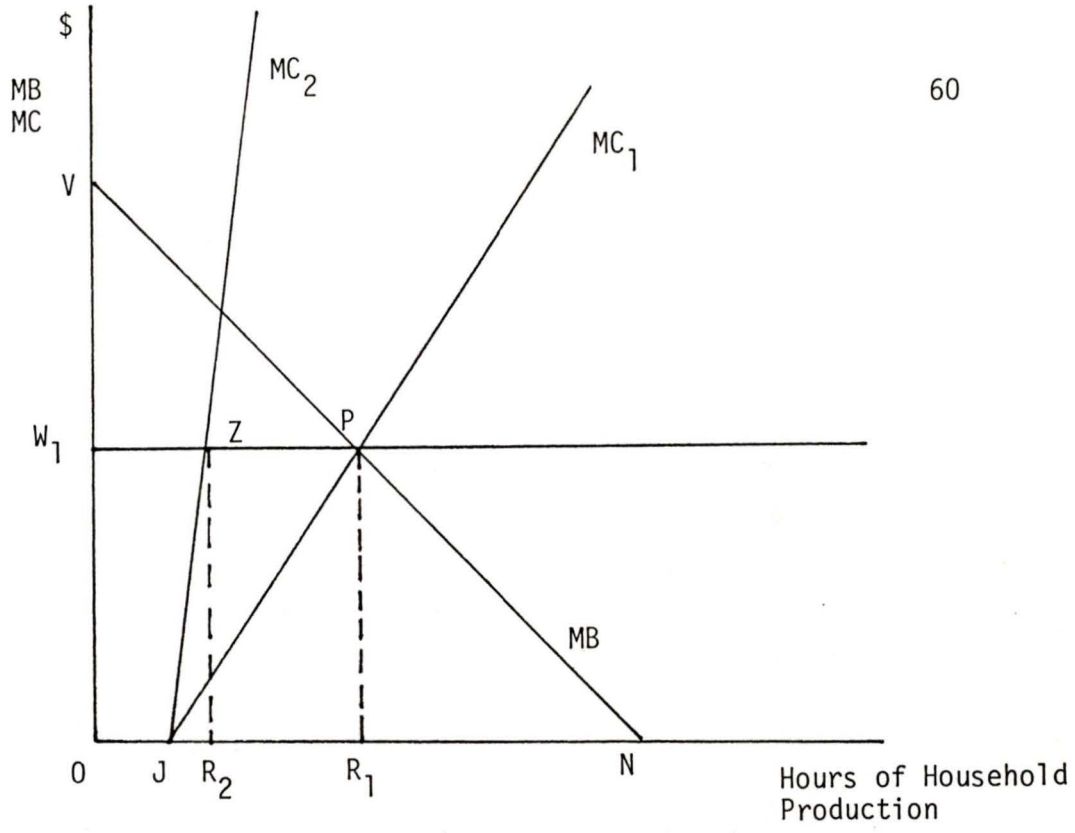

Figure 9a

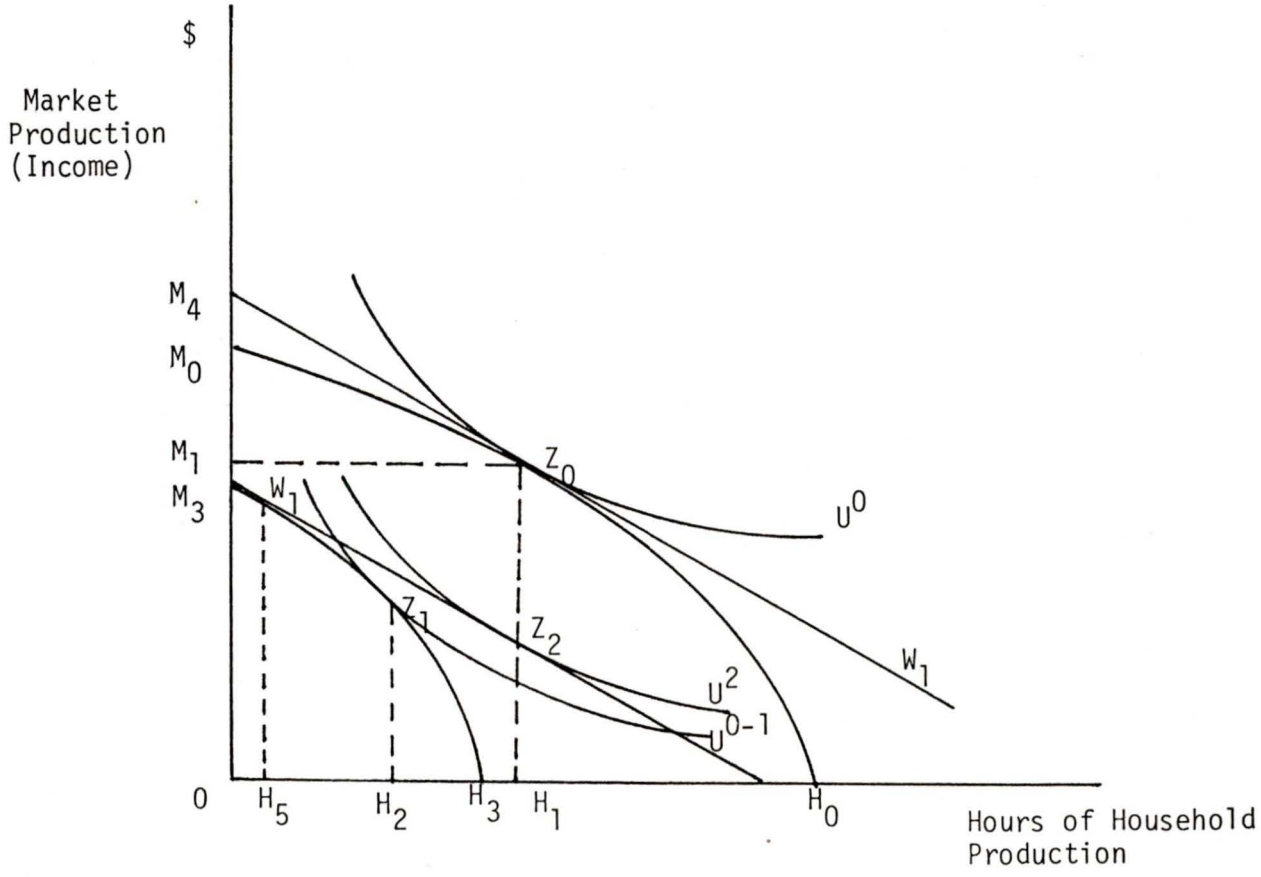

Figure 9b

households enjoyment of the level of welfare OVPJ in Figure 9a. At point Z_0, the household produces H_1 level of household production and buys no replacements. If a member of the household dies or is totally disabled following a tortious act, both the maximum amounts of household production and market production (market income) that the household can now receive falls. This is shown by the shift of the household's production possibilities curve from M_0H_0 to M_3H_3. Corresponding to this, is a lower welfare or utility level given by U^{0-1}. Utility is now maximized at poing Z_1, the household now producing at H_2 level of household production. We note that the production possibilities curve has not only shifted in, but, its slope has also become steeper indicating higher marginal cost for each hour of housework now performed. However, since the household can improve its welfare position by hiring replacement services at wage rate W_1 for some portion of the hours for which the opportunity cost is lower ($W_1 < MC_2$ for R_2R_1 hours in Figure 9a), the result is that a higher utility level U^2 is reached instead of U^{0-1}. The household now self-performs H_5 and hires H_5H_1 number of hours of household production. But since utility level U^2 is still below the household's original utility level, U^0, the compensation sum required is thus M_3M_4 (equal to Z_2Z_0)--the minimum compensation necessary to leave total net benefits or net value unchanged.

The analysis is very much the same if instead the market wage rate of replacements is not W_1 but some wage above W_1, say W_2. Figures 10a and 10b illustrate this. In Figure 10a, as before, the household is shown to self-perform OR_1 hours of household production given that

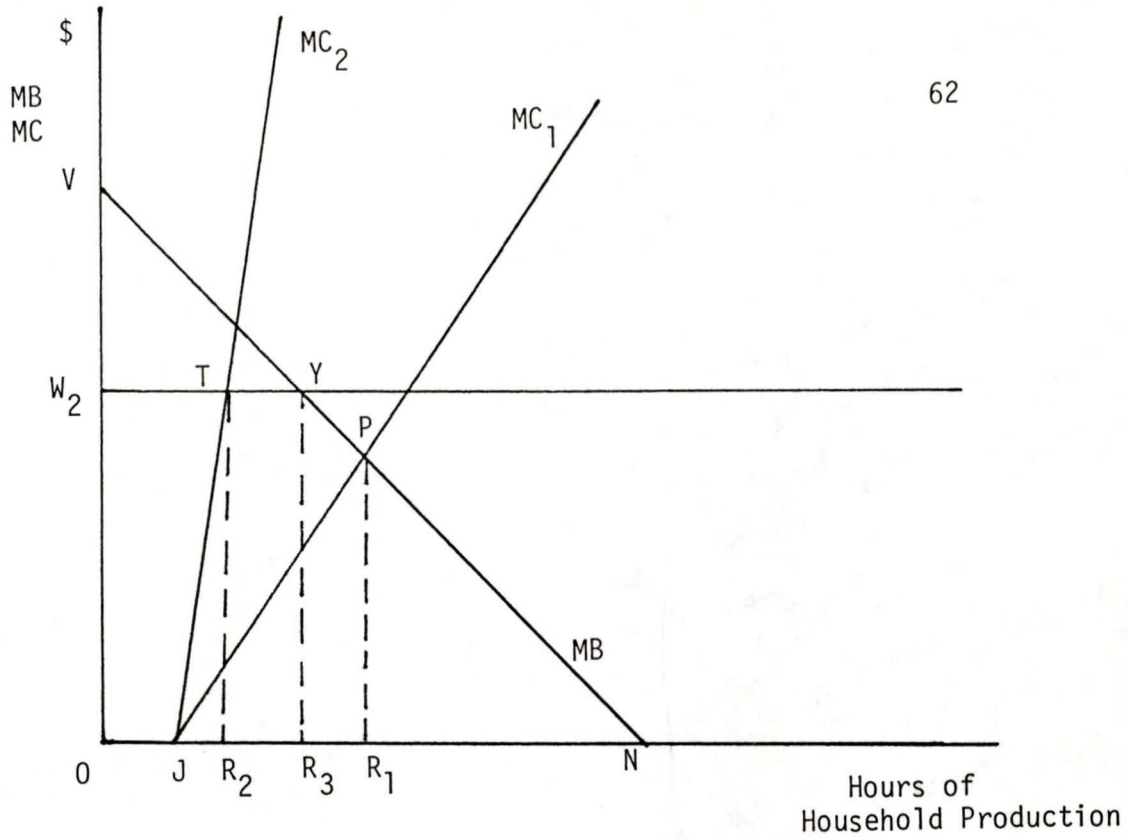

Figure 10a

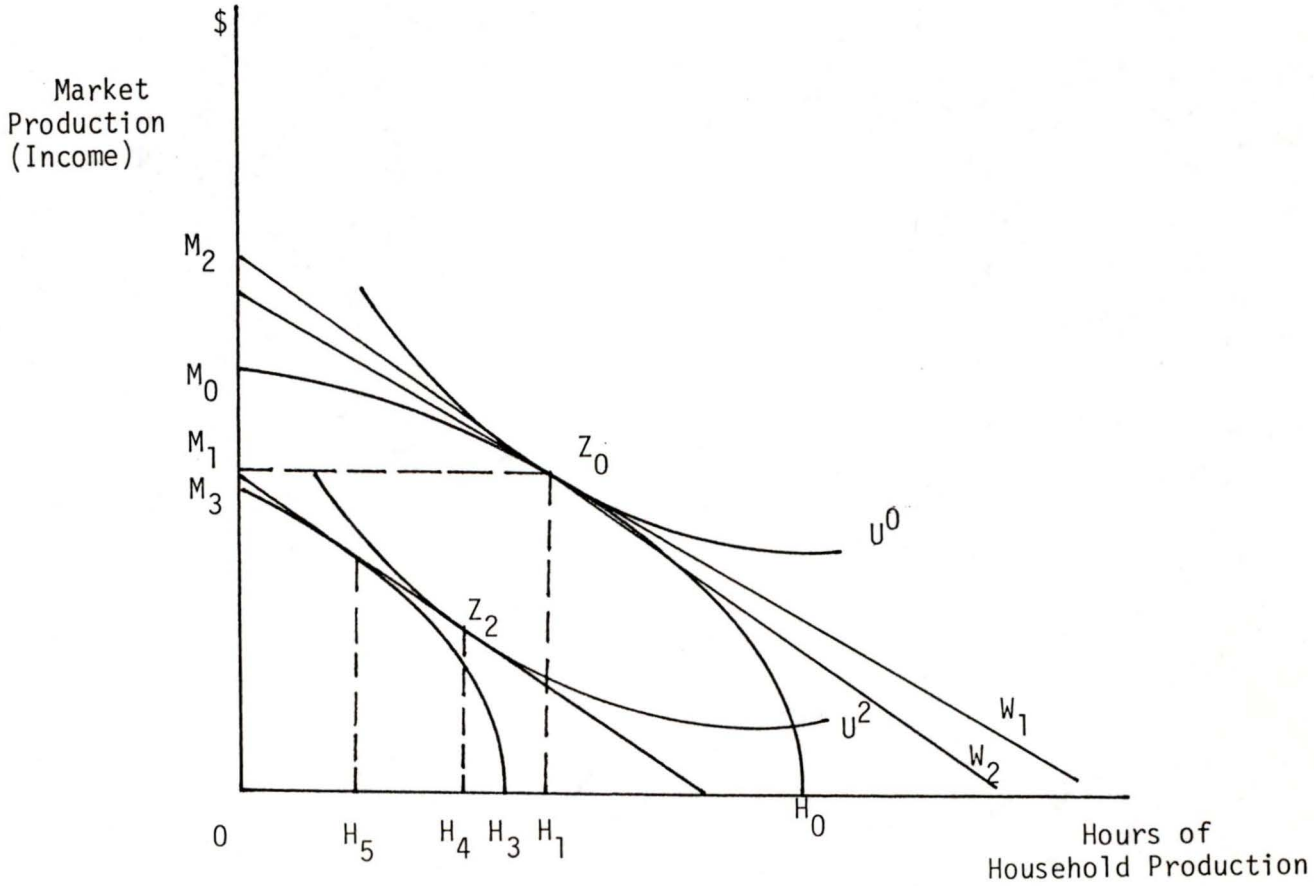

Figure 10b

their $MC_1 < W_2$ up to OR_1. Net value from having OR_1 hours of household production is OVPJ. After the accident, the household's marginal cost curve, MC_1 pivots inwards to MC_2. Since $MC_2 < W_2$ up to OR_2 hours, the household continues to self-provide these hours but hires replacement services for R_2R_3 hours, the latter because of $MC_2 > W_2$ and that the household's marginal benefit is greater than wage rate W_2. Net value is now OVYTJ. The change in net value is then OVPJ - OVYTJ or TYPJ. In other words, the household's loss in welfare when compensated by the amount TYPJ, returns the household to its original welfare OVPJ.

Similar representation using indifference curves is made in Figure 10b. Wage rate W_2 is shown to have a steeper slope than W_1. The household is initially at point Z_0, with H_1 level of household production and enjoying utility level U^0. After the accident in which less household production and market production that can now be produced, the production possibilities curve shifts downwards and to the left, from M_0H_0 to M_3H_3. The hiring of replacements at wage rate W_2 is now attractive for at least some portion of the hours for which a higher level of utility, U^2, can be reached than if the household were not to hire any replacements.[3] It is assumed here as in all other cases that the household cannot sell their household production services.[4] The household now self-performs H_5 and buys H_5H_4 amount of household production. The amount of compensation required is again the compensating variation income, M_1M_2. M_1M_2 when paid to the household, restores the household's utility, U^2 to U^0, its original level of welfare.

Finally, we consider a wage rate W_3 such that $W_3 < W_1$. Figures

11a and 11b illustrate this. In Figure 11a, the household is optimal by producing OR_2 hours of household production themselves and hiring R_2R_3 hours of a replacement, given wage rate W_3 and marginal cost, MC_1. The level of total net benefits enjoyed by the household is OVLKJ. Again, after the accident, the marginal cost curve pivots from MC_1 to MC_2. With revised marginal cost curve MC_2, the household now performs OR_4 hours themselves and hires R_4R_3 hours from a replacement. The level of net benefits now enjoyed is OVLBJ; the change in welfare--welfare loss--being JBK.

In Figure 11b, the household is shown to enjoy utility level U^0 prior to the accident. At wage rate W_3, the household is induced to perform only H_4 level of household production and buys H_4H_1 hours from a replacement. In doing so, the household reaches a higher level of utility than if the household were to self-perform all the hours of household production themselves (H_6). After the accident, the household produces H_5 amount of household production themselves and buys H_5H_1 amount from a replacement. The highest level of utility attainable is now U^2 such that $U^2 < U^0$. The amount of compensation therefore required to restore the household's utility from household production to U^0 is again the compensating variation income, M_3M_2 (equal to Z_2Z_0).

In sum, whichever framework one may choose to look at, the amount of compensation required for losses of household production services due to a wrongful death is always given by the amount of change in total net benefits--net value--before and after the accident. This correctly measures the household's loss in welfare consistent with

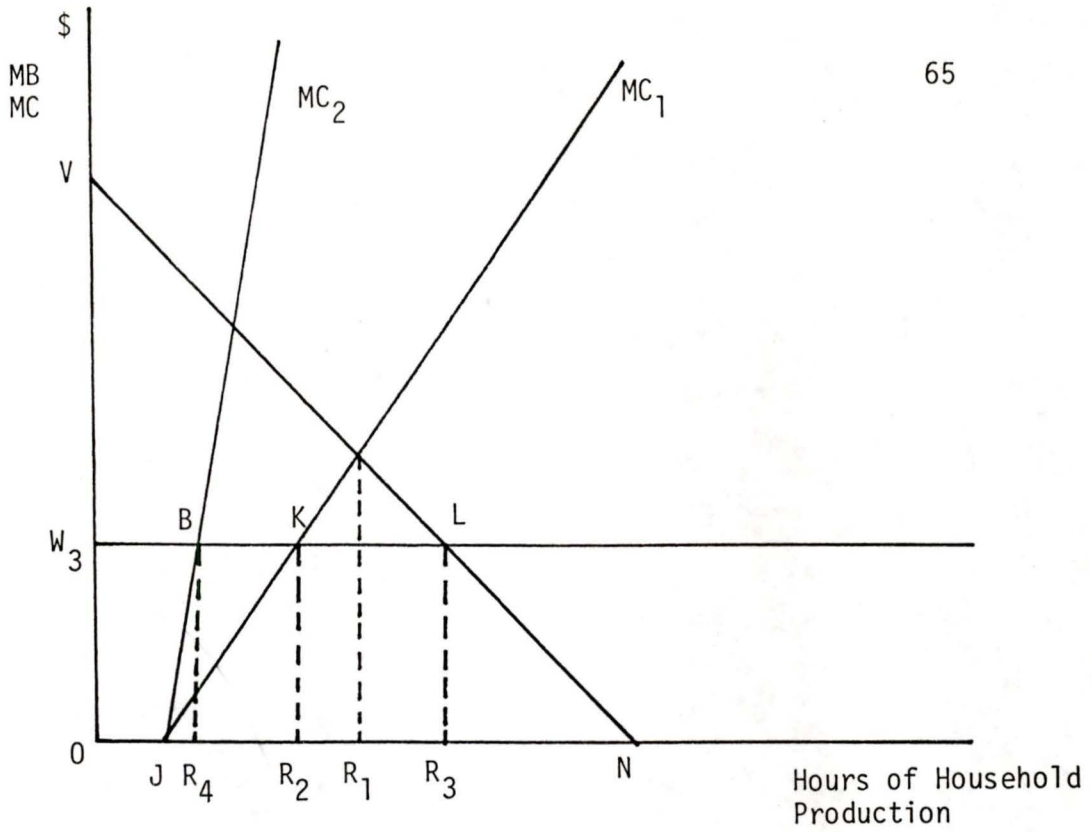

Figure 11a

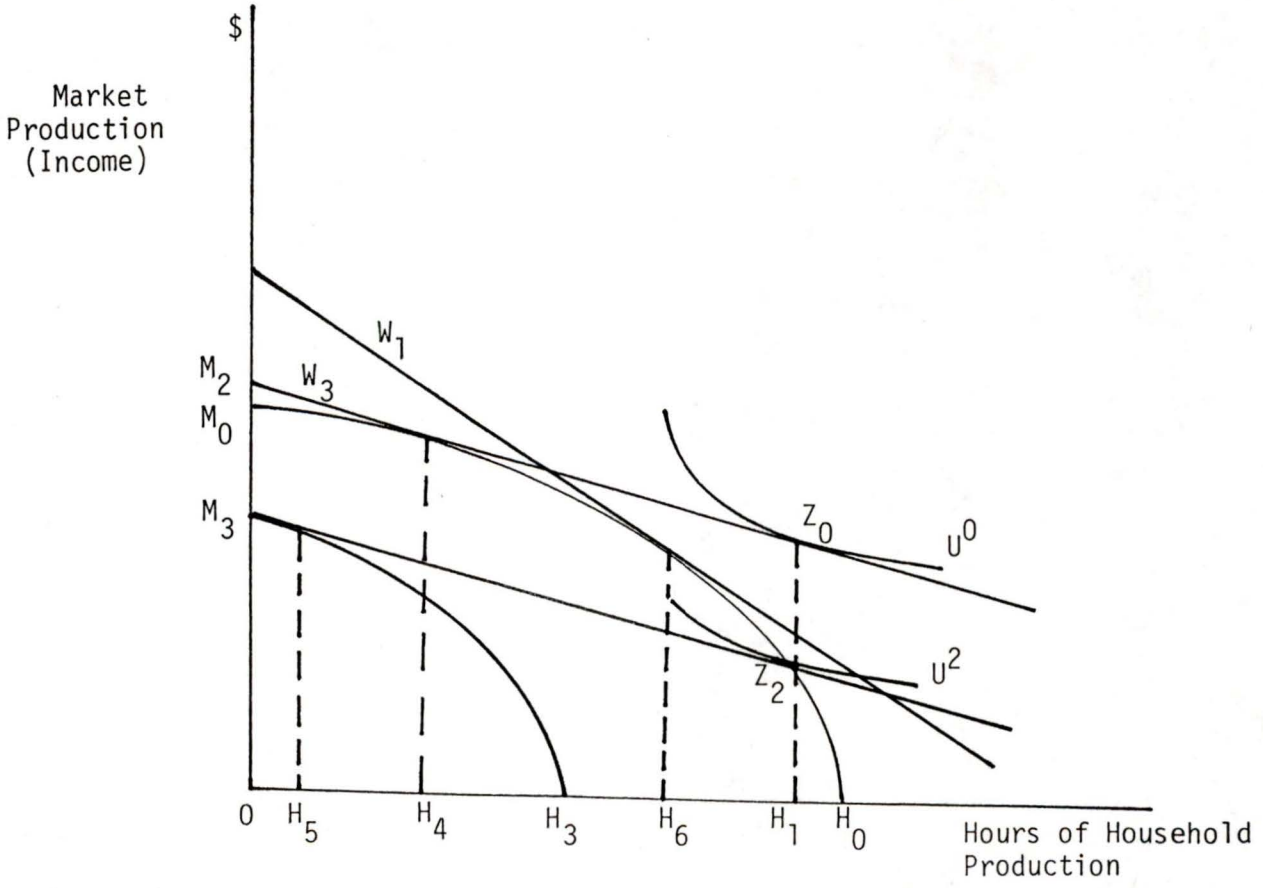

Figure 11b

economic theory. The same notion is applied to cases involving wrongful injury, with the difference being the extent of compensation required is less.

