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Why Labour Works:

The Valuation of Subsistence Economies

By

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ABSRACT

Prior to 1982, Aboriginal culture and traditional livelihood in Canada were legally governed by common law and treaties and there was an underlying presumption that the Aboriginal culture and economy would eventually be assimilated into the larger Canadian society. However, in 1982 Aboriginal rights were placed under the protection of the Canadian Constitution. The Constitution now demands that Aboriginal culture and livelihood be defended as vigorously as other Charter rights. This change in legal status has had an important impact upon the way that Aboriginal economic activities can be valued. Previous methods that were used to value Aboriginal economic activities were consistent with the assimilationist view. For example, the replacement cost method was based upon replacing wild meat with the value or price of meat in a grocery store. Although more appropriate methods have recently been proposed by welfare economists, most of these methods have not escaped the biases of western thought and are not accepted as appropriate by Aboriginal groups. Given the large volume of claims and infringements of Aboriginal rights, a valuation method that is acceptable to Aboriginal people, industry and governments is needed.

The challenge for this study was to propose and apply a valuation method that was consistent with Aboriginal culture and would also be acceptable to government and industry. Such a method would have to provide reasonable estimates based upon transcultural principles of valuation.

This project included a review of the philosophical and theoretical basis of value and valuation. The project then discussed the legal Aboriginal context in Canada including common law the Constitution and Treaty 8. Based upon these underpinnings, existing theories and methods used in anthropology and welfare economics were discussed. A valuation method was

then proposed, which was intended to be consistent with Aboriginal legal rights and would be understandable to western based negotiators. This method used labour time to value the economic activities of Aboriginal subsistence activities. The method was applied in the Fort McKay Community of northern Alberta. It involved modeling the annual cycles of the subsistence economy and using Elders' estimates of labour time hunting for, gathering and processing traditional products. Upon comparison with other methods, this valuation method generated higher estimates and took into consideration a wide range of traditional activities associated with their economy.

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This work could not have been accomplished without the support and knowledge of Bertha Ganter. Bertha was a member of the Fort McKay community and a co-author of the book by the Industry Relations Corporation upon which this work is based. Bertha patiently taught me about traditional land use, about Aboriginal culture and world views and about aboriginal economies and preferences. Bertha worked to ensure the data was of good quality and truly represented the history of her people.

I would also like to thank Ken Shipley, IRC Director, who pursued the idea of analyzing the losses of the Fort McKay traditional economy due to oil sands activity. I would like to thank Alice Rigney (neé Marcel) who helped me better understand the traditional structure and culture of the Dené people. I would like to thank John Rigney who helped me understand the history of part of northern Alberta. I would also like to thank Cathi Tanner and Caroline and April for supporting me during this process and putting up with the long hours that I was away working.

DEDICATION

This thesis is dedicated to the memory of **Bertha Ganter**. Bertha was passionate about her community's culture, history and traditional land use. She provided enthusiasm knowledge and understanding required to undertake this work in the community of Fort McKay. She worked with the Elders of the community to discover, record and preserve their traditional knowledge and information. After the completion of this work, Bertha continued to record and preserve information that would otherwise be lost due to the massive oil sands development that surrounds the community of Fort McKay.

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CHAPTER ONE: INTRODUCTION

Valuation of losses due to infringements on Aboriginal subsistence activities is challenging. Aboriginal subsistence activities have been limited by the encroachment of settler society since the first settlers began to come to America. Recently the courts have been defending Aboriginal subsistence activities and awarding compensation for infringements of Aboriginal rights to practice subsistence activities. This thesis proposes a valuation method that is intended to assist in assessing the compensation that may be paid as a result of infringements on aboriginal traditional activities.

Aboriginal subsistence activities are often not associated with markets or market prices and usually take place outside of the mainstream economy. Before 1982, valuation methods presumed that Aboriginal subsistence culture and economy would eventually be assimilated into the larger economy and therefore market substitutes could be used as value proxies. However, in 1982, Aboriginal rights to maintain hunting and gathering activities were protected by the Canadian Constitution and now they have a status in law equal to other basic human rights. Given these new legal conditions and the previous problems in assessing the value of subsistence economies, finding a generally accepted valuation method was needed.