1.2 Wrongful Injury

Cases of wrongful injury are ones in which the household member who normally provides household services for his or her own home, is only partially injured in an accident and still able to perform household tasks albeit at a lower level than before. The analysis of the resulting welfare loss and the subsequent compensating sum whether in a replacement world or a non-replacement world remain the same as for those cases involving wrongful death, the difference being only one of degree of magnitude of loss. As such is the case, I purport to show only wrongful injury in a non-replacement world and wrongful injury in a replacement world when the wage rate is W_1.

a. A Non-Replacement World Example

Figures 11c and 11d depict such a situation. In Figure 11c for example, the household is shown to produce at OR_1 hours of household production ($MB = MC_1$), enjoying net benefits equal to OVPJ. After the accident in which a member of the household gets disabled, less household production services would be performed by the household. This is shown by the reduction in total hours worked at home from OR_1 to OR_1^1 where $MC_2^1 = MB$. The marginal cost curve, MC_2^1 is steeper than MC_1 indicating higher marginal opportunity cost for every hour spent on household production beyond OJ hours than before. But note that the

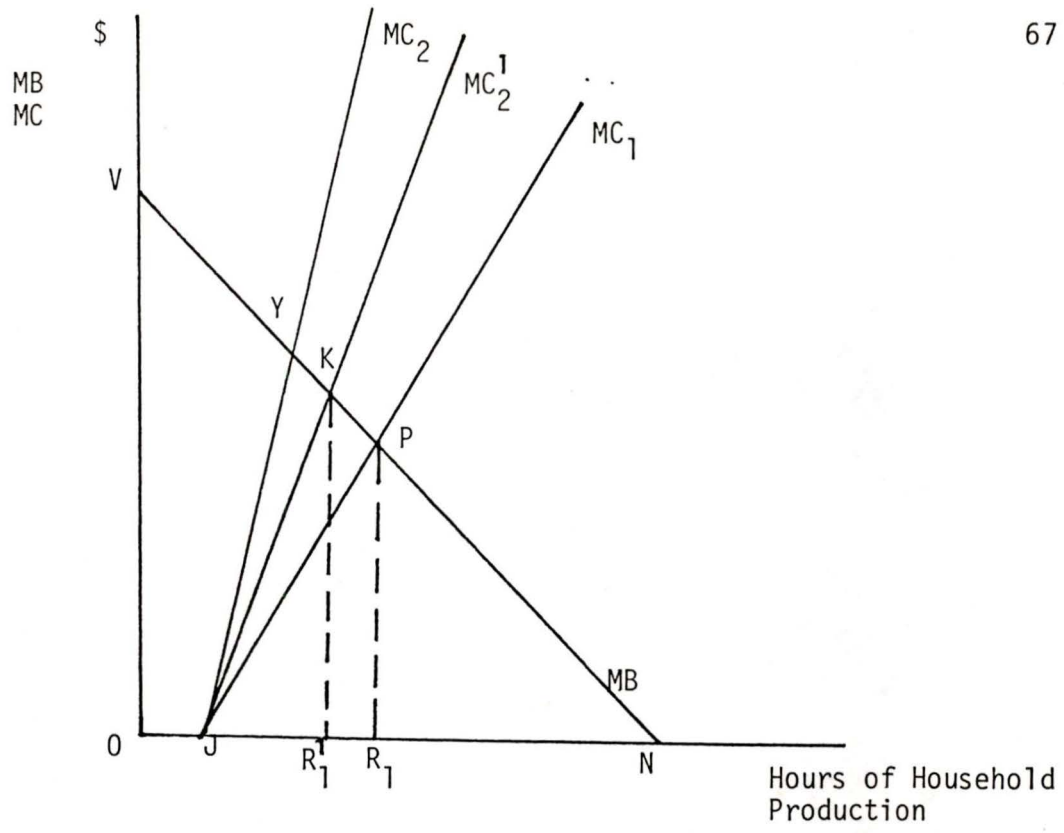

Figure 11c

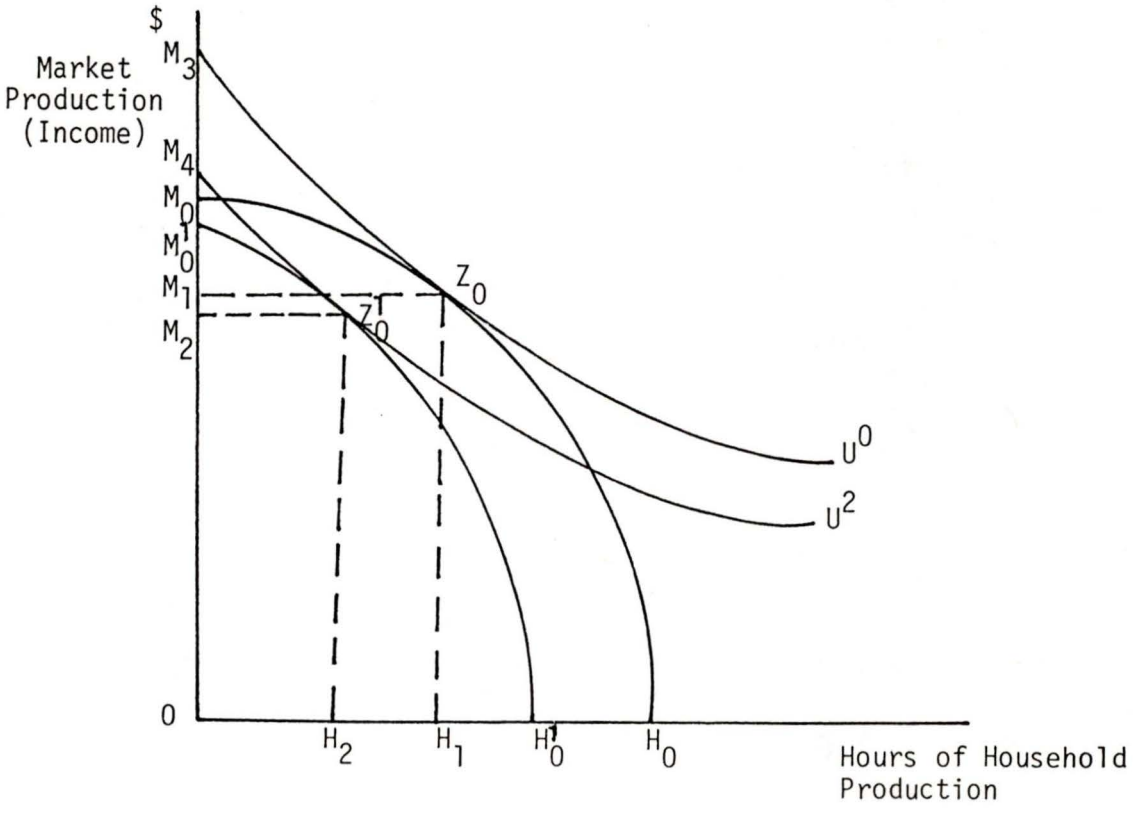

Figure 11d

rise in marginal opportunity cost in the case of wrongful injury is still below that of wrongful death such that $MC_2^1 < MC_2$. Total net benefits from having OR_1^1 level of household production is OVKJ; the loss in welfare is thus OVPJ - OVKJ or JKP. This area JKP, represents the amount or value of the loss in household production services arising from partial disability and therefore the correct compensation required to restore the welfare of the household to its original level, OVPJ in a non-replacement world. Note that this is less than the required compensation sum for the previous case involving wrongful death (JKP < JYP).

In Figure 11d, the household's initial welfare is shown to be at level U^0, producing H_1 and M_1 level of household production and market production (market income) respectively. After the accident and the resulting partial disability, the household's production possibilities curve shifts downwards and to the left, from M_0H_0 to $M_0^1 H_0^1$, indicating lower maximum amounts of both household production and market production that the household can now expect to produce. The household is now optimal at H_2 level of household production such that $H_2 < H_1$. At H_2 level of household production however, the household enjoys a lower level of welfare, U^1. The amount of compensation therefore required to restore the household's welfare to its original level is the vertical distance M_4M_3 (M_4 and M_3 lie on the same indifference curve as Z_0^1 and Z_0 respectively).[5] In other words, M_4M_3 when paid to the household enables it to reach utility level U^0--the original utility level enjoyed by the household before the accident.

b. A Replacement World Example

We now examine the case of compensation for wrongful injuries in a replacement world. Consider replacement wage rate given by W_1 in Figure 11e. Figure 11e, shows that at wage rate equal to W_1, the household hires no replacement services and self-performs OR_1 hours of household production. The household's marginal cost curve is given by MC_1, the level of net benefits it currently enjoys is OVPJ. Following an injury of the household member who normally provides the household services in the home, the marginal cost curve pivots to the left, indicating higher marginal opportunity cost in self-performing household services. Faced with this new marginal cost curve, MC_2^1, the services of a replacement is now attractive since a portion of the hours could now be performed by the substitute at lower cost. Accordingly, the household hires $R_1^{11}R_1$ hours of replacement services ($MC_2^1 > W_1$ for $R_1^{11}R_1^1$ and $MB > W_1$ for $R_1^1R_1$) and self-performs OR_1^{11} hours. Total net benefits is now OVPKJ; the change in welfare--welfare loss-being OVPJ - OVPKJ or the area JKP, the relevant measure for compensation. Note that this amount of compensation JKP for wrongful injury is again less than the amount JZP required for compensation in wrongful death.

The same notion of the relevant compensation is depicted in Figure 11f. Before the accident, the household enjoys utility level, U^0, producing M_1 and H_1 levels of market production (market income) and household production respectively. This utility level U^0, corresponds to the household's enjoyment of the level of welfare OVPJ in Figure 11e. If a member of the household gets disabled and less household production

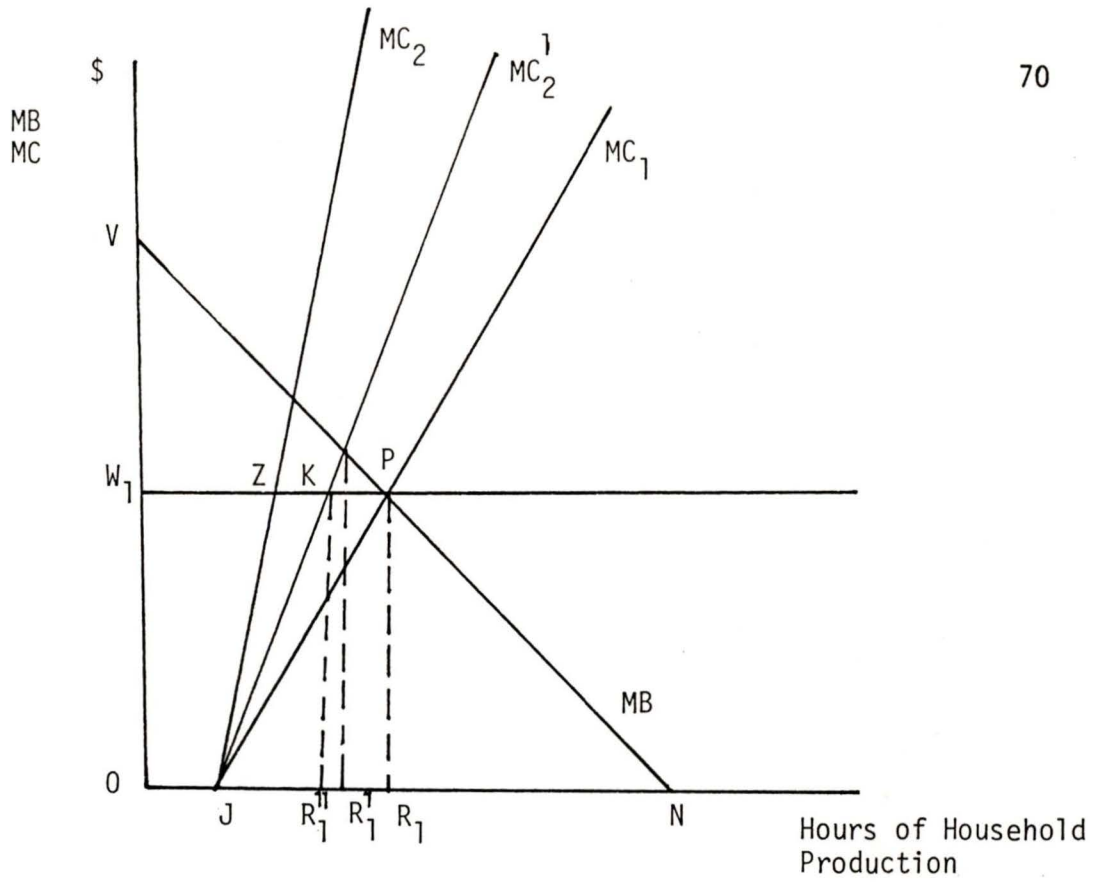

Figure 11e

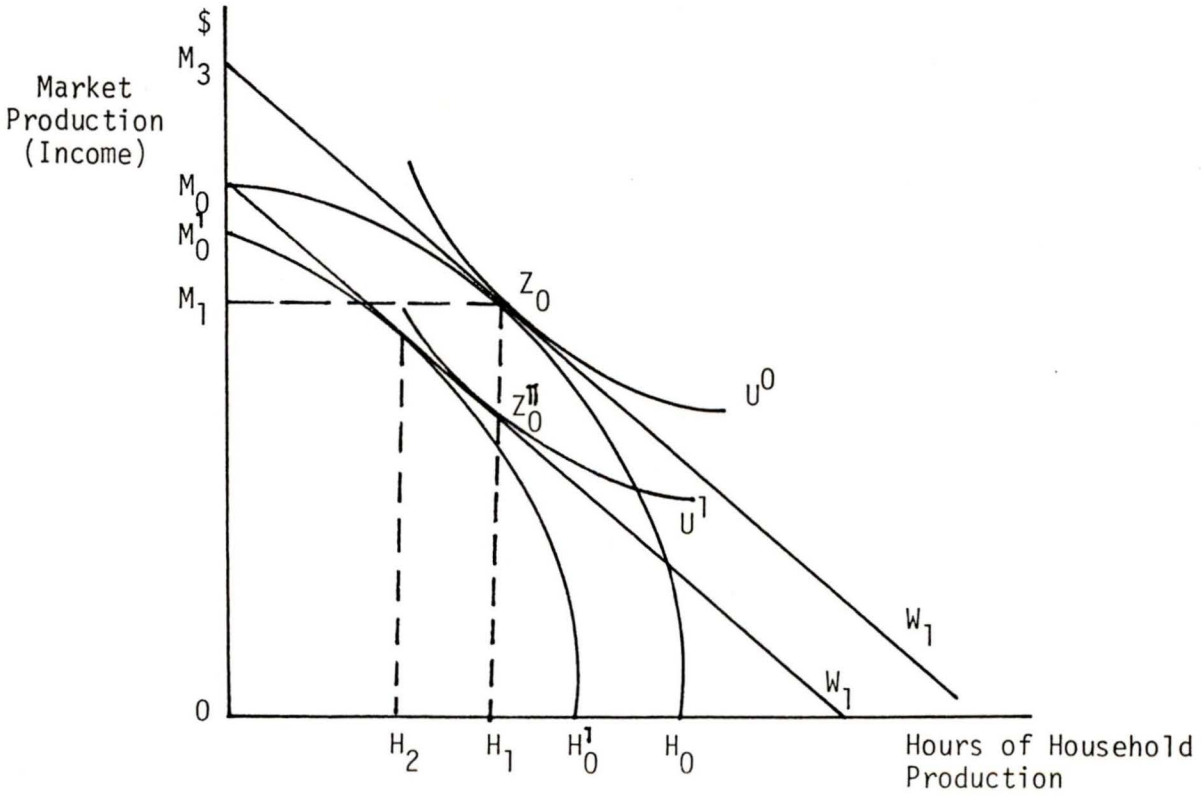

Figure 11f

services are now being performed, the production possibilities curve shifts downwards and to the left, from M_0H_0 to $M_0^1H_0^1$. In the case of wrongful death, this shift of the household's production possibilities curve would be more pronounced (compare Figure 11f to Figure 9b). The household now maximizes utility at point Z_0^{11}, producing H_2 level of household production themselves and hiring H_2H_1; the level of welfare now enjoyed is U^1. But since $U^1 < U^0$, compensation is required by the amount $Z_0^{11}Z_0$ (equal to M_0M_3, since the indifference curves are assumed vertically parallel). This amount $Z_0^{11}Z_0$ is the minimum compensation necessary to leave total net benefits or net value unchanged.

In sum, this chapter has shown a possible useful application of the model of household production presented in the previous chapter to the assessment of damages in tort litigations. We have seen that the correct measure of welfare or utility the household derives from having household production is always given by the level of net benefits that accrues to the household. Any change, specifically a reduction in net benefits, resulting from wrongful injury or wrongful death effects a change in the level of welfare of the household. This being the case, any measure of the reduction in welfare from household production is then given by the amount of net benefits lost. In terms of welfare economics, the compensating variation income measure is used to measure such welfare changes (shown with indifference curve analysis). Specifically in cases involving welfare loss in household production due to wrongful injury or death, the compensating variation income is defined as that sum for which: $W_2^* (Y_2,Z_2,\ldots) + CV_{12} =$

W_1^* $(Y_1, Z_1, \ldots)$ where W_1^* and W_2^* are the alternative states of welfare such that $W_2^* < W_1^*$, Y_1 and Y_2 measure the market income of the household in the two alternative states, Z_1 and Z_2 represent vectors of household commodities in the two welfare states and, CV_{12}, the compensating variation income from welfare state 1 to welfare state 2. Since $W_2^* < W_1^*$, CV_{12} would be positive, indicating a sum to be received by the household in order to restore his welfare to W_1.[6]

Footnotes: Chapter 4

1. Note that in compensating the household for the loss of OR hours of household production, we do not include the area JPR--which measures the total opportunity costs--as we are concerned only with net benefit measures. Moreover, the amount JPR represents that amount which the household was already prepared to accept as costs in household production prior to the accident.
2. It is assumed here that the portion of the hours in household production that corresponds to the household incurring zero opportunity cost remains unchanged after the accident. Strictly speaking, the marginal cost function may not only pivot but also shift to the left at the same time. The analysis however is not significantly altered by this occurrence, if any. Depending on the extent of the leftward shift of the marginal cost function, the compensation required for the welfare loss will be more than the assumed non-shift case.
3. The indifference curve with lower utility level U^{0-1}--without market replacements--is deliberately left out so as not to complicate the diagram.
4. Thus the household can only produce household production and/or buy household production services from market replacements. This rules out the possibility of the household selling household production by moving along wage line W_2 in a reverse direction.
5. As before, we assume the two indifference curves to be vertically parallel.

6. Note that the compensating variation from welfare state 1 to welfare state 2 is also equal to the equivalent variation from welfare state 2 to welfare state 1, i.e. $CV_{12} = EV_{21}$ (In general $CV_{ij} = EV_{ji}$). See E.J. Mishan, forthcoming 1984.

CHAPTER 5

Legal Rules and Alternative Measurement Methods

As the desirability of establishing economic values for the time used in household production and therefore, of measures of benefits received, has become more apparent in recent years, a number of methods for measuring or estimating them have been proposed.[1] None of these methods are entirely satisfactory and some are quite incorrect. Despite a superficial variety, the techniques used usually reduce to one of only two alternatives--valuation by foregone wages (termed the opportunity cost method) and valuation by paid services (termed the replacement value method). Here in this Chapter, I discuss both methods and show that they are not only inappropriate for use in the many welfare and compensation issues but also, adherence to these methods will lead to serious biases. Though widely cited as an improvement over the single use of either the opportunity cost or the replacement value method, the Pyun Model, has I believe, some very serious flaws in its theoretical methodology and this is discussed in the same Chapter. Also, an examination of the various approaches taken in practice by Courts of Law to the assessment of tort damages for lost household services in wrongful death and injury actions is made.

1.1 Economic Approaches

a. Valuation by Foregone Wages

A commonly suggested means of valuing the time devoted to

household production is to ascribe to this time an opportunity cost in terms of the income that is given up.[2] The person who performs most household services could earn a money income by devoting the same amount of time to paid employment outside the home. If that time is used for household production instead, and money income is foregone, the presumption is that the household values the benefits from household provision more than the money given up. The opportunity income is thus a measure, arguably a lower bound measure of the value of household production. The implicit assumptions here are (i) that household members allocate their productive time in such a way as to receive the same value from their marginal hour in household production as they receive from their last hour in paid employment; and (ii) that there are no institutional constraints on the allocation of time between work at home and the market. The value of the time people spend performing housework is then calculated by using their wage rate in market employment. In the case of those who are, at present, employed in the market, their current wage rate is used, while for those who are currently unemployed, the potential market wage rate is utilized.

There are a number of problems that may arise in the application of such a procedure. One concerns the wage rates that should be assumed to be foregone. This may be a particular problem with individuals who have been out of the employment market for a long time and presently have little in the way of marketable skills. Another concerns the institutional constraints dictating the length of work

weeks (such as 35 or 40 hours per week) thereby introducing a large element of 'lumpiness' to the options facing individuals. Because of this, it is not clear how much of the household production time is valued more than the outside wage and how much it is not--even though the total wages are attributed to the sum of the work performed. In effect, each individual is faced with an all or nothing choice. The person must accept or reject a contract that specifies both the wage rate and the required hours of work. Thus, given this 'lumpiness' problem and the lack of flexibility in the labour market, it may be inappropriate to value all the hours spent in household production at the market wage rate.[3]

A more serious difficulty with the opportunity wage approach is that people make the trade-off of money income that could be received not only against the value of the housework that can then be produced but also against the added disutility of having to do the outside work as well. The fact that labour market imperfections exist and the rather high transaction costs involved in switching jobs (such as barriers to entry) would make this problem all the more serious. While the money that could be earned is clearly a welfare gain, this must be weighed together with the usual disadvantages of earning that income such as the imposition of the restrictions and discipline of a work place, commuting, lost leisure, and, performing at least part of the household chores that, in the usual case, must still be done. It may well be that households choose to forego the money income, but in doing so, they also save themselves the bother

and displeasure of doing the outside work. In more technical language, all things being equal, individuals would prefer to work exactly enough hours until the marginal gain in net utility from non-market time is equal to the net gain of satisfaction (or utility) from the money income earned less the disutility from having to work. This means that, the marginal utility from having more non-market time relative to having more money income is equal to the market wage rate less the disutility of work relative to income at the margin.[4] A simple comparison of money wages foregone, even accounting for taxes and added expenses, would, in these cases, then seem to overstate the value of time in household production. As Rueben Gronau, the designer of some of the most sophisticated models of household production admits, the formulation, "implicitly assumes that work, whether in the market or non-market sector, carries no utility (or disutility) . . . and even casual observations would indicate that this assumption is wrong."[5]

More seriously, the opportunity cost approach is not a measure of welfare loss at all. It is, therefore, inappropriate for use in the many issues of compensation as in tort litigations. If the opportunity cost method were to be used to assert a welfare or well-being measure of household production, then it would have the ridiculous notion of implying that the higher the cost of household production provision, the more valuable, in terms of welfare, is such a provision.[6] Clearly, what must be considered, in addition to costs, are the benefits from having such a provision. Only if the difference

between total benefits and total costs is large (say for a given household), can we then assert that the household enjoys a large measure of welfare from its current provision of household production.

The opportunity cost approach is not only inappropriate for compensation and welfare analysis but also it is likely to lead to serious over or understatements of the net value from household production depending on the wage rate that is assumed to be foregone at the margin. Consider Figures 12a and 12b. In Figure 12a, the wage-rate that is assumed to be foregone is W_1, the opportunity cost the household incurs at the margin of provision OR_1. The opportunity cost method will then, take $W_1.OR_1$ or OW_1PR_1 as the measure of welfare or net value from household production, while the true net value is the area OVPJ; the amount of overestimation being $JPR_1 - W_1VP$. In Figure 12b on the other hand, with the same marginal benefit curve but a different marginal cost curve, the opportunity cost is W_2 at the margin of provision OR_2. By taking $W_2.OR_2$ or OW_2PR_2 as the measure of net value, the result is an underestimation of the true net value OVPJ; the amount of underestimation being $W_2VP - JPR_2$. Only if by some rare and pure chance $W_1VP = JPR_1$ (in the case of Figure 12a) or $W_2VP = JPR_2$ (in the case of Figure 12b), will, the opportunity cost method yield an accurate estimate of the true net value from household production. But even then, as pointed out earlier, there is no economic justification for using the opportunity cost method to measure the household's welfare or net value from household production, simply because it is not a welfare measure at

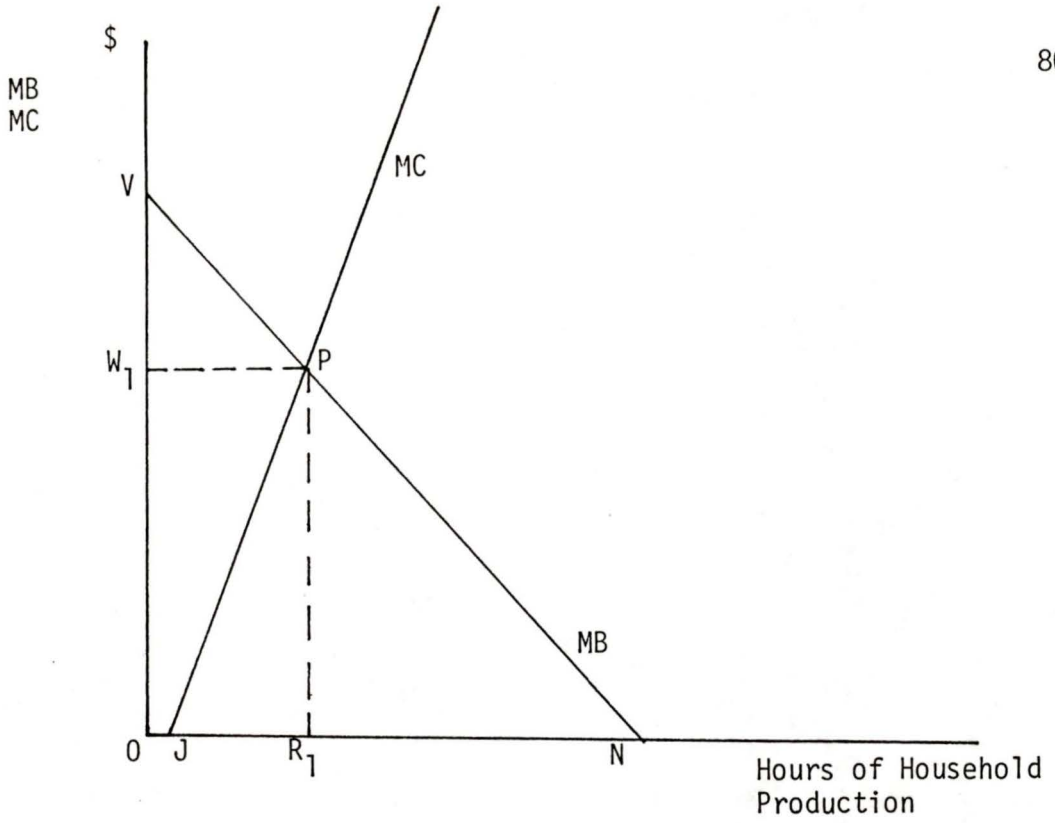

Figure 12a

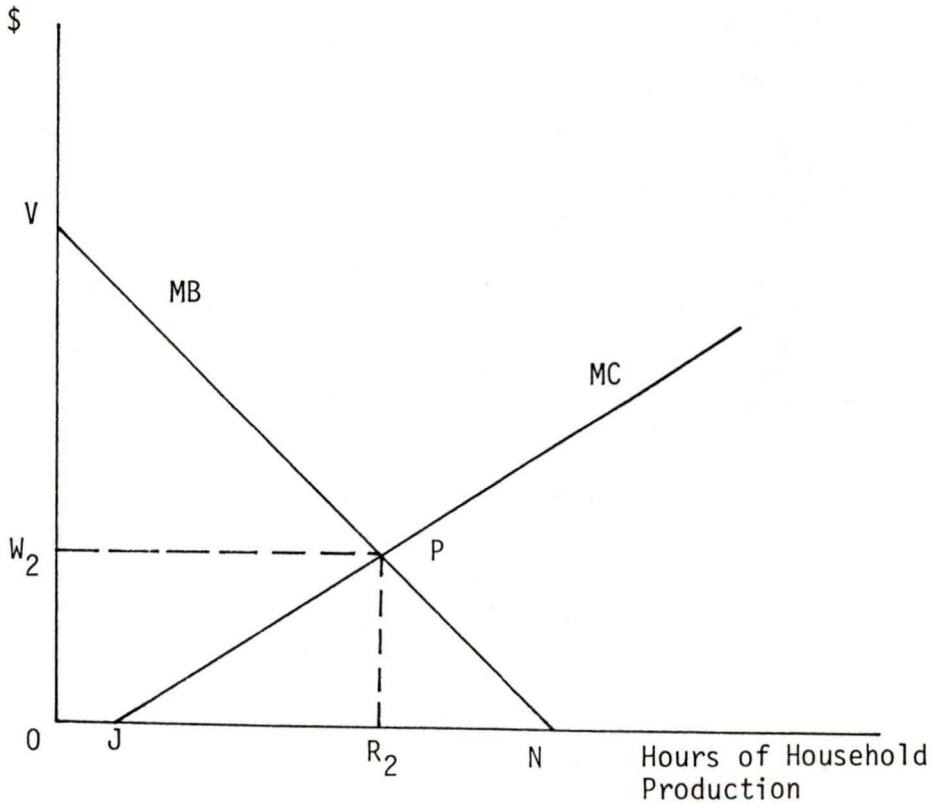

Figure 12b

all, let alone asserting erroneously that such an opportunity cost estimate is a lower bound measure of such values. Using the method to measure welfare and welfare changes is conceptually and theoretically incorrect.

b. Valuation by Paid Services

The most popular method used to value household production performed by members of a household is to equate this value to the cost that would be necessary to hire another person or persons to do the work. This method, termed the replacement value approach has two variations.

The first applies an appropriate replacement wage rate to the average amount of time that is devoted to the different types of activity at home. The total time taken up in household production can be broken down into separate time use for such functions as meal preparation, laundry, child-care, cleaning and so on. The total value is then taken to be the sum of the hours devoted to meal preparation multiplied by the market wage rate of a cook, plus the hours devoted to cleaning, multiplied by the market wage rate of a cleaning lady (or charwoman), plus the respective hours taken up by other tasks, each multiplied by the wages commanded by people who hire themselves out to do those sorts of jobs. Proponents of the method argued that, while some household tasks do not lend themselves to easy classification in terms of employment or job categories, most do and approximations are usually made for the rest.[7]

The second variant of the replacement value method evaluates

what it would cost to replace all household services by hiring a single maid or housekeeper.[8] Rather than assuming that different tasks would be done by cooks, babysitters, accountants, chauffeurs, commercial cleaning services, and the like, who, it is sometimes argued, would demand premium wages to work the intermittent hours that most households usually give to such activities, this approach makes the more realistic presumption that all of the work would be done by a single individual.

There are a number of conceptual problems associated with either approaches. Either version of the replacement method has the inherent weakness that both quality and efficiency between home producers and market workers are assumed constant. It takes an hour of cleaning or meal preparation as an hour of scrubbing or one of cooking. Quite apart from issues of having work done by a member or members of a household who, presumably, have affinity bonds with others in the household (which is quite another consideration to that of valuing household production) the quality of the work done by a substitute or a replacement person may be substantially different to that normally performed. Although a ready presumption is that it would be inferior because of the lack of an ability to cater to idiosyncracies of members of a household, the quality could also be greater. The same argument applies to efficiency differences. The point is that quality and efficiency in household production services between market replacements and non-market home producers may not be the same and that the replacement cost will, therefore, over or under estimate the value.

It is interesting to note that hired-help, in terms of domestic servants is not a common phenomena in households, which necessarily implies that replacement values may be biased. Presumably the household rejected these replacement services, either because the price or wages charged were too high relative to their own perception of value or because of differences in quality. As established earlier,[9] the correct measure of the household's welfare from current provisions of household production is given by the net value measure. In Figure 13, a household is shown to self-provide OX hours of household production. By providing OX hours, the household enjoys net benefits or net value equal to OVRJ. The amount OVRJ, represents the household's current level of welfare from household production. The replacement value approach, on the other hand, estimates this level of welfare to be OW_1LX, assuming the wage rate of replacements is W_1.[10] For expositional purposes, the areas OVRJ and OW_1LX is divided into sub-areas a, b, c and d, with OVRJ = a + b and OW_1LX = b + c + d. Thus, unless a = c + d, the use of replacement wages will be biased, upwards if $a < c + d$ or downwards if $a > c + d$.

Finally, the replacement value approach ignores changes in

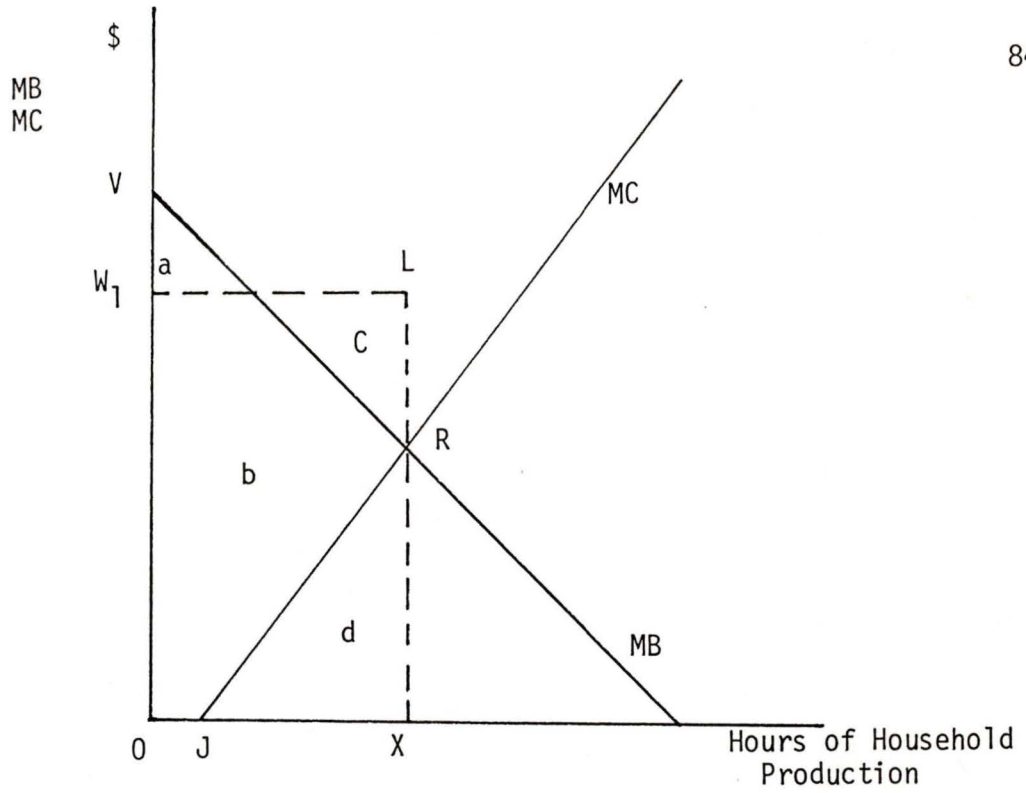

Figure 13

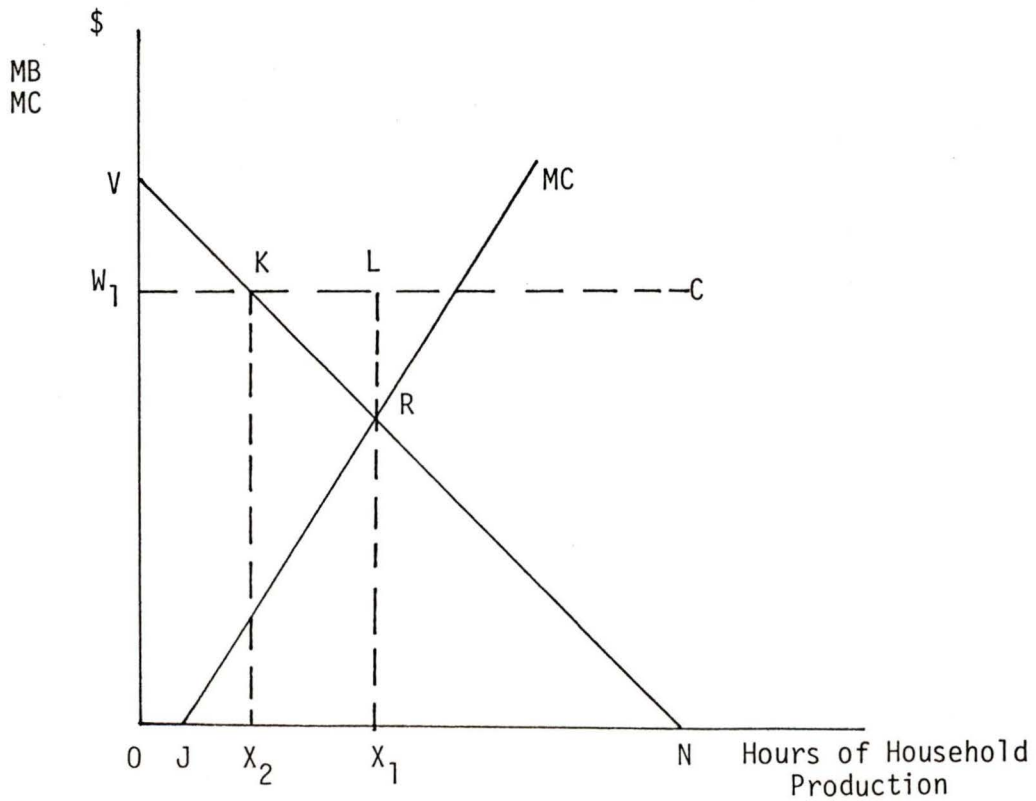

Figure 14

welfare arising from tort damages. Use of replacement wages for compensation purposes will almost certainly seriously overstate how much households are willing to pay for, and thus value, at least some of the work that is performed after a wrongful death. Whatever time is normally devoted to household production--which is determined largely by the preferences and alternative opportunities faced by the individuals involved--this time would likely be greatly reduced if the household were required to pay the going wage for the performance of each of those hours. In all likelihood, they would then choose to rearrange their time and money expenditures in such a way that they would not spend their incomes (and after tax adjusted money) on the same level of household production as before. The number of hours of housework demanded by a household under the usual arrangements is simply more, and possibly far more, than would be demanded by the same household if they were required to pay the wages implied by the replacement value. There seems to be no reason to expect that they would value all of the work that highly. Alternatively, if households were awarded a monetary sum equivalent to the replacement wages to compensate for a loss of the present level of services due to incapacity or death, it seems a near certainty that the surviving members of the household would not use all of the money to actually purchase replacement services--they might be inclined to spend a portion, possibly a large portion on other more highly valued goods and services. Much of the work previously performed by the injured or deceased housewife may also be of marginal value.

An illustration of such an overcompensation is provided in Figure 14. The household originally self-provides OX_1 hours of household production, enjoys level of net benefits or welfare equal to OVRJ. Now, suppose the member of this family who normally provides these services in the home gets killed or becomes totally disabled following an accident and that no other household member can perform due to other constraints. Then OX_1 hours of previously performed services are lost. The household's marginal cost curve is now vertical and is equal to OV. But because this loss in household production services can be replaced by hired-help at wage rate W_1, the household's marginal cost curve is, in effect, altered to OW_1C. Given this new marginal cost curve, the household will buy OX_2 hours from a replacement. By buying OX_2 hours from a replacement, the household reaps a surplus of W_1VK. This surplus amount equal to W_1VK is the household's welfare from having household production after the accident. Since the household originally enjoyed a much larger welfare equal to OVRJ, the household suffers a welfare loss equal to OVRJ - W_1VK or OW_1KRJ. The amount of compensation therefore required to restore the household to its original welfare is OW_1KRJ. The replacement value approach will, however, ignore the reduction in the number of hours demanded by the same household following the accident and will estimate the change in welfare or welfare loss as being equal to $W_1.OX_1$ or OW_1LX_1. This results in an overcompensation by the amount $KLR + JRX_1$.

In sum,it is argued here that both methods of the replacement

value produce serious biases for valuation of welfare or net benefits from current levels of household production. More serious however, is the fact that either version of the replacement value approach are quite inappropriate for measuring losses in welfare or welfare changes in household production. It may be more justifiable, however, to use the replacement value approach for GNP or national income accounting purposes.

c. The Pyun Model[11]

Lamenting that most economic analysis supplied by economists (as well as by non-economists) in courts on the problem of establishing the monetary value of a housewife has been "flimsy", Pyun, a professor of economics, published a paper on the subject and offered his alternative based on a combination of opportunity cost-replacement value method. The Pyun Model, as it has since then become known, is widely cited in the legal literature[12] and has apparently been accepted by at least one Court of Law.[13] I believe, however that serious flaws exist in both his exposition and methodology which has led to several incorrect assertions. I first outline the Pyun Model and then expose the relevant errors associated with it.

(i) The Exposition

Figure 15 reproduces the diagram Pyun uses in his article. The Pyun Model assumes that a housewife can contribute money income (market production) and utility income (home production) to her household with the latter defined as "the housewife's utility creating capacity expressed in terms of the monetary value of her services

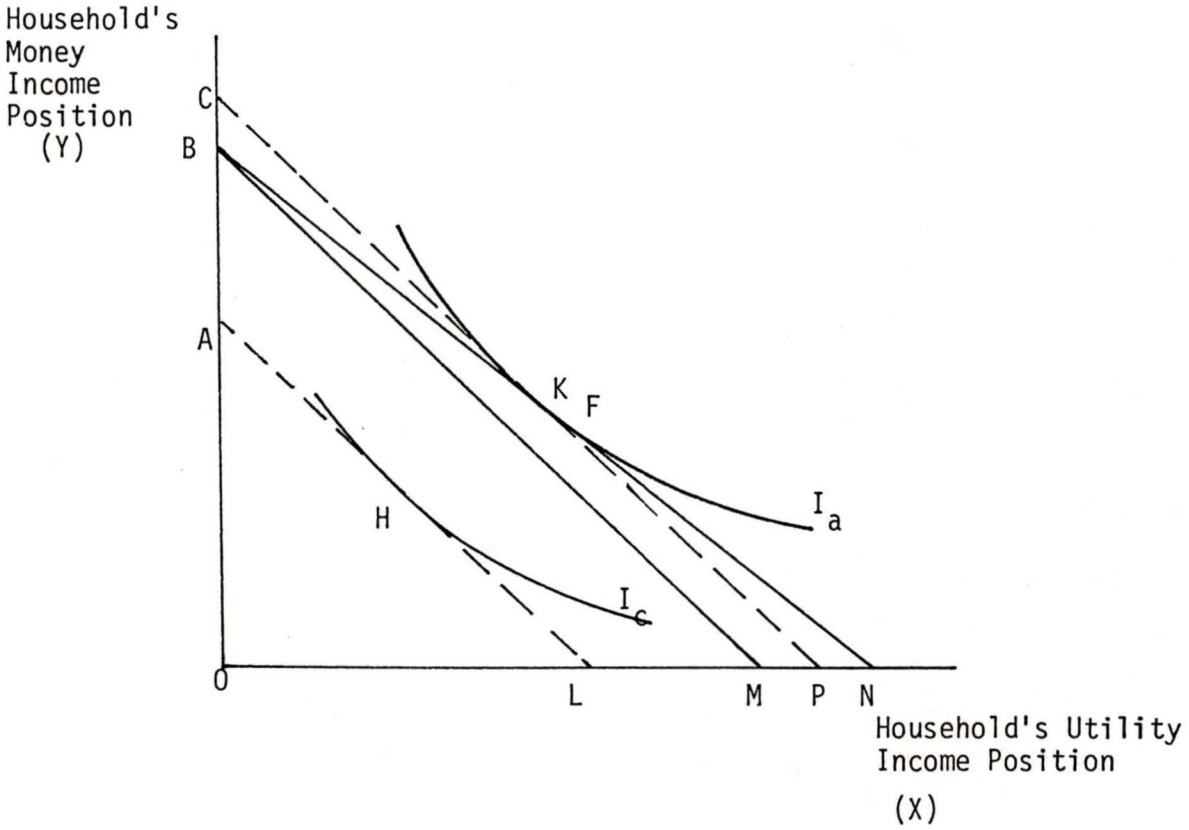
Household's
Money
Income
Position
(Y)
C
B
A
K
F
H
I_a
I_c
O
L
M
P
N
Household's Utility
Income Position
(X)

Figure 15

computed on the basis of going wage rates for her various services in the household."[14] In Figure 15, this utility creating capacity of the housewife is measured along the horizontal axis(X) and is given by the amount LN. Pyun assumes that the housewife does not work in the market but if she had, the maximum amount of her monetary contribution is AB measured along the vertical axis(Y) and is equal to $\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$, where $\overline{X}$ is the prospective annual earnings of the given housewife in the base year, X_i is the average annual earnings of the ith occupation which she can fill and n is the number of occupations for which she can possibly do.

Pyun argues that the housewife's utility creating capacity to her household must be greater than the opportunity cost or wage income she could have earned in the market (her monetary contribution) or otherwise she would have been employed i.e. LN > AB. He defines BN as the household's income restraint line and indifference curves Ia and Ic as "the behaviour line of the household as a whole toward the total utility derived from the combination of the X and Y income sources."[15] The household's initial equilibrium position is at point F, the point of tangency between Ia and BN. As a result of the death of the housewife, the household settles on a lower indifference curve Ic, indicating lower total utility with optimality now at point H. Following Hicks, the substitution effect is derived by drawing a line parallel to AL and shifting that line until it is tangent to indifference curve Ia. The economic loss to the family in terms of

household production is not LN but some amount less than that. He measures PN as the amount of the substitution effect and concludes that the loss to the household from household production is LP.

(ii) The Critique

Most of my criticisms leveled at the Pyun Model stemmed from his incorrect and improper use of indifference curve analysis, which has led to several incorrect conclusions. I shall list and discuss each of these criticisms in order.

1. The fundamental purpose of indifference curves is the illustration of choice involving say two goods, the combination in the amounts consumed of each yields a certain level of utility. In Pyun's analysis, this element of choice is missing as he considers the housewife as not working in the market at all. Moreover, the equilibrium position F of the household implies a level of utility income that is slightly below OL, but we are told that the housewife's utility income contribution is LN.
2. It is not clear from his analysis as to what he means by 'utility income'. Pyun, by asserting that utility income provided by the husband, OL, is limited to the amount of his money income, OA, such that OL = OA would seem to me to imply a one to one transformation between money income and utility income, which then calls into question the validity of his income restraint lines and the shape of his indifference curves. If OA money income provides OL utility income, then the line AL is not a constraint line and the position H shown in his diagram becomes impossible

to interpret. These assertions that utility income measured in dollar terms is perfectly transferable into money income, also in dollar terms and vice-versa, would necessarily imply that the two goods (market and home) are perfect substitutes and as such would require the indifference curves to be straight lines and not convex as he has drawn them. His income restraint lines are in essence his indifference curves!

3. Since the objective of his paper is to determine the monetary value of household production as contributed by the housewife, it is ironic that he starts off his analysis by assuming a replacement wage approach, as apparently evident by his so-called 'utility income creating capacity' measured on the horizontal axis, X, where LN represents "the monetary value of the housewife's services computed on the basis of going wage rates for her various services in the household."[16]
4. Pyun's treatment of utility is also incorrect. Since the level of utility attained by an individual from the consumption of goods is reflected in positions of the indifference curves on an indifference map which is drawn in commodity space, Pyun, by measuring utility on the horizontal axis is destroying the foundation of the ordinal indifference analysis he seems to employ. He should have set up his analysis in such a way as to provide for a choice between money income and household production, or some other alternative on the horizontal axis. Then utility can be measured by the resulting indifference curve reached.

5. Finally, Pyun's idea that the compensating variation income measure lies between the opportunity cost and replacement cost estimates is theoretically incorrect.

In sum, the Pyun Model is seriously in error in its use of indifference curve analysis, although the same could not be said of its attempt and purpose. The direction and objective taken by Pyun is in fact commendable since it represents an attempt to measure the loss in total net benefits suffered by a given household following the death of the housewife in a manner consistent with welfare economics, this being the compensating variation measure which is the relevant measure for compensation questions involving welfare loss.

1.2 Legal Approaches and Jurisprudence[17]

Raymond Kierr wrote in the Louisiana Bar Journal:

> Realistically, the marvel that is the modern mother-housewife serves so many functions that her bread-winning husband pales to think of swapping chores with her. She is chief-cook and baker; dishwasher, waitress, dietician; upstairs maid, downstairs maid, nurse maid, chambermaid; a ready seamstress, never seamy; an oracle who is expected to sew on buttons before they come off; psychologist, physicist, chauffeur; keeper of the garden, warden of kids; bathing beauty, banker; an economist, a purchasing agent who can operate without funds, a veterinarian to cat and canary; teacher to small fry and large; a tower of strength, with delicate charm, cool thinking, warm acting; a creature of two talented hands and 1000 resourceful facets . . . . All this is lost when tort fells a stalwart housewife . . . . Can the Law measure this in money?[18]

The Law indeed can, and has many times.[19] The methods adopted however, may be questionable as far as consistency with

economic theory goes. The right to sue for damages for loss of services was established by the Supreme Court of Canada in 1885 in St. Lawrence and Ottawa Ry. v. Lett.[20] In that case, W.J. Ritcher, C.J. said:

> I cannot think the injury contemplated by the legislature ought to be confined to a pecuniary interest in a sense so limited as only to embrace loss of money or property, but that, as in the case of a husband in reference to the loss of a wife, or, in the case of children, the loss of a mother may involve many things which may be regarded as of a pecuniary character.
>
> . . .
>
> I am free to admit that the injury must not be sentimental or the damages a mere solatium, but must be capable of a pecuniary estimate; but I cannot think it must necessarily be a loss of so many dollars and cents capable of calculation. The injury must be substantial; the loss, a loss of substantial pecuniary benefit, and the damages are not to be given to soothe the feelings of the husband or child, but are to be given for the substantial injury.
>
> . . .
>
> I must confess myself at a loss to understand how it can be said that the care and management of a household by an industrious, careful, frugal and intelligent woman, or the care and bringing up by a worthy loving mother of a family of children is not a substantial benefit to the husband and children; or how it can be said that the loss of such a wife and mother is not a substantial injury but merely sentimental, is, to my mind, incomprehensible.
>
> . . .
>
> The evidence in this case shows that the husband was receiving benefits and advantages from the services of his wife capable of pecuniary computation, and had such reasonable expectation of pecuniary benefit from the continuance of such services by the continuance of the wife's life as would entitle him to damages . . .

The case thus established the principle that the husband and children are both entitled to compensation for the loss of household services previously performed by the deceased wife and mother. Similarly, in other cases following,[21] the assessment of damages included a determination of the value of household services performed by the deceased or injured victim to her surviving family. And with regard to husbands and fathers:

> . . . the father performs in the average household a great number of services which, on his death, must either be paid for outside, done by the widow and children, or foregone. In any given case you can think of a great many being the family chauffeur, preparing tax returns, removing and installing storms and screens, snow removal, painting, decorating and so on. All these things have a value capable of a dollar determination . . . . In the average case of the loss of a husband and father this amounts to a substantial increase per year in the dollar value of what that family enjoyed when the father was alive . . . .
>
> Find the attitude of the father to his family and you can put a dollar on the value of that father as a tutor helping with homework, teaching the children to play soccer, to play hockey, ... The average father spends a lot of time with his children. Some of this teaching you can buy in the market place. The loss . . . is not a sentimental loss but a loss with provable money value.[22]

Thus, the loss of services performed by a deceased mother and wife is not necessarily more severe than the loss of a father and husband to the surviving family. In both cases, the surviving family suffers from loss of household production, certainly a decrement of welfare, and, it is this welfare loss that is the subject of damage awards or compensation.

Damages for the loss of household services should reflect the

actual value of those services. But what is the actual value of those services or, to return to Raymond Kierr's question, "Can the Law measure this in money?"[23]

It appears that judicial decisions attempt to measure this welfare loss consistent with the legal interpretation of the purpose of compensation common to tort law. The word 'tort' is derived from the Latin word for wrong and is taken to be a concept of liability. The purpose of tort law is to enable some party (called victim) who has been wronged by another (called tort feasor) to seek redress from that party for the losses suffered. The intent of tort law is then, to restore an injured party or victim to the same welfare position he or she enjoyed before being injured. A well-known statement of the Law is provided by Lord Blackburn, who in Livingstone v. Rawyards Coal Company said:

> Where any injury is to be compensated by damages, in setting the sum of money to be given . . . you should as nearly as possible get at that sum of money which will put the person who has been injured . . . in the same position as he would have been in if he had not sustained the wrong.[24]

Similarly, well-known discussants of law have always maintained that the rule of compensation is measured by restoring the original position of the victim--restitutio in integrum--if it can be restored. Professor Fleming James for example wrote:

> The principle of compensation is a natural enough corollary of the fault principle. If the defendent is a wrong-doer and he is to pay damages to an innocent plaintiff, it seems eminently fair that these damages

> should (at least) put the plaintiff, as nearly as may be in the same position he would have been in if the defendant's wrong had not injured him.[25]

And, Professor Neil Komesar wrote in the Journal of Legal Studies:

> Should the destruction of the driver and loss of his or her services be treated differently? These chattels are inputs into the household process which produce the ultimate pleasure and well-being of the household. The loss to the household is the decrease in its ability to produce the same state of welfare associated with the original state of these chattels.[26]

In the past, common law of which torts were a part, did not allow survivors to sue for any losses and all claims died with the victim. The right of survivors--husband (if the wife dies) or family--to sue for damages have since been opened by acts of legislatures and has become an expanding area of contemporary tort.[27] Thus, if a wife dies as a result of the tortious act of another, recovery for losses of household production and other damages will fall under this 'loss to survivors' approach.[28] Compensation based on a 'loss to survivors' approach seems more preferable or sensible because it assesses the loss from the perspective of the beneficiaries--the loss of welfare which the household originally enjoyed and will continue to enjoy if the victim had not died. The Courts recognize this loss of welfare to the surviving household as similar to that of the loss of welfare arising from injury cases. The rationale for compensation and the basis of damage awards should then be one and the same, with the appropriate compensation being the amount that would leave the injured party in the same position as before the accident had occurred.

In economic terms, this would involve the determination of a damage award that would restore the welfare of the injured party to its original level. In cases of proven loss of household production services to a household and the subsequent decrease in welfare or well-being enjoyed by the household, the same rule of compensation--that of restoring the original household welfare from household production--should apply.

It is perhaps disappointing to observe that, in litigations involving wrongful injury or death, this rule of compensation was not applied. This may be due to practical necessity and/or expediency considering the difficulty in the nature of obtaining measurements consistent with theory. However, a far more valid reason it seems is due to a conceptual misperception of the actual loss. Existing methods of measuring the welfare loss from household production to a given household such as replacement cost, opportunity cost or other variants do not measure this welfare loss consistent with the rule of compensation.[29]

Most of the legal approaches used to appraise the economic loss to a household resulting from the death or injury of a homemaker, make use of either the opportunity cost or replacement value method, or, some variant of the two. Canadian Courts of Law have consistently adopted the replacement cost approach to value the lost household services.[30] Called the substitute mother approach in most legal context, the valuation is based on what it would cost to replace the deceased wife or husband with a person or persons of equal ability performing services of equal quality. Alternatively, in the

catalogue of services method, the deceased homemaker's time is divided into different time slots, with each time slot representing the amount of time the homemaker spent in performing a particular task. Assuming that each task can be performed by a replacement hired from the market at an appropriate market wage rate, the valuation of the lost services, is then, measured according to the total cost of their replacement, on an item by item or task by task basis. The Court then determines the appropriate time period over which the replacement would be required, taking into account of mitigating factors such as remarriage potential, probabilities of divorce and natural death age.[31] The major criticisms levied against both of these variations of the replacement cost approach have been discussed in the earlier section of this Chapter, and as such, will not be repeated here. As an additional note,however, it should be pointed out that many of the tasks performed by homemakers do not require the associated degree of education and/or skills of a market equivalent, and that also few homemakers rarely spend as much time at the job as these methods seem to indicate.[32] The result is that, more often than not, the award or the computed figure based on these methods is inflated.

Some qualifications or adjustments may be made to the quantification of damages using the replacement cost approach. These qualifications, often the subject of contention, usually arise because of stated differences between the value of household services to the decedent's family and the cost of replacing the lost services.

In Franco v. Woolfe[33] for example, the trial judge Mr. Justice Haines said:

> We must . . . give due consideration not only to the cost of the services she (the deceased) would have rendered, but also the value of those services as it affected the individual lives of Carl Franco, Bunny Franco and Adi Franco. Cost and value are two different things . . .

And while, differentiating between replacement cost and value of household services, the usual presumption is that the latter in monetary terms far exceeds the former. In Pennsylvania Ry. v. Goodman,[34] the court noted:

> Certainly the service of a wife is pecuniarily more valuable than that of a mere hireling. The frugality, industry, usefulness, attention, and tender solicitude of a wife and the mother of children, surely make her services greater than those of an ordinary servant, and therefore worth more.

Similarly, in Continental Bus System, Inc. v. Toombs,[35] the trial judge said:

> In computing the damages of a husband for the death of his wife, the recovery should not be limited to the recovery of the cost of a menial servant . . .

Certainly from these legal citations, one can infer that the replacement cost award is judged to be inadequate simply because, it is argued that the replacement services would be of inferior quality to the decedent homemaker's services. The argument, I contend, is unfounded, for the replacement quality could also be greater.[36] On

a more serious note however, it appears that, the said Courts have detracted from the primary objective, that of valuing the lost household services. Instead, they have valued the lost household services plus the loss of some sentimental attachment (eg. performed by loved ones) to those services. The issue remains contentious and unsettled, as other Courts have chosen not to follow these precedents and have opted for the narrow interpretation of the replacement cost approach. In an appeal following Franco v. Woolfe,[37] Justice Houlden said, " . . . in assessing damages for the death of a wife, . . . the Court can consider the cost and the incidental expenses resulting from the hire of a housekeeper." Similarily, a decision by the British Columbia Supreme Court, in Debrincat v. Mitchell,[38] the damage award encompassed only the cost of a housekeeper with no adjustments for the speculated lower quality of substitute service.[39]

Very occasionally, the plaintiff's testimony as to the subjective and perceived value of the lost activity in injury actions is accepted.[40] Similarily, in death actions, the family and friends of the deceased homemaker are sometimes allowed to testify as to the value of the lost household services.[41] Both of these approaches are however, uncommon and generally avoided due to their inherent unreliability and their prejudicial effect on the jury. Another closely related subjective technique of valuation is what is known in legal literature as 'presumption'.[42] This method assumes that the homemakers' services have value and it is left to the jury to decide

(based on their common experience in performing housework) as to the appropriate amount of compensation necessary to restore the welfare originally enjoyed by the household. The presumption technique however fares no better than the other methods of valuation, in that it is purely speculative and just as the jury decides in cases involving compensation for pain and suffering, the method carries no convincing explanation of the welfare loss, at least from a theoretical viewpoint.[43]

The use of so-called 'expert technical witnesses' such as economists, home economists, directors of employment agencies and actuarists to provide testimony as to the magnitude of the relevant loss, and to refine and expand on the existing loss concepts, is becoming increasingly common in tort litigations. In the past, expert testimony was not readily accepted and some Courts have held it in error to admit such testimony on the theory that the determination of the value is a matter of common knowledge and experience and most appropriately should be left to the judge and jury.[44] Other Courts take the view that expert testimony is too controversial to admit, since the courts will have to determine which expert testimony is appropriate.[45] For instance, is the testimony from an economist considered more relevant and correct than the testimonies of home economists or persons engaged in the operation of employment services? The contemporary view, it seems, is that all expert testimony should be admissible for the assistance it can give the judge and jury in making a determination of the value of household services rather than

relying on just pure common sense. In Sharp-Barker and Barker v. Fehr,[46] Judge Locke of the British Columbia Supreme Court quoting Judge Dickson in Lewis v. Todd:[47]

> . . . the award of damages is not simply an exercise in mathematics which a Judge indulges in, leading to a 'correct' global figure. The evidence of actuaries and economists is of value in arriving at a fair and just result . . . . If the Courts are to apply basic principles of the law of damages, and seek to achieve a reasonable approximation to pecuniary restitutio in integrum expert assistance is vital.

Similarly, in Merrill v. United Air Lines Inc.,[48] the Court stated:

> As knowledge becomes more professionalized, specialists will more frequently be called upon as expert witnesses. This is the judicial by-product of an age of pervasive technology and expanding social sciences.

More succinctly is an article by Leo O'Connor and Robert Miller. Writing in the Notre Dame Lawyer, the Professors of Law said:

> One purpose of using an economist-statistician is to assist a Court and jury in determining the true economic losses sustained . . . . The economist-statistician's opinion stands or falls not on the resultant dollar computations but on the convincing explanation of the basis of his calculations.[49]

While expert testimony may aid a Court to arrive at a fair and appropriate compensation, the conceptual basis upon which the calculations depend are, quite often in error. The error lies in trying to use methods which are inappropriate for issues involving measurements of welfare and welfare changes. For example, in Franco v. Woolfe,[50] one of the expert witnesses was Oli Hawrylyshyn, a

a professor of economics from Queen's University whose testimony consisted of an estimated value of the average Canadian housewife's contribution to the gross national product. Professor Hawrylyshyn, had quantified the deceased homemaker's lost services in terms of a replacement cost by item approach. Such an approach has already been shown to be not only inappropriate from a theoretical standpoint for measuring welfare changes, but also capable of grossly exaggerating the value of household services.[51]

Finally, the use of opportunity cost to assess the value of lost household production is not a novel idea but with the exception of British Courts--and even then a rarity--Canadian Courts and U.S. Courts have not attempted nor accepted the idea of valuing a household's welfare from household production and the subsequent welfare loss from tort induced injuries or death to a household member in terms of foregone wages.[52] While foregone earnings constitute a distinct head of pecuniary damages if the injured or deceased housewife had worked in the market, the assessment of this loss is complicated if a housewife lacked labour force participation--the Courts regard the measurement exercise of potential contribution to the household as too speculative in nature and are unwilling to accept such a probabilistic estimate. One further relevant criticism of the opportunity cost approach to the valuation of homemaker's services is that the method implies that a more highly educated wife and/or mother is a better spouse and as such the household should be awarded higher damages. It might be the case that the foregone

career may have no correlation to the skills required by a homemaker. Apart from these criticisms, I have maintained that the opportunity cost measure is not a welfare measure at all. Since the objective of the Courts is to determine the value of household production to a given household--the welfare enjoyed from having household services performed--and the subsequent loss in welfare when a tort befalls the household, it is simply inappropriate and incorrect to assert an opportunity cost measure as a measure of net value.[53] Whatever other reasons, the Courts may have to reject the opportunity cost method, is reinforced by this cost-net value inequality.[54] While the method may reveal the opportunity cost of the time spent in household production, it does not say anything about the amount of welfare the household derives from having such a production. The measurement of the latter depends on the amount of total benefits less total opportunity costs at the margin of provision. Since the rule of compensation common to tort law and now adopted in the loss to survivors approach is that of restoring the welfare lost to that level previously enjoyed by the household, damage awards if based on the opportunity cost method will be thoeretically incorrect.

Proponents of the opportunity cost method often fail to see the difference between an opportunity cost measure and a welfare measure, suggesting instead that the former measures the latter. Komesar for example, states that "the loss to the household is the decrease in its ability to produce the same state of welfare . . . .",[55] but then goes on to argue the merits of using the opportunity cost approach.

Similarly Frances Pottick argues that "The foregone wage is, . . . valuable evidence in litigation involving the value of her (home-makers services".[56]

Since under current practice, courts do not admit evidence based on the opportunity cost method of valuation of the lost services to the household,[57] it is perhaps surprising to find the recently released report on compensation for automobile accident victims in British Columbia advocating the opportunity cost approach, while, at the same time, allowing an option for the injured party, if he so wishes, to collect damages based on replacement cost. The relevant section of the Report reads:

> Persons at home . . . . These victims include spouses who are not the principle bread-winner and live at home for reasons other than impairment or disability. The loss they incur results from their inability to pursue their daily activities and the need to get some form of replacement for the services they previously provided to their families. For these victims, the income replacement annuity would be determined in the same fashion as for those who are unemployed, . . . that is, it would be equal to 90 percent of the net income derived from their earning capacity in an employment situation. These victims would also have the option to receive instead of an income replacement annuity, full reimbursement of reasonable costs for replacing services up to $250 per week.[58]

The reason it seems for setting constraints on the amount of damages recoverable is to avoid the possibility of overcompensation. The Report indicated that, "it is reasonable to deduct some portion to represent the minimal expenses normally incurred to earn that income",[59] but no rationale was made for the upper limit

of $250 using the replacement cost method except for the fact that the Report thinks it is "reasonable". Reasonable or not, it calls into question as to whether the writers of the Report, which incidentally spends a Chapter on the issue of compensation,[60] have really understood its meaning. But perhaps their contribution has this value: that they recognize that household production contributes to economic welfare of a household and that unlike the easily calculated or measurable money income stream lost of market workers, the value of household production must be imputed. Because of the difficulty in getting accurate and consistent estimates of such values and a survey of the literature--legal and economic--yields nothing more (in terms of alternative methodologies) than the conventional methods of measurement, the writers of the Report may have been induced to accept the existing methods. The only novelty which comes out of the Report--with regards to household production--is the proposed options whereby the victim (in personal injury cases) or survivors (in wrongful deaths) can choose between the opportunity cost or the replacement cost methods of compensation. However, unless the proposed options method of compensation is passed in the Provincial Legislature and accepted as a Statute of Law, it seems unlikely that the Courts, having consistently rejected the use of the opportunity cost method of compensation will, all of a sudden accept it now.

In conclusion, the valuation of household production has always troubled the Courts and while conventional methods of measure-

ment may contain theoretical flaws and conceptual biases, they may be admissable for the purpose of the Courts since there are no other alternative methodologies available which can provide better measurements. The economic literature on household production provides neither encouragement nor alternate solutions. The literature has been stagnant, with only the replacement cost and opportunity cost methods as alternative approaches to valuation. Worse yet, economists and some as expert technical witnesses in Courts, have incorrectly asserted--knowingly or unknowingly--that the measures derived from these conventional methods measure the true loss in economic welfare to a household from tort induced lost household production.

An alternative method of measurement that may avoid some of the weaknesses of these more commonly suggested approaches involves the use of contingent evaluation methods to measure the value placed in household production by individual households themselves. Using the theory and model of household production suggested in this thesis, the next chapter shows how, with the aid of the contingent evaluation methods, a measure of economic welfare from family household production can be derived.

Footnotes: Chapter 5

1. For calculus approaches, see Rueben Gronau, 1980. Also see John Muellbauer, 1974. For indifference curve analysis, see Chong Soo, Pyun, 1969 and Harvey S. Rosen, 1974.
2. Among the proponents of this method include: Neil Komesar, 1974; Francis Pottick, 1978, and, Gary North, 1968. Also see Richard A. Posner, 1977.
3. For more discussion on this aspect, see E.J. Mishan, 1979 at pp. 57-58. Also, see Jack L. Knetsch, 1984.
4. In mathematical notation: $M.U._{nm} = WM.U._{y} - D.U._{mw}$ where $M.U._{nm}$ is the marginal net utility of non-market time, W the

market wage rate, $M.U._y$ is the marginal utility of income and $D.U._{mw}$ is the disutility of market work. Dividing throughout by $M.U._y$ yields: $\frac{M.U._{nm}}{M.U._y} = \frac{W\ M.U._y}{M.U._y} - \frac{D.U._{mw}}{M.U._y}$ or

$M.R.S._{nm.y} = W - M.R.S._{mw.y}$, where $M.R.S._{nm.y}$ is the marginal rate of substitution of non-market time for income and $M.R.S._{mw.y}$ is the marginal rate of substitution of market work for income.

5. Reuben Gronau, 1973.

6. A similar theoretical flaw is found in recreation economics where the cost method has been used quite widely in the past to measure benefits from having outdoor recreational facilities. By similar application, the cost method assumes that the value of outdoor recreation use is equal to the cost of providing it. Thus, if a park costs $3 million to build, then it is assumed to have benefits or value equal to $3 million. Again, the method implies that the higher the cost of setting up a given park, the more valuable it must be to consumers of the park. Such a notion has the effect of justifying any contemplated park. All other considerations such as alternatives or substitutes available and site demand valuation are ignored. See Jack L. Knetsch.

7. In other words, the basic assumption here is that household work has close counterparts in the market. The method has been

suggested by among others: W.H. Gauger and Kathryn E. Walker, 1980; Ronald MacIsaac, 1977, and, Chase-Manhattan Bank, New York, 1965.

8. This suggested by among others, Janet Yale, 1982; Harvey Rosen, 1974; Thomas Segalla, 1971, and, Newson, 1968.

9. See Chapter 3.

10. It is more likely that the wage rate is above point R for replacements since hired-help is not common in households.

11. Supra note 1.

12. See Komesar and Pottick, Supra note 2.

13. Har-Pen Truck Lines Inc. v. Mills, Federal Reporter, (1967) 2nd series Vol. 378, at pp. 705-715. Actually, Pyun served as an expert witness in that case and applied his model to the valuation of a deceased housewife.

14. Supra note 11.

15. Ibid.

16. Ibid.

17. This section deals with current methods of valuation on losses in household services, used and accepted by Courts of Law. It is not concerned with the history nor the development of tort law. Neither is it concerned with the question on liability nor proofs of negligence. Also, the measurement of the loss of household production is seen as a loss to the household and not to any one individual member of the household.

18. Kierr, 1961.

19. Legare v. United States, Spangler v. Helm's New York Pittsburg Motor Express, Fabrizi v. Griffin, and, Weiss v. Rubin, cases cited in Thomas Lambert, 1961. See also Franco v. Woolfe, St. Lawrence and Ottawa R. Co. v. Lett in Janet Yale, 1982. Also, Griffiths et al. v. Canadian Pacific Railways, Lapinski and Farrell, Stonehouse v. Gamble, (1983), Vol. 44 B.C.L.R. and Sharp-Barker and Barker v. Fehr, (1982) Vol. 39, B.C.L.R.

20. (1886), 11 S.C.R. 422 (S.C.C.) Also later established by statues for example, in British Columbia: Family Compensation Act, R.S.B.C. 1979, c. 120. S.2.

21. See for example: Vana v. Tosta (1968), 66 D.L.R. (2d) 97 (S.C.C.) and Ponyicky v. Sawayama (1943)2 D.L.R. 545 (S.C.C.).

22. Recent Developments in the Law of Damages (1975) Dept. of Continuing Educ. L.S.U.C. p. 38. See also: Sharp-Barker and Barker v. Fehr (1983) B.C.L.R. 39, p. 19. and Danchuk v. Murray (1979)

14 B.C.L.R. p. 273.

23. Supra note 18. It abstracts from those complications and concentrates on Courts attempts to provide fair and appropriate recovery on the economic loss suffered by a household following an injury or death of one of its members who normally performs the household services.

24. (1880) 5 App. Cas. 25 at pp. 39.

25. Fleming James Jr., 1956.

26. Supra note 2.

27. See for example: Lord Campbell's Act (1846), Family Compensation Act (1979) and Ontario's Fatal Accidents Act (1960).

28. The alternative called 'loss to estate' approach presents substantial problems. Problems commonly mentioned among legal critics are:

    (i) the problem in attempting to value a human life with the representative of the victim demanding infinite compensation for the loss of the victim's life; and

    (ii) in cases of instaneous death where the victim suffers no pain, had no history of labour force participation and not showing or indicating signs to enter the labour force in the future could go uncompensated.

29. See earlier section of the same Chapter.

30. Cooper-Stephenson and Saunders, 1981.

31. See for example: Franco v. Woolfe (1977), 69 D.L.R. (3d) 501 (Ont. C.A.), Griffiths et al. v. C.P.R., Lapinski and Farrell. (1978), 6 B.C.L.R. 115 (C.A.) and Stonehouse vs. Gamble and Lewis (1983), 44 B.C.L.R. 375 (C.A.).

32. See Euston Quah and Jack L. Knetsch, 1983.

33. Supra note 31.

34. Cited in St. Lawrence and Ottawa Ry. v. Lett (Supra note 19).

35. Cited in Speiser, 1978.

36. In some cases, a wife and/or mother may be a 'worthless' or 'useless' housekeeper, a poor cook and an uncaring alcoholic mother. The surviving family in this case may be said to have gained an improvement, quality wise, to have engaged the services of a replacement. Her family, so far from having suffered a pecuniary loss in terms of household services are actually better off as a result of the death of the deceased. Far less uncommon, are cases in which a wife and/or mother may have suffered during her lifetime an illness or natural disability that, she might be unable to perform most of the usual household chores and those that she could perform may be of marginal quality. Here again, the services provided by a replacement may be superior.

37. Supra note 31.

38. (1958), 26 WWR 634 (B.C.S.C.).

39. Alse see Griffiths v. C.P.R. Supra note 31.

40. See especially Frances Jean Pottick, 1978.

41. Burke v. City and County of San Francisco and Combs v. Combs, both cited in F.J. Pottick's article, Supra note 40.

42. Supra note 40.

43. See earlier section of this chapter.

44. See Cornelius Peck and William Hopkins, 1969.

45. Ibid. See also, Thomas Segalla, 1971.

46. Supra note 19.

47. (1983) B.C.L.R. Vol. 39 at 27.

48. Leo O'Connor and Robert Miller, 1972.

49. Ibid.

50. Supra note 31.

51. See earlier section of the same Chapter. Moreover, employing this method can result in large disparity in the figures, ranging from $4,705 per year as calculated by one source--the

Social Security Administration, U.S., to $13,364 per year as calculated by another source, Ann Crittenden Scott, of the Office of Research and Statistics, U.S., 1979.

52. See for example Griffiths V.C.P.R., Lapinski and Farrell (1978) 6 B.C.L.R. at 115 (C.A.).

53. Net Value which is, by definition welfare, is equal to Total Benefits less total opportunity cost.

54. See Chapter 3 on the definition of welfare and net value. Also see earlier section of this Chapter on the discussion of opportunity costs.

55. Komesar, Supra note 2.

56. Pottick, Supra note 40.

57. See Griffiths v. C.P.R. (1978) 6 B.C.L.R. 115 (C.A.). Also see Massman v. City of Philadelphia where the plaintiff was disallowed to recover for earnings voluntarily foregone (Case cited in Frances Jean Pottick's article, Supra note 40).

58. Report by the Automobile Accident Compensation Committee, B.C. 1983, pp. 160-161.

59. Ibid.

60. Ibid.

CHAPTER 6

Contingent Evaluation, Survey and Results

The thesis has established that the measure of household welfare from household production is the net value or net benefit measure from current levels of provision. It is now shown that this welfare measure of household production can be obtained empirically from contingent evaluation approaches--the use of responses of individuals to various contingencies that are posed to them.

1.1 Contingent Evaluation Approaches

The contingent evaluation method has been used, with growing success, to value other non-market goods and seems an appropriate approach to value household production as well. The technique, essentially involves the construction of a hypothetical market for the good in question and information is given as to its quantity, quality, location, time dimensions and other attributes. The rules of operation of this contingent market are then established and the respondent is asked to indicate a reaction to some contingency that is posed. In its more common application, in which values have been placed on various non-market environmental amenities, individuals have been asked how much money they would be willing to pay to attain some improvement in natural surroundings--for example, atmospheric visibility (Randall et al., 1974; Rowe et al., 1980), parks and recreation (Knetsch and Davies, 1979), water for recreation and

scenic beauty (Quah, 1981; Darling, 1973), strip mining induced land form alteration (Randall et al., 1974; Brookshire et al., 1976) and reduction in water pollution (Gramlich, 1977). Still other applications of the contingent evaluation approach have included things as diverse as public television broadcasting (Bohm, 1972), airplane safety and valuation of human lives (M. Jones-Lee, 1976), wildlife (Hammack and Brown, 1974), postal service and waterfront piers (Knetsch et al., 1982) and property values (Ralph d'Arge, 1979).

Contingent evaluation studies are distinguished from traditional methods by their use of survey questionnaires to acquire the relevant data for analysis. The method is seen as a means of allowing individuals to participate in the choice of the provision of a non-marketed good or service, thereby indirectly expressing his level of enjoyment--welfare--from current provision. The individual, in making his response, will evaluate the prospective sacrifices and gains in utility as a result of the proposed contingencies.

Contingent evaluation approaches usually reduce to one of only three methods: the direct question method, the indirect question method and the Davies method (also commonly called the bidding games technique). In the direct question method, the individual is simply asked the maximum amount of money he would be willing to pay rather than forego the current benefits from consuming good X. Taking this figure and adjusting for any consumption costs should provide an estimate of net value (Barret and Waddell, 1974; Gluck, 1975). Although simple and of great intuitive appeal, the direct question

method suffers from problems of 'lumpiness'. For example, in valuing environmental commodities, of which many are intangible, the individual may be asked in one single direct question: "At most, how much would you be willing to pay for clean air?" Clearly, such a question is very difficult to answer for no other information is given to the individual (the quantities available, site variation and alternatives, etc.). This 'lumpiness' problem together with the intangibility of such goods make it even more difficult for individuals to arrive at some degree of accurate assessments. Indirect methods on the other hand, ask questions about quantities consumed from which the analyst infers the consumers' willingness to pay. The techniques used in these indirect methods are certainly considered more sophisticated than those of the direct methods for they involve the creation of either hypothetical markets or simulated markets with actual cash transactions from which demand curves are derived (Clawson and Knetsch, 1966; Hammack and Brown, 1974; Bishop and Heberlein, 1980).

The iterative bidding techniques is but an extension of the indirect methods. Pioneered by Davies,[1] the method essentially follows an iterative questioning procedure to elicit responses which enable the researcher to construct a demand curve for the good in question. Individuals are asked to indicate a 'yes' or 'no' answer to a given bid of a proposed contingency. Thus, for example, a question may take the form: "Would you be willing to pay $X for the continued use of resource Y of defined quantity and quality?" If the respondent indicates a 'yes' answer, the bid is then raised to $X+x where x is

some dollar increment. The process is then repeated with equal x increments until the respondent switches to a 'no' answer, with that point being the highest sum he is willing to pay for continued use of resource Y. Per contra, if the respondent initially indicates a 'no' answer, the bid is then lowered to $X-x and the iterative process is repeated until the respondent switches to a 'yes' answer, with again that point being the maximum sum he is willing to pay for the use of resource Y. By developing a series of contingent markets, we clearly allow the individual to react more positively (or negatively) to a proposed contingency by avoiding the 'lumpiness' problem, with the data obtained then revealing individuals' perceptions of value.

The validity of such relevations of value using contingent evaluation is, however, subject to question since it has been argued by some that the method creates incentives for biased behaviour on the part of respondents which in turn tend to distort the true values placed on resources. Since contingent evaluation techniques for the most part depend on survey responses, it is argued that these responses are more indicative of what people would like to see done than how they would actually behave in a real market. Respondents perceiving that they eventually will not have to pay for the continued supply of extra-market good Y, but knowing that their responses may influence decision-making, will overstate their true willingness to pay. Per contra, respondents may understate their true willingness to pay if they perceive that they eventually will have to pay for it. In these and other cases, individuals may be induced to mistate their own preferences in an attempt to influence the average bid to as close

as possible to their own true bid. In this way they are said to impose their true preferences on others. Such games playing, or more formally known as strategic behaviour, will, however, require some knowledge as to what the average bid is, the size of the sample and whether the individual in question is the last bidder. Empirical evidence in the form of experiments and surveys which specifically test for strategic bias thus far do not support its alleged widespread existence (Bohm, 1972, Schulze et al., 1981, Rowe et al., 1980). Moreover, if respondents do not believe that their responses will have any significant impact on decision-making, then no incentives for strategic bias will exist. This may in part be due to the presence of another suspected bias--the hypothetical nature of contingent evaluation--which works against it.

Perhaps the single most serious source of bias inherent in contingent evaluation studies is what is commonly referred to as hypothetical bias. Hypothetical bias is the result of not confronting the individual with a real situation but rather an assumed situation. Thus, it is argued that when respondents are asked a hypothetical question with a given hypothetical situation, their responses will not be the same as those that would result from confronting them with real markets having well-defined prices and actual cash transactions. In other words, hypothetical bias leads to discrepancies between observed and proposed behaviour, thus resulting in inaccurate and misleading survey data.[2] However, such allegations of discrepancies between recorded responses and actual behaviour will only hold if the

underlying information and well-defined circumstances of the hypothetical market is similar (or has not changed) from the actual market. As Rowe et al., have argued: "The question of hypothetical bias is then not whether given a change in circumstances the observable behaviour pattern changes but whether the contingent answer can be observed when the defined circumstances do occur."[3]

Testing for hypothetical bias can be quite difficult and costly, this resulting from having to set up a real market with actual cash transactions taking place (Bishop and Heberlein, 1980; Brookshire and Crocker, 1981).[4] In any case, it is appropriate to attempt to minimize hypothetical bias by paying close attention to the design of survey questionnaires. This requires for example, making the contingent setting believable to the respondent and that the researcher (or interviewer) must ensure that the respondents are fully aware and have understood all the ramifications of the proposed change. The respondent must also be led to believe that the proposed contingency might occur and that, where relevant, his contingent valuation or response determines the outcome and magnitude of the change. In all, the less hypothetical the proposed change, the more accurate will be the response. Finally, it might be the case that the existence of both a hypothetical bias and a strategic bias may in effect be incompatibile, since the former implies that people are not likely to take these studies seriously because of the use of hypothetical markets, while the latter implies that people are likely to be serious enough as to attempt to misrepresent their true preferences in an effort to

influence the final result or outcome of the study.

Another possible source of bias in contingent evaluation is what is known as starting bid bias. This potential bias arises from the researcher's specification of a starting bid, say $X to a respondent before initiating the auctioning process of varying the bids to $X+x or $X-x. It is quite possible that the given starting bid may suggest to the respondent the approximate range of where his bid should lie. In other words, the individual may respond differently with different starting bids. It may also be the case that a respondent bored by the whole process of bidding--especially if the starting bid is substantially different from his true bid--may settle for a bid close to the starting bid. The effect then of starting bid bias is to cause inaccuracy of the contingent results. One way to test for starting bid bias is to present the same respondents with different starting bids and observe the change in magnitude of the average bid. Should the average bid change substantially, it would then suggest a significant presence of starting bid bias and careful interpretations of the survey results are clearly warranted. However, the test for starting bid bias itself may be biased since respondents are aware of their first bid and would want to appear consistent with it. In any case, results of three recent tests as starting bid bias showed its non-presence in all three tests (Thayer, 1981; Brookshire, 1977, 1980).

Other source of biases, such as sampling bias, non-respondent bias, information bias and interviewer bias may also be present, but

since these forms of biases are not particular to contingent evaluation studies as they might occur in any other approaches using survey techniques, I will not discuss them here. However, in the next section where I show how the contingent bidding technique can be applied to value household production, the possible existence of some of these biases will be discussed where information is available.

In sum, the contingent evaluation method sets up a hypothetical market, perturbs it and records the respondents' responses to those contingencies posed. The main advantage in using such methods is that, it not only allows researchers to construct a market to obtain values for a particular good or service in place of one that presently does not exist, but also, to the extent that hypothetical bias is minimized, such contingent markets are relatively cheaper to set up and operate than some other proposed alternative of actually constructing a market in which real cash exchanges take place. Contingent methods also allow the researcher to at least partially control the exercise in a way similar to controlled experiments in the physical sciences.

1.2 Contingent Evaluation in Household Production

a. The Survey

The study was conducted over a 4-month period in the summer of 1983 involving 60 households, all of which were residents of Victoria or the Greater Victoria Region. The participants were randomly selected from the telephone directory using a computer generated table of random numbers. Initially, a list of potential

participants was compiled and these participants were contacted by phone to obtain their cooperation in the study. Since the aims of the study were to investigate the division of labour within households, the value placed by households on household production and other intra-household interacting variables, all single person households were excluded from the sample. A final sample of 60 households was used.[5]

Each of the participant households received a mail package containing the survey questionnaire (see Appendix A) from which responses regarding personal data and information relating to household production were elicited. The participants were also contacted at varying times after they were in receipt of the mailed questionnaire to inquire about problems, to urge close attention and to answer any questions.

Following the return of all completed questionnaires, it was noticed that many households had had difficulty in answering the two Contingent Evaluation questions posed in the questionnaire (Questions 15 and 16) and that some households registered inconsistent answers[6]--perhaps a problem in understanding the questions. A second attempt was made using a new set of Contingent Evaluation questions; the responses this time were consistent.

Each of the respondents was again contacted and a Contingent Bidding game was played. Specifically, they were first informed of the number of hours that their household was currently spending in household production per week (as reported in their completed questionnaire). The respondents were then told of the possibility of reducing this total number of hours in household production, with the

magnitude of reduction in hours to be performed by a hired substitute worker. Each respondent was told to assume that the services offered by this substitute worker would be identical in nature and quality to those now performed by members of the household and would be done each week for an indefinite period so as to allow them to contemplate longer term reallocations of their use of time. Further, they were also told to assume that the work would somehow be done in a way that would not result in the household's loss of privacy or any other inconvenience. Given these assumptions, the respondents were then asked:

(i) whether they would be willing to pay $2 per hour to reduce their current hours of household production by 2 hours a week. If their answer was 'yes', the bid was then raised to $4 per hour and the question repeated. The amount was increased in $2 increments until a negative response was obtained. On the other hand, if their initial answer was 'no', the bid was lowered to $1 per hour and the question was asked again. A refusal to pay $1 per hour was then recorded as a $0 bid.

(ii) whether they would be willing to pay $2 per hour to reduce their current hours of household production by another 2 hours a week, bringing a total of reduction by 4 hours a week. The iterative bidding process of (i) was then repeated. Subsequently, the entire question was repeated using decrements of 2 hours until a marginal $0 bid was recorded. Throughout this part of the interview, the respondents were reminded that under no circumstances were they compelled to purchase these substitute services.

The theoretical presumption behind the above questions was such that we would not expect households to be willing to pay more than their own marginal opportunity cost of household production. At most, we would expect households to be willing to pay an amount equal to their own supply cost or marginal opportunity cost. Their responses or bids to each of the 2-hour reductions then trace out the entire individual household's marginal cost function in household production.

After all the responses were recorded in the first part of the interview, the respondents were then told to assume that for some reason or other, their household could only perform 2 hours less than their current hours in household production. The respondents were then asked the same question as in (i) and the iterative bidding process repeated. Questions were varied in terms of variations in hours that can be performed by their own household in equal decrements of 2 hours until 0 hours are performed by the household and all positive hours performed by the substitute worker. The difference between the questions in this part of the interview and the first was that the respondents were now restricted to perform a given number of hours and the remaining hours (up to current levels) could only be performed by the substitute worker. Thus, the households could either leave the remaining hours undone, use market services outside the household (eg. eating out, live in a room and board type of accomodation) or hire the substitute worker to perform services for them.

While the contingent questions in the first part of the interview attempted to generate the respective households' marginal cost

function, the questions contained in the second part were aimed at tracing out the households' marginal benefit function. Given the hypothetical situation posed in the latter, we would not expect households to be willing to pay more than what they expect to gain from having additional or incremental hours from household production. This is to say that, at most, households would be willing to pay up to their marginal benefit from having the additional hours. Their responses or bids to the incremental changes are in effect their marginal willingness to pay for the additional hours.

The interviews were conducted by a male and female interviewer during mornings and evenings in August. While the small size of the sample--necessitated by resource constraints and the intentional exploratory nature of the study--limits the possible generalizations of the specified findings, it appeared to be large enough to explore and illustrate the techniques and to obtain rough indications of some magnitudes.

b. Empirical Results

Descriptive statistics are first presented. Analytical insights into household production from a regression model of the semi-log type, using the data collected, are then presented in the second part.

Descriptive Statistics

The major results of the survey are presented in Tables 1 to 7. Tables 1 and 2 show a ranking of time commitments to the various household tasks generally performed by households with and without

pre-school children respectively. Unfortunately, the average amount of time spent in each category of household task was not recorded but the survey data was sufficient to generate a rank order of time commitments to the various household tasks. Based on the respondents' own ranking of time commitments to the various tasks, a final average rank was computed. The method and procedure used in determining this average rank and those of the other tables are explained in Appendix B. The results indicate that for those households with pre-school children, child-care takes up the most time and paper work (matters relating to the settlement of bills, accounts, etc.) the least time. For those households without pre-school children, cooking is the most time consuming activity and again paper work taking up the least time. The results also indicate that if we remove child-care from the ranking, the same order of rank of time commitments to the various household tasks is observed.

A comparison to other recent studies on such ranking of time commitments showed consistent results. The study by Walker and Woods[7] based on actual time allocations reported for each household activity, showed that regular meal preparation takes up the highest percentage of total household work time. This was followed by cleaning activities, marketing, after-meal clean up, washing of clothes by machine and other categories of household tasks not included in the present survey.[8] Child care was intentionally excluded from their rank for the reason of extreme difficulty in defining child care.[9] For example, is the mere presence of an adult member of the household

TABLE 1

RANKING OF HOUSEHOLD TASKS BY TIME FOR

HOUSEHOLDS WITH PRE-SCHOOL CHILDREN

1	2	3	4	5	6	7	8
Child Care	Cooking	Cleaning	After Meal Clean Up	Outdoors	Shopping	Laundry	Accounts

TABLE 2

RANK ORDER OF HOUSEHOLD TASKS

BY TIME FOR HOUSEHOLDS WITHOUT PRE-SCHOOL CHILDREN

1	2	3	4	5	6	7
Cooking	Cleaning	After Meal	Outdoors	Shopping	Laundry	Paper Work

with a child considered child care or does the adult member have to interact or play an active role (eg. changing diapers, feeding) with the child? Whichever definition is used, it is difficult to avoid ambiguous reporting of such results.

The same results were also observed in a 1982 study by Quah and Knetsch[10] in Vancouver, B.C., utilizing a sample consisting of equal numbers (called categories) of type of dwelling and households with or without pre-school children. The respondents, using an 18-hour time chart of 5-minute intervals, recorded the amount of time devoted to household production per week by individuals who performed the chores by task and by category. The authors reported that for those households without pre-school children, meal preparation was by far the most time consuming household activity, while accounts occupied the least time across all categories.[11] For those households with pre-school children, child care was dominant as the most time consuming activity. In between these two activities, the authors listed cleaning and after-meal cleanup as the second-highest and third-highest time consuming activities in apartment dwellers and people living in houses respectively.

Table 3 shows the households' division of labour in household production expressed in percentage terms. The results show that on the average, the disparity between men and women spouses in performing household tasks is quite small with 41 percent of the total household tasks are being performed by men and 53 percent by women. Approximately 6 percent of the total household tasks are performed

by other household members (eg. older children). While the results may be indicative of the increased participation by men in performing household chores in recent years, the results are not to be taken as indicating the increase in time participation by men in household production. In fact, Table 3 shows that men are predominant in performing household tasks such as paper work and outdoors (gardening, washing cars, etc) but these activities by reference to Table 2 are ranked among the least time-consuming activities. Also, Table 3 shows that the traditional roles of the spouses with regard to division of labour in household production have largely remained unchanged. Meal preparation, cleaning, laundry and shopping are essentially done by women while outdoor work and paper work are mainly done by men. However one major surprising finding of the present survey was the relatively higher proportion of men in child care than women--about 55 percent of the sampled households with pre-school children reported that the husband takes care of the children while this was about 33 percent for the wife. That this result was observed, could be attributed to the recent economic downturn in local labour market conditions. The seemingly high unemployment rate together with widespread lay-offs in the primary sector (at least true in British Columbia) has resulted in more men staying at home than before. In order to balance this loss of income to the household, to cushion its impact and to help ends meet, women spouses take to the labour force, particularly in the secondary or service sector where it has been traditionally their domain. Men, having more time available, try to make use of this surplus time by expanding into some selected areas of household domestic

TABLE 3

DIVISION OF LABOUR IN HOUSEHOLD PRODUCTION

IN PERCENTAGE TERMS

	HOUSEHOLD TASKS								
Household Member	Cooking	After Meal Clean Up	Cleaning	Laundry	Paper Work	Shopping	Outdoors	Child Care	Total
Husband	28.57	44.44	31.43	25.81	53.33	35.00	66.67	55.55	41.12
Wife	52.38	44.44	62.86	64.52	46.67	60.00	25.92	33.33	53.30
Other Household Member	19.05	11.11	5.71	9.68	0.00	5.00	7.41	11.11	5.58
TOTAL	100.00	99.99*	100.00	100.01*	100.00	100.00	100.00	99.99*	100.00

* Rounding Errors

such as child care and outdoors. Alternatively, the observed results may be a product of the lack of households having pre-school children in the sample[12] with the result that non-random differences were observed. Thus, the higher percentage of men in child-care than women may just be a function of the data used.

Tables 4 and 5, show the average rank order of pleasurability in performing the different household tasks for households with and without pre-school children respectively. The results indicate that for those households with pre-school children, child care and outdoors were ranked among the most pleasant activities while after-meal cleanup and cleaning the least pleasant activities. For those households without pre-school children, household tasks such as outdoors and cooking were considered among the most pleasant activities while after-meal cleanup, the least pleasant.

The degree to which households find household tasks pleasant or unpleasant depends on whether they consider the respective household chores as work or hobby. In Table 6, this taste variation in performing household tasks by all households is presented. For example, in the category called cleaning, 76% of the households sampled found these activities to be work, while 17% considered them as neither work nor hobby and only 6% of the households reported cleaning activities to be a hobby. Other categories of housework that were considered more to be of work than hobby, include: Maintenance and Repairs (83%), Painting (61%) and Chopping Fire-place Wood (65%). Gardening and sewing were considered more to be of hobby

activities than work with 46% and 79% of the households sampled respectively. The remaining household tasks were indeterminate as far as taste was concerned in that a high proportion of the households in the sample considered them as neither work nor hobby. While a few of the results given in Table 6 may appear to be inconsistent with those of Tables 4 and 5--cooking was ranked fairly high on the pleasurability scale while 53% of the sampled households considered cooking as work, for example--it is to be noted that one involved an order of ranking among the different tasks while the other was an evaluation of the task taken by itself. Moreover, different tasks were used between tables. The question of whether each household considers the different household tasks given in Table 6 as hobby or work or neither hobby nor work was intended to provide a means of check for consistency of a later question concerning the household's taste in performing housework as the average. Thus, if a household reported that many of the given household tasks in Table 6 as hobby activities, then their answer to the second question should be one that indicates housework to be on the average of pleasant taste.[13] Later, using a taste dummy variable in a regression equation, we see how significant this taste variable is in explaining variation in hours of household production.

Finally, in Table 7, the mean willingness to pay for household production, households' opportunity costs and the average number of hours households currently spend on household production per week, are presented. Households' mean total willingness to pay for

TABLE 4

RANK ORDER OF HOUSEHOLD TASKS
BY PLEASURABILITY FOR HOUSEHOLDS WITH
PRE-SCHOOL CHILDREN

1	2	3	4	5	6	7	8
Child Care	Outdoors	Cooking	Shopping	Laundry	Accounts	After Meal Clean Up	Cleaning

TABLE 5

RANK ORDER OF HOUSEHOLD TASKS

BY PLEASURABILITY FOR HOUSEHOLDS

WITHOUT PRE-SCHOOL CHILDREN

1	2	3	4	5	6	7
Outdoors	Cooking	Shopping	Cleaning	Accounts	Laundry	After Meal Clean Up

TABLE 6

CLASSIFICATION OF HOUSEHOLD TASKS BY WORK

OR HOBBY IN PERCENTAGE TERMS

	HOUSEHOLD TASK										
Taste	Gard-ening	Sewing etc.	Chopping Fire Wood	Cooking	Washing Car	Painting	Child Care	Chauffering	Shopping	Cleaning	Maint. Repairs
Work	28	12	65	53	57	61	37	49	42	76	83
Neither Work Nor Hobby	25	8	16	29	24	20	34	24	32	17	10
Hobby	46	79	18	19	19	19	29	27	25	6	7

TABLE 7

MEAN WILLINGNESS TO PAY FOR HOUSEHOLD PRODUCTION, OPPORTUNITY COSTS AND AVERAGE NUMBER OF HOURS IN HOUSEHOLD PRODUCTION

	Per Week	Per Hour
Average Number of Hours	23.88	
Mean Total Willingness to Pay (Total Value)	$117.31	$4.91
Mean Net Willingness to Pay (Net Value)	$101.10	$4.23
Mean Total Opportunity Cost	$16.21	$0.68
Mean Opportunity Cost at the Margin		$2.22

household production was computed by taking the average of the areas under each household's marginal benefit--marginal willingness to pay--function. The plot of the marginal benefit function was obtained from the household's responses or final bids to the contingent bidding process described earlier. In order to simplify otherwise tedious manual calculations and because log linear functions yielded insignificant result differences, a straight linear regression was used and the integral of the function from zero to current hours in household production taken. The area under this marginal benefit or demand function then indicates the total value which a given household attributes to household production. The average of all these areas representing household's total value is $117.31 per week. Given the weekly average number of hours of household work that these households reported, this is equivalent to an average value of about $4.91 per hour.

A similar computation is made to obtain the households' mean total opportunity costs in household production. By taking the average of the areas under each household's marginal cost function, the mean total opportunity cost is $16.21 per week or $0.68 per hour. However, the mean opportunity cost of the last hour in household production is about $2.22.

Finally, subtracting households' mean total opportunity cost from their mean total willingness to pay for household production yields a mean net willingness to pay of $101.10 per week or $4.23 per hour. In other words, households on the average, place a net value equal to $101.10 per week on household production. This measures

the amount of welfare enjoyed by households from having household production.

Hypothesis Testing

Some further insights into household production evidenced by the respondents might be gained with the use of regression analysis that statistically test possible links between differences in the reported number of hours devoted to household tasks, their willingness to pay and the various factors that may be associated with these variations. The decision about whether or not variables should be included in any regression model should still depend largely on a priori theoretical considerations. Since, in any given demand relationship, the quantity demanded of, say, Good X is a function of its own price, the prices of other goods, consumers' income and tastes, so is the quantity demanded for hours of household production a function of its own price as measured by the opportunity cost incurred by the household at the margin of provision, the prices of substitutes in the form of market replacements, households' income and households' tastes in performing housework, plus all other demand shift variables which one might think would have an effect on hours worked (eg. size of household, type of dwelling, number of pre-school children and number of labour saving appliances). A more difficult hypothesis to be tested using the same data is one involving households' willingness to pay for household production as the dependent variable. The difficulty arises mainly because of a lack of specific a priori theoretical determination of independent variables. Apart from the

fact that the willingness to pay for a good or service depends on the potential utility to be gained from consuming the good or service which is said to be reflected in consumers' demand function, a less satisfying ad-hoc approach may be required in specifying the variables to be included in the willingness to pay regression model. Nevertheless, in specifying the willingness to pay regression model, the hypothesis to be tested is that households' willingness to pay is a function of the demand variables and hours of household production.

Generally, one would expect the number of hours worked at home to be negatively related to the households' opportunity cost at the margin so that a rise in marginal opportunity cost will have depressing effects on the number of hours worked. In the model of household production presented earlier, this is seen as a pivoting of the marginal cost function to the left. The effect of household income on household production is indeterminate since household produced goods and services can be normal or inferior. Thus, if household production is normal, then we would expect that as income rises, the quantity demanded of household production would also rise. But, if household production is inferior, then the reverse occurs such that, as income rises, the quantity demanded of household production falls. Prices of other goods and services are expected to influence household production, for example, prices of substitute goods and services are expected to react directly to household production; but because this is a cross-sectional study such that there is no variation across the sample--every household faces the same prices of these other

goods and services--this variable was omitted from the study.[14] As far as tastes are concerned, we would expect the demand for household production to vary directly with preferences. With regards to size of household and the number of pre-school children present, we would expect household production to vary directly with these variables--'more people more work' and the fact that small children require more attention. Similarly, the type of dwelling (apartment or house) is expected to have a positive influence on household production in that a larger physical space generally requires more household production. And finally, the effect of the number of household labour saving appliances on household production is indeterminate. It may be that most people would presume that the introduction of labour saving appliances to a household would reduce the total time spent in household production, but this is only true if one assumes a fixed amount of housework to be done. However, based on the model of household production presented in Chapter 3, it will be the case that since labour saving appliances increase the amount of work that can be done per unit of time, the intercept of the households' marginal benefit function will shift outward, indicating higher marginal benefits for the first unit of time in household production. But the marginal benefit curve will also become steeper. As more housework is being done per hour, the marginal benefit of additional hours will tend to decline more quickly. The overall effect may therefore be either an increase or a decrease in the total number of hours performed. The possibility of observing an overall increase is strengthened if the

introduction of labour saving appliances increases the quality of housework as well as increasing the amount that can be accomplished in a given time.[15]

Since households' willingness to pay for household production is derived from their demand functions, it can be expected that similar relationships between willingness to pay and these variables would also hold.

The appropriate functional form for estimating a willingness to pay equation is still an unsettled issue. Previous empirical efforts[16] have, for the most part, used a semi-log model specification since the model is consistent with the assumption that the effect of a change in the explanatory variables depends on the level of these variables. Thus, the semi-log form permits the marginal effects of the explanatory variables to change as their level changes, a result that appeals to common intuition. For example, if the explanatory variable considered is one of size of household, then the larger is the size of the household, the smaller is the marginal effect of changes in the size of the household. Moreover, because some of the explanatory variables considered here have zero values, the log linear form cannot be used. Although a linear function was also estimated, the semi-log form performed consistently better and was therefore chosen as the basis for this study's findings. The general specification of the semi-log model is:

$\ln Y = \gamma_0 + \gamma_1 X_1 + \gamma_2 X_2 + \ldots \gamma_n X_n + \ln E$ where E is the error term that is assumed to be lognormally distributed.

Three semi-log equations were estimated using the OLS method. The first two equations take the form:

$$(1)\quad LNHP = \gamma_0 + \gamma_1 PR + \gamma_2 INC1 + \gamma_3 INC2 + \gamma_4 TA1 + \gamma_5 TA2 + \gamma_6 SZ + \gamma_7 PC + \gamma_8 SA + \gamma_9 DW + \varepsilon$$

$$(2)\quad LNTV = \alpha_0 + \alpha_1 PR + \alpha_2 INC1 + \alpha_3 INC2 + \alpha_4 TA1 + \alpha_5 TA2 + \alpha_6 SZ + \alpha_7 PC + \alpha_8 SA + \alpha_9 DW + V$$

and the third equation estimated,

$$(3)\quad LNTV = \beta_0 + \beta_1 HP + \mu$$

where LNHP = log (Household Production, defined as the number of hours households spent on performing housework per week).

LNTV = log (Total Willingness to Pay for household production per week).

PR = Opportunity Cost incurred in performing household production at the margin.

INC1 = 1, if household income is between \$20,000 to \$40,000 inclusive

or = 0, if other income

INC2 = 1, if household income is greater than \$40,000

or = 0, if other income

TA1 = 1, if household finds performing household tasks on the average to be very pleasant

or = 0, if otherwise

TA2 = 1, if household finds performing household tasks on the average to be neither pleasant nor unpleasant

or = 0, if otherwise.

SZ = size of household as measured by the number of household members.

PC = number of pre-school children

SA = number of household labour saving appliances

DW = 1, if type of dwelling is a house or townhouse

or = 0, if type of dwelling is an apartment.

ε, V, μ = random error component assumed lognormally distributed.

Initially a variable for children under 12 years of age (CH) was included in the model specification but because of the high multicollinearity effects between SZ and CH, and PC and CH, the CH variable was dropped.[17]

The OLS estimates of the three equations were (with t-statistics in the parenthesis):

(1) LNHP = 1.80 - 0.03PR - 0.03INC1 - 0.30INC2 + 0.73TA1 + 0.44TA2
(4.91) (-0.91) (-0.21) (-1.61) (3.53) (2.24)

+ 0.11SZ + 0.05PC + 0.15SA + 0.49DW
(2.29) (0.30) (2.09) (0.23)

$\bar{R}^2 = 0.206$

(2) LNTV = 2.99 - 0.10INC1 - 0.23INC2 + 0.77TA1 + 0.54TA2
(8.72) (-0.67) (-1.22) (3.65) (2.72)

+ 0.16SZ + 0.04PC + 0.16SA + 0.16DW
(3.24) (0.34) (2.03) (0.74)

$\bar{R}^2 = 0.286$

(3) LNTV = 3.79 + 0.03HP
(28.23) (9.46)

$\bar{R}^2 = 0.600$

These regression results largely confirm a priori expectations, despite the insignificance of four of the coefficients.[18] Consider Equation (1). The income variables are largely insignificant in explaining variations in hours of household production. The insignificance of the income variables were further tested as a group using an F-test, the result of which showed that there is no difference in different levels of income on quantity demanded of household production. This was confirmed at either the 1 or the 5 percent level.[19] Since we cannot reject the will hypothesis that the income coefficients are not significant from zero, we can conclude that the income elasticities must be close or if not, equal to zero.[20] What this means is that, percentage changes in household income do not affect the quantity demanded of household production. Although the income coefficients display negative signs suggesting that household production varies indirectly with income, care must be taken in their interpretation since the income coefficients are not significant from zero. If it were the case that the income variables were significant, then the negative signs of the income coefficients would imply that household production is inferior. This is, however, not to say that household production does not contribute to the welfare of the household. The inferiority only arises because of a particular sort of substitution relationship between goods. It might be that households, on receiving higher

incomes, are now able to afford some other goods previously unattainable. An example would be one in which a household, on receiving a higher income, is now able to afford dining in expensive restaurants, or in general, eating out more often.

Looking at the taste variables next, we see that they are both significant in explaining variations in hours of household production. The results indicate that for households who enjoy performing household tasks on the average adds 0.73 percent more to hours demanded of household production than for those households who dislike performing household tasks.[21] For those households who find household tasks on the average to be neither pleasant nor unpleasant, this was 0.44 percent over those households who dislike performing household chores. The will hypothesis of identical household production demands by households indicating a positive preference for household production and those households indicating neither a positive nor a negative preference was rejected using an F-test at the 5 percent level of significance.[22]

Two other variables were also significant in explaining variations in quantity demanded of household production--the size of the household (SZ) and the number of labour saving appliances (SA). An additional member to a household on the average adds 0.11 percent to the total hours of housework performed while an additional household appliance on the average increases the hours demanded of household production by about 0.15 percent.

The remainder of the variables: PR, DW and PC display

statistically insignificant coefficient values but have the anticipated signs. In other words, households' opportunity cost at the margin, the type of dwelling (whether it be a house, townhouse or apartment) and the number of pre-school children have no significant impacts on hours of household production. That the opportunity cost at the margin is insignificant in explaining variations in hours of household production can be explained if the households' marginal benefit function is steeply sloped over the last few hours in household production, so that changes in marginal opportunity cost over that range do not produce significant changes in quantity demanded of household production.[23] Finally, the insignificance of the pre-school children variable may again be a function of the data used.[24]

The same variables which are significant in explaining variations in hours of household production also appeared significant in the total willingness to pay equation (Eq. 2). All the variables in the LNTV equation also have the same signs as those in the LNHP equation. The results indicate that household income is not significant in explaining households' willingness to pay for household production. Even when both income dummy coefficients were tested as a group using an F-test at either the 1 or the 5 percent level failed to make it significant in explaining willingness to pay.[25] The size of households continued to be significant with an additional member to present levels on the average raising households' total willingness to pay by about 0.16 percent. The results also indicate that for those households which enjoy household production, they are willing to pay on the

average 0.77 percent more than those households which dislike household production. Presumably the former reaps higher total benefits from household production than those of the latter. (The marginal benefit or demand function of the former lies above and to the right of the latter's). To avoid repetitions, the coefficients of the remaining variables are similarly interpreted.

Finally, because of the high multicollinearity between hours of household production (HP) and the other independent variables in Equation (2), a separate regression (Equation 3) was run between households' total willingness to pay and hours of household production. The results indicate that hours of household production is statistically significant in explaining variations in willingness to pay. Thus, an additional hour of household production on the average, adds 0.03 percent to households' total willingness to pay.

The adjusted multiple correlation coefficient of determination or $\bar{R}^2$, which indicate the percentage of variation explained by the regression equation is quite high for all three equations, considering this is a cross-sectional study. By means of an overall F-test, the null hypothesis that the multiple correlation coefficient of determination is not significantly different from zero, can be rejected at the 5 percent level of significance for all three equations.[26]

Tests for an overall multicollinearity were made in both Equations (1) and (2) using conventional methods. First, following Lawrence Klein, a check was made to see whether the simple correlation coefficient between two suspected variables (eg. INC1, INC2 and SA;

SZ and PC; DW and INC1, INC2) is larger than the correlation of either or both variables with the dependent variable. Having satisfied that there were none, a second check for multicollinearity was made using the Farrar-Glauber Test where the technique essentially involves a comparison of the computed observed Chi-Square value from the sample and the critical Chi-Square statistic at the 5 percent level with 1/2K(K-1) degrees of freedom, where K is the number of explanatory variables. The Farrar-Glauber Test showed that there was no serious multicollinearity problem in both functions.[27]

1.3 Some Implications and Limitations

In the present study, the contingent evaluation approach was used to estimate the value of household production as recorded by the participant households themselves. The results indicate that an average households' total willingness to pay--total value--for household production is $117.31 per week. This value measures how much the household would be prepared to give up--to pay--if necessary to obtain a weekly supply of household production. However, since households only pay an amount equal to their total opportunity cost in current levels of production, they are said to gain from having household production. This gain--total willingness to pay less total opportunity cost--measures the amount of welfare the household receives from household production. On the basis of the present survey, this measure of economic welfare amounts to $101.10 per week or an average net value of $4.23 per hour.

The average values placed on household production may or may

not be indicative of the values that would result from a more extensive and more representative sample, but aside from the small size of the sample, there seems little to indicate that a larger sample would result in much different values. Although no specific tests were made for biases--efforts that would require very sophisticated statistical techniques and not the primary focus of this thesis--arising from the use of contingent bidding methods, considerable care was taken in the design and conduct of the survey so as to ensure that the results obtained are as reliable as possible. The efforts included a number of trial tests in which problems relating to ambiguities in some questions and misinterpretations were detected and corrected before the final survey was launched. Interviewer bias was kept to a minimum with interviewers following a strict common questioning format and regular cross-checks between interviewers were made to determine problems so as to allow for common solutions. Furthermore, great efforts were taken to make sure that the hypothetical situations posed were as realistic as possible to the respondents; these efforts include careful explanations of the contingencies posed to respondents and allowing the interviewees to take their time in answering the questions asked. To the extent that these and other biases were minimized, the contingent evaluation technique applied to value household production would appear to have yielded the relevant estimates.

The limitations of the sample--the rather small size in the number of participants--do not allow wide generalizations of the

findings especially with respect to the relationships, or the lack of relationships, between the hours of household production, the evaluations of household production and the various factors that may be associated with their variations. The four variables that have continually surfaced as significant in explaining variations in time spent on household production and households' willingness to pay are: tastes or preferences, size of households and the amount of time spent as related to total willingness to pay. Although other studies (Walker and Ganger, 1971; Gronau, 1976) have indicated the importance of the pre-school children variable in determining household production time and value, the lack of variations of this variable in the sample clearly limits any generalized conclusions. The results are, for the most part to be seen as largely illustrative of possible impacts and a means for further investigation.

1.4 Value and Time Comparisons with Other Studies

Attempts to measure the amount and economic value of time devoted to household production are not new and many originated from the United States.[28] The only extensive study on household production done in Canada was that of Hawrylyshyn's 1971. But whether the studies are Canadian or United States, they exhibit two things in common: the use of replacement cost as the method of valuing household production and, the assertion that the values derived have multi-purpose applications. Of the latter, it has already been shown that the correct measurement of the values depend critically on the purpose of valuation such that it is incorrect to assert a

single method of valuation for all purposes.[29] The use of replacement cost as the method of valuing household production for welfare and compensation purposes has also been shown theorywise to likely lead to an overestimation.[30] The possibility of such an overestimation is further strengthened by the observation of the infrequent hiring or market domestic substitutes in households, either because households regard the value from having these services performed to be less than the hiring cost they would have to incur including search and transaction costs or, the services performed by market substitutes are taken not to be comparable--quality wise--to self-performed household services. Also, for many households, the cost in terms of opportunity costs in self-performing these services is less than the cost they would have to pay in hiring replacements. The results of these past studies (summarized in Table 8) are thus evident in consistently showing large numbers.

In order to compare the results of the present study with those of the other studies, adjustments were required to convert past dollars into current (1983) dollars. Moreover, because some of these studies are United States studies, the Consumer Price Indexes for Canada could not be used and separate adjustments were made by using the Consumer Price Indexes for the United States. Also, an adjustment was made to the United States studies to take into account of the currency exchange rate between Canada and the United States. The adjustments and calculation procedure are given in Appendix C.

In terms of value comparisons, the average of about $4.23 per hour of this study, is far below those estimates that have been

TABLE 8

SUMMARY TABLE OF PAST AND RECENT STUDIES ON HOUSEHOLD PRODUCTION*

Author(s)	Method Used	Hours/Week	Average Hourly Value ($)	Average Annual Value ($)
Oli Hawrylyshyn (1971)	Replacement Cost	47-63	5.06 - 6.78	16602
Walker and Gauger+ (1971)	Replacement Cost	69.3[a.] 24.5[b.]	6.64	23940.31
Chase-Manhatten+ (1972)	Replacement Cost	99.6	7.57	39200.80
Evelyn Kage+ (1982)	Opportunity Cost	206	4.19	44812.41
Michael Minton+ (1978)	Replacement Cost	257.4	7.17	95996.92
Ontario Status of Women Council (1977)	Replacement Cost	100	3.53	18356
Monique Proulx (1978)	Replacement Cost	49	6.04	15394.70
Quah and Knetsch (1978)	Indirect Method of Willingness to Pay	27.25	1.51	2137.71
Present Study (1983)	Contingent Bidding Method of Willingness to Pay	23.88	4.23	5252.64

* In 1983 Canadian Dollars
\+ United States Studies

a. Non-employed wife households
b. Employed Wife Households

generated by the replacement cost method. Indeed, in the Chase-Manhattan Bank studies, the average per hour value of household production was reported to be $7.57, a difference as large as $3.34. The disparity in value measurements is even more marked when one considers the annual value figures. The Chase-Manhattan study reported an average annual value of about $39,200.80, while the study by Michael Minton, the average was asserted to be $95,996.92 per year, the difference with current results being nearly $34,000 and $91,000 respectively!

A major part of the reason for such high numbers, particularly for those estimates of the Chase-Manhattan study and Michael Minton's can be found by examining the range of wages used as replacement costs. Instead of using the average wage rates as values for the various estimation of each household function, particularly high and wages usually earned by specialists were used. For example, in activities relating to cooking and dietary functions performed by the housewife, a wage-rate of nearly $17.00 per hour was used as the equivalent market replacement cost!

The 1982 study by Quah and Knetsch was the first attempt to directly obtain estimates on the households' total willingness to pay for household production. For the first time in household production research on valuation, the traditional methods of replacement cost and opportunity cost were discarded and a contingent evaluation of the indirect type was introduced. In their study, the respondents were presented with various prices charged by a substitute worker and they were asked the number of hours their household would contract for at each of

those prices. Unfortunately, there is a methodological error in using such a contingent question--the question in effect only allowed households to compare the hiring cost to their own opportunity costs in household production with no measurement on benefits at all. Moreover, the contingent question postulated had also measured the value of some additional hours that were currently not performed by households--the marginal benefit of those hours is less than the marginal cost--but would have been performed if the price of the substitute worker has fallen to such comparable levels as the households' marginal benefit of those hours. The low estimate of $1.51 per hour is thus a measurement of the value of market domestic servants and not the households' value of their own household production.

Attempts to assess the amount of household services performed by households have largely relied on respondents' recall of time devoted to such purposes. A typical survey poses questions to a member of the household asking for an estimate of the average number of hours that the person thinks are spent either on individual tasks such as meal preparation, cleaning, laundry and other household chores, or on the total time devoted to all such chores on a daily or weekly basis. The average of about 23.88 hours spent on household production by households per week reported in the present study followed such a method. Admittedly, a major weakness of the method is that people may not have any accurate awareness of the amount of time allocated to household production activities. The estimation is made even more difficult by the fact that while a disproportionate amount of the household chores

may be performed by one person, some such work is usually done by nearly all household members. As mentioned earlier in Chapter 2, there are also other problems such as the definition given to housework and the joint-production problem.

Since the present study has given a precise definition to household production and resolved the joint-production problem by adopting time estimates only for the major task performed, much of the ambiguities were hopefully reduced.[31] Moreover, the estimate of about 23.88 hours is supported by a time-budget study--estimates based on an actual allocation of time--of that of Quah and Knetsch where the authors reported an average of about 27.25 hours of household production a week. The rather large disparity in time estimates between the present study and those of the other studies shown in Table 8, is largely the result of the joint-production problem in that the other studies made no distinction between major and minor tasks for simultaneous activities and the accounting of time was simply doubled for two activities performed at the same time. Thus, it is quite possible for households to report more than 168 hours spent on household production per week such as those reported by the studies of Evelyn Kage and Michael Minton.

Because of the rather involved nature and difficulty in obtaining respondents' cooperation, very occasionally will time-budget studies be done. Only two studies in Table 8 were reports on time use based on time-budget studies--the study by Walker and Gauger and, that of Quah and Knetsch. The rather large disparity in time estimates of the two time-budget studies can be explained by the fact that the

estimates of the former came from non-employed wife households, while the latter's sample consisted mainly of employed wife households. If employed wife households were taken in comparison, the disparity almost disappears since Walker and Gauger reported that only 24.50 houses were performed in an average week.[32]

Given the increasing importance being attached to estimates of the quantity and economic value of time devoted to household production in policy formation and litigation, there would appear to be considerable point to appraisals that would yield more accurate and appropriate evaluations. The widely used replacement cost approach for issues involving welfare and compensation, seem to be both unreliable and consistently biased in the direction of larger numbers--a factor which may not have diminished their appeal. The present modest exploratory study has attempted to demonstrate methods that might lead to some improvement in these measures. While illustrative, the small and restricted sample limits the general representativeness of the specific estimates. They seem not to be without interest, however. If the values obtained by this application of the contingent evaluation method are even roughly correct, to an order of magnitudes, they are suggestive of the extensive bias inherent in other procedures.

Footnotes: Chapter 6

1. In his analysis of the demand for outdoor recreation, Robert K. Davis applied the Contingent Bidding technique. See Davis, 1963.
2. In a classic 1934 study from social psychology, La Piere wrote to 251 restaurants, cafes, hotels and tourist homes asking the hypothetical question: "Will you accept members of the Chinese race as guests in your establishment?" Of the 128 that replied, 91% said no, 9% said they were uncertain or that it depended on the circumstances, and only one establishment said yes. However before mailing his letters, all 251 establishments had been visited by a Chinese guest and at only one was service denied. In other words, La Piere's study tells us that what people say in given hypothetical situations may substantially diverge from what people actually do in real situations. See R.T. La Piere, 1934. However successful prediction of many election results based on hypothetical answers would serve as a counter example.
3. Rowe et al., 1980.
4. Such experiments involving hypothetical and real cash transactions have been attempted but the results were not conclusive. In the study by Bishop and Heberlein (1980) on goose hunting permits, the simulated market with actual cash transactions, resulted in $63 as being roughly the average willingness to pay of goose hunters for

early season permits, but the hypothetical market yielded only $21. Thus, it was argued that the hypothetical bias present, has resulted in values that substantially underestimate the true value of willingness to pay. On the other hand, a study--The South Coast Air Basin Experiment--reported in Brookshire and Crocker (1981) revealed, that, for an approximate 30% improvement in air quality in the Basin, the property value study registered an average dollar bid per household per month to be $42, while the hypothetical valuation study yielded a mean bid of $29 per household per month. In other words, the results indicate that air quality deterioration in the South Coast Air Basin has had significant negative impacts on property values (housing prices) and that these negative price effects are comparable in magnitude (at least being not too far off) to what people say they are willing to pay for improved air quality.

5. The original number of households which agreed to participate in the survey was 70 but, because 7 of the households were unavailable in the follow-up interviews (perhaps they had left for their summer vacation by then), only 63 households were used as the sample. However, 3 of the remaining 63 households have registered inconsistent answers, perhaps a problem of understanding and these households were subsequently dropped from the sample so that a final sample size of 60 households was used.

6. The inconsistent answers were such that when the household was asked how many hours of housework that they would contract from a replacement at a given price, given the option that the household

can of course choose not to hire any hours from the replacement and performs these services themselves, their answer was observed to be some positive amount (Question 15) but, when asked how many hours of housework that they would contract from the same replacement at the same price if they cannot for some reason perform these hours themselves (Question 16), their answers were zero hours!

7. Kathryn Walker and Margaret Woods, 1976.
8. These other categories include: school work, volunteer work, all family and social activities.
9. Although actual time estimates were recorded by households with various child-age groups.
10. Euston Quah and Jack L. Knetsch, 1982.
11. Removing outdoor activities since apartment dwellers generally do not undertake gardening activities.
12. Only 11 households in the sample reported having pre-school children.
13. Only 2 households registered inconsistent answers.
14. Moreover, only 5 households reported as having engaged baby-sitters, gardeners or cleaning maids.
15. Alternatively, labour saving appliances are said to reduce the cost per unit of household output produced. This exogeneous reduction in cost would shift the households' marginal cost function to the right and with a given marginal benefit function, the result is increased household production. What this means intuitively is that, households with more labour saving appliances will substitute home production for market goods and services, this arising out of

the change in relative prices between household production and market production. Household production is said in this sense to be relatively 'cheaper' than market production.

16. See Kenneth McConnell, 1977; Menz and Mullen, 1981.

17. The correlation coefficient between SZ and CH was about 0.58 while for CH and PC was about 0.64.

18. Following Wonacott and Wonnacott, the variables which carry the expected sign, but which are not statistically significant should nonetheless be retained in the analysis because the relationship between these variables and the dependent variable have not been disproven. See Wanacott and Wannacott, 1970.

19. The F observed value is 1.991 while the critical F values are 7.195 and 4.04 at the 1 percent and 5 percent levels of significance respectively.

20. Income elasticity is defined as: $\frac{\partial LNHP}{\partial INC} \cdot \frac{\overline{INC}}{\overline{LNHP}}$, but since

$\frac{\partial LNHP}{\partial INC}$ is not significant from 0, then $0 \cdot \frac{\overline{INC}}{\overline{LNHP}} = 0$

21. The model specified can be written as:

$$\ln HP = \alpha_0 + \alpha_1 T$$

Differentiating totally,

$$\frac{1}{HP} \cdot dHP = \alpha_1 dT$$

$$\frac{dHP}{HP} = \alpha_1 dT$$

Since $\frac{dHP}{HP}$ represents proportionate changes in HP, then when dT = 1, HP changes by $\frac{dHP}{HP} = \alpha_1$. In percentage terms this is $\alpha_1\%$.

22. The test for the equality of coefficients of the two taste variables showed the F observed value as 4.515 while the critical F value was 4.04.

23. A cursory examination of the households' marginal benefit function confirms that over two thirds of the households in the sample have rather steep marginal benefit functions over the last few hours worked.

24. A check was made to see if there were collinearity problems between PC and SZ. The simple correlation coefficient between these two variables was only 0.21, suggesting that high collinearity was probably absent.

25. The F observed value in this joint test is 0.470 while the critical F values are 7.195 and 4.04 at the 1 percent and 5 percent levels of significance respectively.

26. In Equation (1), the F observed value is 2.701, the F critical value is 2.08. In Equation (2), the F observed value is 3.959, the F critical value is 2.14 and in Equation (3), the F observed value is 89.543 while the F critical value is 4.00.

27. In Equation (1), the χ^2 observed value is 9.1304 while the χ^2 critical value is 49.77. In Equation (2), the χ^2 observed value is 3.3704 while the χ^2 critical value is 43.77. Since in both equations the χ^2 observed values are less than the χ^2 critical

values, we accept the null hypothesis such that there is no multi-collinearity problems in the regression equation.

28. The earliest United States Study was that of Wesley Mitchell in 1919 (see Hawrylyshyn, 1971). In this section, I discuss only the studies that have been done after 1970.

29. See Chapter 2.

30. See Chapter 5.

31. See Chapter 2.

32. The housewife's daily time spent on household production on the average was reported to be 3½ hours. In one week, this is (3.5 x 7) or 24.50 hours. See Walker and Gauger, 1971; also reproduced in a shorter version entitled, "Time and its Dollar Value in Household Work", Family Economics Review, Fall 1973, pp. 8-13.

CHAPTER 7

Some Concluding Comments

The family has long been considered to be an economic institution and economics has recognized the increase in household welfare made possible by the pooling of home production and division of labour associated with family life. Household work has economic value. What has been less clear however, is the extent of the production and the measurement of this value. Current methods of estimating the value which households place on time used to produce household services seem to require unrealistic assumptions and yield seriously biased estimates.[1] Even more ambiguous is the purpose of valuation. Matrimonial disputes involving opportunities foregone involve different measures as do attempts to value housework for national income accounting purposes and tort litigations. The opportunity cost approach for example, is totally inappropriate for the measure of household welfare and for the many issues involving tort compensation.

An alternative approach using contingent evaluation to determine the values which individual households place on this time and therefore of the benefits produced, may lead to more realistic and useful measures. The appropriate measure of economic welfare from household production is one given by the household's total net benefits--net value--from current provisions. It has been established that this measure corresponds to the relevant area of the household's demand curve for household production above its marginal cost curve (or

supply curve), although subject to errors due to income effects over the range at issue. This area, also known as the economic surplus (producer plus consumer surplus) enjoyed by the households can be obtained by survey questionnaires of the contingent bidding approach.

While the empirical findings are suggestive rather than conclusive, especially in view of the small and restricted sample size, they seem not to be however without interest. If the values obtained by this application of the contingent evaluation method are even roughly correct, to an order of some magnitude, they are suggestive of the extensive bias inherent in other procedures.

One obvious use in deriving such estimates is that they not only establish an indication of the state of well-being of the household from having household production, but also these estimates aid in determining the appropriate compensation for losses in family household production due to tort induced injuries or death of a household member engaged in such production. The loss of household production say amounting to 5 hours a week would require a weekly compensation of about ($4.23 X 5) or $21.15 to maintain pre-tort household welfare, where $4.23 is the derived per hour dollar measure of the economic welfare received by the family before the accident. Strictly speaking, in theory, the correct amount of compensation for such cases involving welfare loss should be given by the amount lost in total net value by individual households. But for practical purposes, households' total net value on the average would suffice. Just as the Courts award compensation on the basis of the average market replacement value for the

family loss of household production, so does the method advocated here on the basis of the average total net value. However, the method proposed here has a definite advantage over existing methods of estimating this loss in that the method is consistent with theoretical economic concepts of measuring welfare changes such as that of welfare loss. Moreover, the measurement conforms more to the judicial stated purpose of compensation.[2]

However, just as in any other methods, some sacrifices on measurement precision are unavoidable. But so long as we are aware of the direction of bias in the method proposed, then some appropriate adjustments can be made to provide more accurate assessments. One possible bias associated with the proposed method has to do with the declining net benefits or net value from household production. Because of the declining marginal benefit function and/or the increasing marginal opportunity cost, the net value--calculated from the difference between the areas under the marginal benefit--and above the marginal cost functions--falls with additional hours of household production. This is to say that for the first few hours of household production, the households' net gain is very high while as more hours are spent in household production, the incremental net gain becomes smaller and at the margin of provision where the marginal benefit of the additional hour equals the marginal cost, net gain is zero. What this implies is that, particularly for those households with minor losses in hours of household production from tort injuries, the use of the average total net value per hour will overestimate the true welfare loss. This is because,

when forced to reduce the total number of hours spent in household production, the household will first give up those tasks that are considered of marginal value. Of course, this possibility of bias is more applicable to tort litigations involving substantially small losses in hours of household production. Courts can therefore make adjustments--perhaps by reducing the size of the award--when such cases arise.

The estimate of economic welfare equal to $4.23 per hour of household production may seem low, but it is likely that the less restrictive assumptions of the more direct questionnaire approach will result in estimates that may be considerably smaller than those yielded by the current methods. Also, the possibility of large income effects biasing the results is ruled out since the income elasticities are shown to be close, if not, equal to zero.[4] Much of what is commonly done in the way of household tasks may be of little real utility to the household and there is consequently little willingness to sacrifice other things to retain their continued provision. For some households however, the opportunity costs of devoting more time to household production are high and if assuming equal total benefits for two households of comparable size but one incurs a higher total opportunity cost than the other, then the economic welfare derived from household production for the former household would be smaller than that of the latter.

In sum, the thesis has presented a model of household production from which the correct measure of household welfare from

household production--the net value measure--is established. Following this theoretical discussion, applications are made to tort compensation. Finally, a modest exploratory study involving 60 households was attempted to obtain the relevant estimates. While illustrative of methods that might prove useful in estimating the value of household production, the small and restricted sample, severely limits the general validity and representative of the specific estimates. The average values may well be considered low, but aside from the sample size however, there seems little to indicate that a larger sample would result in much larger values. The contingent evaluation estimates, if indicative of the true values, would suggest that many estimates of and assertions made by current methods--the replacement wages and opportunity cost approaches--may be far from the mark.

Footnotes: Chapter 7

1. A recent work by Ferber and Greene (1983), has empirically shown that using actual or potential market wages as the opportunity cost of home time appeared to provide substantially upward biased estimates.
2. The total compensation sum required should be reduced to the present cash value by using the discount formula:

$$P_0 = \frac{P_n}{(1+r)^n}$$

where P_0 is the final present value compensation sum, P_n is the amount of compensation in terms of base year values, n, the number of years and r the discount rate.

3. See Chapter 5, 1.2.
4. See Chapter 6 on empirical results.

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APPENDIX A

HOUSEHOLD ECONOMICS SURVEY

Victoria, 1983

University of Victoria
Research Identification Card

PROJECT NUMBER: 110-83

This certifies that the University of Victoria has approved the project indicated below.

PROJECT TITLE: Household Economics Survey

RESEARCHER'S NAME: Euston Quah

POSITION: Graduate Student-Dept. of Economics

PROJECT TIME PERIOD: FROM July 7, 1983
TO Dec. 31, 1983

RESEARCHER'S SIGNATURE [redacted]

APPROVED BY: [signature]

Chairman, Committee on Research Involving Human Subjects

UNIVERSITY OF VICTORIA

P.O. BOX 1700, VICTORIA, BRITISH COLUMBIA, CANADA V8W 2Y2
TELEPHONE (604) 721-7211, TELEX 049-7222

Department of Economics
(604) 721-8532

July 4, 1983

Dear Participant,

Re: The Household Economics Survey,
A Note of Appreciation

We very much appreciate your taking the time to help us in our study of what is now often called household production. These activities in the home have received little attention in the past, and we seem to know little about them in terms of how much time is devoted to different tasks; the nature and importance of each of the tasks; and how much this varies between people with and without children, for example.

This study is part of some research into such questions. In order to shed some light on this area of research, we are asking a fairly large number of households in Victoria to take part. We realize that we are asking you to take some time in filling out the questionnaire and that all we can offer you is a copy of the results of the study. Individual household records will, however, remain confidential. The usefulness of the conclusions depends, of course, on the accuracy of the records. We appreciate your returning the completed questionnaire in the enclosed envelope at your earliest possible convenience. Should you have any concerns that you might want to express or any inquiries you might have with regard to the questionnaire, please do not hesitate to call us--either 721-8540 or 477-7942.

Again, thanks for your help.

Yours sincerely,

[redacted]

Malcolm Rutherford
Assistant Professor

[redacted]

Euston Quah
Graduate Student and
Teaching Assistant

Record Number _____

UNIVERSITY OF VICTORIA

P.O. Box 1700, Victoria, B.C.

V8W 2Y2

Department of Economics

HOUSEHOLD ECONOMICS SURVEY

Participant's Name _____

Address _____

Telephone Number 1. Office _____

2. Home _____

This information is required only for follow-up purposes and will be removed, stored separately, and destroyed as soon as the final results of the survey are in.

Record Number _____

QUESTIONS

1. How many people are living in your home? _____

2. Of these people, how many are over 12 years of age? _____

3. a. Do you have any pre-school children? Please circle your answer. Yes/No

   b. If yes to part (a), how many are there? _____

4. a. Of the people living in your household, how many have outside employment? _____

   b. How many people are employed full time? _____

5. Is your home: an apartment _____

   a single house _____

   a townhouse _____

   a mobile home _____

   other _____

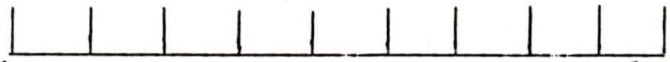
   Please check (or tick) one of the above.

6. How many cats and/or dogs does your family have as house pets? _____

.....3

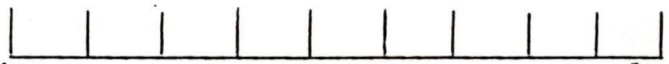
7a. Below, nine major categories of household work are listed. Please rate these activities according to the time you spend on them, on a scale of 1 (most time consuming) to 9 (least time consuming). Please put a check mark in the appropriate box. If two or more activities take up similar amounts of time, please assign them the same rank.

Cooking or meal preparation



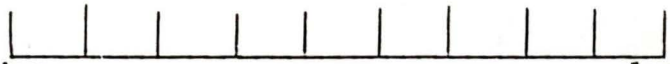
most time least time

After meal clean-up



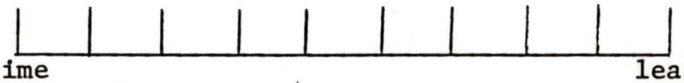
most time least time

Cleaning or regular house-care



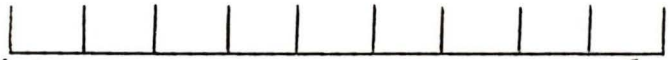
most time least time

Laundry including ironing



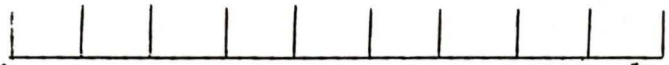
most time least time

Accounts or matters of paper work (for example, settling bills and check payments)



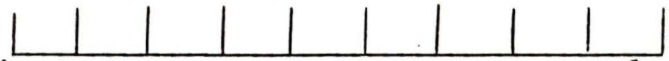
most time least time

Shopping



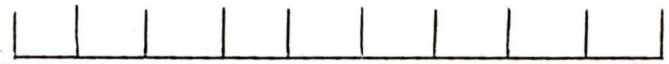
most time least time

Outdoors



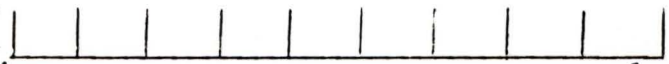
most time least time

Child caring (if any under 12 years of age)



most time least time

Other - please specify

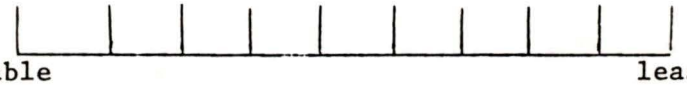


most time least time

.....4

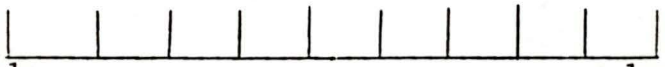
7b. Now, please rate the same household tasks along the scale provided below. This time, the rank reflects the pleasures derived from performing the activity with 1 (most pleasurable) and 9 (least pleasurable).

Cooking or meal preparation



most pleasurable least pleasurable

After meal clean-up

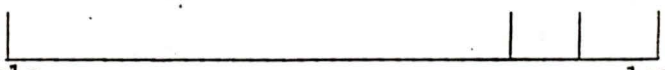


most pleasurable least pleasurable

Cleaning or regular house-care

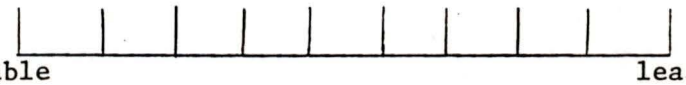
most pleasurable least pleasurable

Laundry including ironing



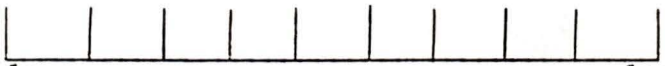
most pleasurable least pleasurable

Accounts or matters of paper work (for example, settling bills and check payments



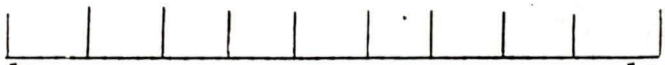
most pleasurable least pleasurable

Shopping



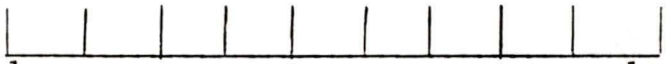
most pleasurable least pleasurable

Outdoors



most pleasurable least pleasurable

Child caring (if any under 12 years of age)



most pleasurable least pleasurable

Other - please specify

most pleasurable least pleasurable

.....5

8. (a) Does your household at present employ someone to do part of your household tasks? Yes/No Please circle your answer.

If your answer is No, then go on to part (c).

(b) If any of the following people are hired by your household, please indicate the rate of pay in dollars per hour and the number of hours hired per week.

		Check here	Dollars per Hour	Hours Hired per Week
(i)	maid	_____	_____	_____
(ii)	gardener or landscaper	_____	_____	_____
(iii)	cleaning lady or charwoman	_____	_____	_____
(iv)	chauffeur or driver	_____	_____	_____
(v)	babysitter	_____	_____	_____
(vi)	cook	_____	_____	_____
(vii)	other	_____	_____	_____

(Please specify) _____

(c) If you have pre-school children, do you send them somewhere out of the house to be taken care of (for example, nursery schools, day care centres or someone else's house)?

Yes/No Please circle your answer.

(d) If your answer is Yes to part (c), then how many hours per week do you send your child (or children) out of the house to be cared for and how much were you charged?

_____ hours per week.

_____ dollars per hour/ _____ dollars per day/ _____ dollars per wee

.....6

9. Would you regard the following activities on the average as 'work': Please indicate along the scale from Work to Hobby for each activity.

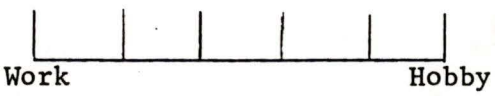
(i) Gardening

(ii) Sewing/crocheting/knitting

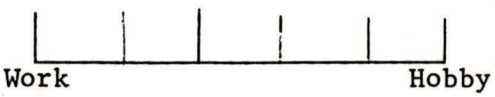
(iii) Chopping fireplace wood

(iv) Cooking

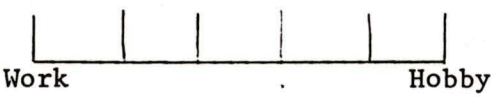
(v) Washing cars



(vi) Painting



(vii) Child-care



(viii) Chauffeuring household members

(ix) Shopping for groceries and those goods and services for the household

(x) Cleaning activities

(xi) Maintenance and repair

10. Do you find housekeeping on the average:

Very pleasant				Very unpleasant

11. (a) Do you make lunches for the employed members of your household to take to work?

Yes ____ No ____ If No, go on to part (c).

(b) If Yes to part (a), how often do you make lunches? Please check the appropriate box.

sometimes	most of the time	all the time

(c) Do you go to restaurants or fast food outlets for breakfasts, lunches and dinners? Please check one of the following:

(i) less than once a week ____

(ii) once or twice a week ____

(iii) three or four times a week ____

(iv) more than four times a week ____

(d) Do you make a significant amount of

(i) your own clothing Yes ____ No ____

(ii) your children's clothing Yes ____ No ____

(iii) other family member's clothing Yes ____ No ____

(e) Do you use laundry services for items that could be cleaned at home?

Yes ____ No ____

(f) Do you make your own preserves (for example, jams, fruits, etc.)?

Yes ____ No ____

(g) Do you go outside of the house for commercial entertainment (for example, attend theatre performances, cinemas, concerts, etc.): Please check the appropriate box.

less than once a week	once or twice a week	more than twice a week

12. What is your total household income?

Under $10,000 ____

$10,000 and above but less than $20,000 ____

Between $20,000 and $40,000 inclusive ____

Above $40,000 but less than $60,000 ____

Greater than $60,000 ____

13. Please indicate which of the following household appliances you have in your home

Microwave oven ____ Washing machine/dryer ____

Dishwasher ____ Freezer ____

Electric mixer or blender ____

.....8

14. Approximately how many hours a week does your household spend in performing housework? Please take time to reflect on this question and give an indication of the total hours spent as accurately as you possibly can.

_____ hours

15. Suppose that there is someone who is willing to perform household services for you. That is he or she will come into your house and do the housework according to your prescribed specifications (for example, making a cup of coffee according to your tastes--so many cubes or lumps of sugar or not any; cleaning the floor in some specified manner, etc.). Assume that this person does not stay in your home, that there is no loss of privacy or inconvenience to your household and that the services are offered on a weekly basis. Then, how many hours per week would you be willing to take or buy and how many hours would you still perform yourselves at each of the prices listed below (in hours):

	Amount bought (in hours)	Amount self-performed (in hours)
$14 an hour	_____	_____
$12 an hour	_____	_____
$10 an hour	_____	_____
$ 8 an hour	_____	_____
$ 6 an hour	_____	_____
$ 4 an hour	_____	_____
$ 2 an hour	_____	_____
$ 0 an hour; i.e. free	_____	_____

16. Assume that for some reason, your household cannot perform these household services for itself. This is to say that you have no choice but to hire someone to perform these household functions for you and/or substitute other purchased services; i.e. you can eat out, bring meals in, use a laundry service, stay in a service apartment, etc.

Given this situation, and assuming your total household income remains unchanged, then how many hours per week would you take or buy from the replacement at each of the following prices per hour:

Price Charged	Number of Hours I Will Buy
$20 per hour	_____
$18 per hour	_____
$16 per hour	_____
$14 per hour	_____
$12 per hour	_____
$10 per hour	_____
$ 8 per hour	_____
$ 6 per hour	_____
$ 4 per hour	_____
$ 2 per hour	_____
$ 0 per hour	_____

.....9

17. Which member of your family normally does the household chores? Please check only one:

(a) husband _____

(b) wife _____

(c) husband and wife _____

(d) other household member (age greater than 12) _____

(e) combination of husband, wife and other household member _____

18. If your answer to 17 is (c) or (d), then please specify roughly what each member normally does. You can refer to question 7 for choice of household categories.

Husband's duties _____

_____

Wife's duties _____

_____

Other household member's duties _____

_____

19. We have come to the end of the survey. Is there anything you would like to add or comment on?

_____

_____

_____

_____

APPENDIX B

TABLE OF COMPUTATION PROCEDURES

Table 1

Ranking of Household Tasts by Time for Household with Pre-School Children.

The Procedure consists of the following steps:

Step 1

Question 7(a) lists nine major categories of household work. Respondents were asked to check one of nine boxes for each category ranging in numerical value from 9 for most time to 1 for least time. On a tally sheet, nine columns were used (one for each category) and the respondents' score was placed in each column.

Step 2

The frequency of each numerical value was tallied for each category. For example, cooking received the following tally:
fifteen households gave 9s; nine gave 8s; nine gave 7s; nine gave 6s; four gave 5s; seven gave 4s; four gave 3s, two gave 2s and no households gave 1s.

Step 3

Each numerical value was multiplied by its category. For example, cooking received a score of 388. This procedure was repeated for all nine categories. The categories were then ranked by their respective sums.

Table 2

Ranking of Household Tasks by Time for Households without Pre-school Children.

The same procedure was followed as in Table 1 but only for those households without pre-school children.

Table 3

Division of Labour in Household Production in Percentage Terms.

The procedure consists of the following steps:

Step 1

Question 18 of the survey asked respondents to specify roughly what each member of the household normally performs with respect to household tasks. The respondent was also told that he or she could refer to Question 7 for the choice of household categories. Each task listed was then placed into one of eight categories of household tasks. When a respondent listed 'general household tasks' instead of specific tasks, each task was considered as being performed (except child care for childless households).

Step 2

After the tasks were placed into the respective categories, the frequency of each category for each household member was recorded. For example, the category cooking, had a frequency of 12 under husband's

duties, 22 under wife's, and 8 under other household member. The frequency for all three household members was 42 (12 + 22 + 8). The procedure was repeated for all eight household categories.

Step 3

The frequencies were then converted into percentage terms by dividing the frequency of each category total for each household member by the total of that category. For example, for cooking: 12 ÷ 42 = 28.57%; 22 ÷ 42 = 53.38% and, 8 ÷ 42 = 19.05%. Thus, the husband performs 28.57% of total cooking tasks, the wife performs 53.38% and the other household member(s) performs 19.05%. This procedure was repeated for all the other categories.

Table 4

Rank Order of Household Tasks by Pleasurability for Households with Pre-School Children.

The procedure used was the same as for Table 1 but this time in terms of pleasantness in performing household tasks.

Table 5

Rank Order of Household Tasks by Pleasurability for Households without Pre-School Children.

Same as Table 4.

Table 6

Classification of Household Tasks by Work or Hobby in Percentage Terms.

The procedure consists of the following steps:

Step 1

Question 9 asked respondents to rank 11 different household tasks along a five-point scale ranging from 1 to 5. Boxes 1 and 2 were taken to indicate work, box 3 indicated neither work nor hobby and, Boxes 3 and 4 indicated hobby. The responses were recorded in 11 columns denoting the different activities. For each activity, three rows were created: one for work, one for neither work nor hobby and, one for hobby.

Step 2

The respondents answers were placed in the appropriate cell. For example, one of the respondents answered that gardening was regarded as a hobby. Under the column gardening and in the row hobby, a tally of one was placed. The procedure was repeated for all household tasks and for every respondent.

Step 3

A consistency check was taken to determine if the respondent's answer to Question 10 which indicated the respondents' overall feeling for housework, were consistent to that of Question 9. If a respondent checked more 'work' boxes than hobby in Question 9 and then checked housekeeping as very unpleasant in Question 10, it was assumed that the respondents' answers were consistent. If the opposite had

occurred then, the response was recorded as inconsistent. There were only 7 inconsistencies: respondents numbered 1, 15, 31, 43, 46, 50, 53.

Step 4

The frequency tally for each cell was then taken. For example, 16 respondents regarded gardening as work, 14 as neither work nor hobby and, 26 considered the activity as a hobby.

Step 5

The frequency tally was then converted into percentage terms by dividing the frequency of each cell in a column with the total of the frequencies in that column. For example gardening had a total column frequency of 16 + 14 + 26 = 56; thus 16 ÷ 56 = 28% of the households regarded gardening as work; similarly 14 ÷ 56 = 25% and, 26 ÷ 56 = 46% for the other row categories. This procedure was repeated for all column categories.

APPENDIX C

SELECTED CONSUMER PRICE INDEXES OF CANADA AND THE UNITED STATES: COMPUTATION PROCEDURE FOR TABLE 7

Selected Consumer Price Indexes of Canada and the United States.

Canada[a] (base year 1971 = 100)

Year	C.P.I.
1971	100
1977	160.8
1978	175.1
1982	262.5
1983[†]	276.7

United States[b] (base year 1967 = 100)

Year	C.P.I.
1971	121.3
1972	125.3
1978	195.4
1982	287.1
1983[*]	296.3

a Economic Review April 1983, Department of Finance, Canada, 1983, Table 43, pp. 174.

† The inflation rate up to May 1983 over the previous year was 5.4% or 0.054. Therefore to obtain the 1983 CPI, the calculation was performed as follows:

$C.P.I._{1982}$ X (Inflation Rate 1983 + 1) = 262.5 X (1.054) or 276.7

b Statistical Abstract of the United States 1982-83, 103rd Edition, 1983, Table 757, pp. 461.

* Obtained from United Stated Department of Commerce, Bureau of Economic Analysis, June 1983, Vol. 63, Number 6, Table S5, pp.37.

Computations Procedure for Table 7

For Canadian studies, original value figures were divided by Consumer Price Index (C.P.I.) of that year in which the study was done and then multiplied by the C.P.I. of 1983. For example in Monique Praulx's study, the original value of housework per hour in 1978 dollars was $3.82. The calculation to 1983 dollars was done as follows:

$$\frac{\$3.82}{C.P.I._{1978}} \times C.P.I._{1983} = \$6.04$$

where $C.P.I._{1978} = 175.1$ and $C.P.I._{1983} = 276.7$.

For United States studies, the same procedure was used except that the C.P.I. is that of the United States and that a conversion to Canadian dollars was made by taking the final result and multiplying that with the 1983, November 30th Currency exchange rate i.e., 1 US $ = 1.2406 Cdn. $. For example, in the study by Walker and Gauger, the original value of housework per hour was given as $2.19 in 1971 dollars. The calculation to 1983 dollars in Canadian funds was done as follows?

$$\frac{\$2.19}{U.S.C.P.I._{1971}} \times U.S.C.P.I._{1983} \times 1.2406 = \$6.64$$

where $U.S.C.P.I._{1971} = 121.3$ and $U.S.C.P.I._{1983} = 296.30$

VITA

Surname: QUAH Given Names: TEONG EWE

Place of Birth: Penang, Malaysia Date of Birth: August 18, 1959

Educational Institutions Attended, with Dates of Entering and Leaving:

SIMON FRASER UNIVERSITY, BURNABY, B.C.	1979	to	1981
UNIVERSITY OF VICTORIA, VICTORIA, B.C.	1982	to	1984

Degrees, Diplomas, Etc., Awarded, with Dates and Names of Institutions:

GENERAL CERTIFICATE OF EDUCATION (ADVANCED LEVEL)	1978	University of Cambridge England
B.A. (HONORS)	1982	Simon Fraser University, Canada

Honors and Awards:

University of Victoria, Full Graduate Teaching Supplements, 1982-1983.

Phillips, Hager and North Ltd. Bursary, 1982-83

Publications:

"Measuring the Amount and Economic Value of Time Devoted to Household Production", Forthcoming, 1984 (with Jack L. Knetsch)

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