The purpose of this project was to develop and apply a method of valuation of Aboriginal traditional economic activities that was consistent with Aboriginal values, consistent with Aboriginal legal rights and understandable by Canadian Government and Industry representatives for use as a basis for land use negotiations or infringements on Aboriginal traditional activities. This project values Aboriginal economic activities using the time or labour allocated to obtain the traditional Aboriginal livelihood. To date, current economic valuation methods have been unable to meet the cultural challenges presented by traditional hunter-

gatherer subsistence economies of northern Canada. Because Aboriginal traditional activities are defended by the Canadian Constitution and the Supreme Court, they are considered to be rights. One would normally value such 'rights' by obtaining an estimate of the willingness to accept an infringement or violation of that right. However, the Supreme Court has outlined a range of remedies for infringements of Aboriginal rights depending upon the severity of the infringement. This is a departure from the typical treatment of rights and makes the valuation process much more complex. This thesis reviews current valuation methods, the theory of valuation, the legal framework and the application of the time labour method in this context.

The most common method used to value Aboriginal subsistence economies has been the replacement cost method which involves attributing to subsistence food the value of a similar market-based substitute usually found in a local grocery store (Usher, 1976; Palmer, 1973; Lu, 1972; Bodden, 1981; Adams, 1998; Surrendi, 1998). However, the replacement cost method has been rejected by certain Aboriginal communities because it does not measure Aboriginal values.[1]

Economists such as J. Duffield (1997) proposed alternative methods. He stated that according to economic welfare principles, the possible methods that could be used to evaluate such losses as those incurred by the Alutiiq Aboriginal People of the Alaskan coast when exposed to the devastation of the Exxon Valdez oil spill, are market methods, contingent valuation, travel cost, hedonic techniques and factor income techniques. These methods use the theoretical principle that value comes from the preferences of those doing the valuation, however, these methods were constructed in a western or market context, rather than an Aboriginal cultural view. Therefore, they may not meet the required objectives.

[1] The Fort McKay Industry Relations Corporation rejected the replacement cost method in 2000. They commissioned a study and asked for a method that was consistent with Aboriginal values. In 2002, ACFN Elders rejected the replacement cost method in negotiations with B.C. Hydro. Economists such as J. Duffield (1997) have also argued that the replacement cost method is not consistent with economic theory.

To propose an appropriate method, in Chapter Two I first examined specific problems with the replacement cost method and other more theoretically sound methods such as those proposed by Duffield (1997). Then in Chapter Three I discuss the fundamental theoretical and philosophical basis of value to discover what elements of value may generate a transcultural approach. In Chapter Four, I investigate the legal rights of Canadian Aboriginal people specifically under Treaty 8, and review anthropological optimal foraging methods. Next I review welfare economics for possible approaches and I propose a method of valuation based upon the actions and characteristics of traditional Aboriginal economic behavior. The proposed method measures the time allocated by Aboriginal people in obtaining each item of their traditional livelihood. Since the method uses Aboriginal cultural activities it tends to be consistent with Aboriginal culture. The use of labour time has long been one method used in historical and even modern economic analysis and therefore is understandable to western government and industry. The labour time method uses basic concepts prevalent in anthropological and welfare economic methodologies to provide relative values of Aboriginal subsistence activities and products.

Once the method is defined, I apply this method to the Fort McKay community of Northern Alberta. First, I modeled the traditional economy of 35 years ago. Then, with the cooperation of community members I designed a questionnaire to gather information on time allocations. Using these time allocations, I calculated estimates of values of moose, bear, fish, birds, berries and medicines in time units. These estimates were then translated into monetary values by using average salary rates in Canada.

In Chapter Five I also compare this method to the results of other methods. The Labour time method appears to provide values that are acceptable to Aboriginal people. This method

has been used in negotiations with respect to infringements of Aboriginal rights in northern Alberta.[2] However, the method has several limitations which should be understood if the method is going to be used to assist negotiators in establishing compensation for infringements on Aboriginal economic rights. These limitations are discussed in Chapter Five.

In Chapter Six I discuss the appropriate use of this system of valuation and what it might contribute to the understanding of Aboriginal economies and inter-relationships between western and Aboriginal thought.

[2] Confidential Report for the Athabasca Chipewyan First Nation by J. Tanner.

CHAPTER TWO: CURRENT METHODS

There are various methods used to value subsistence economies. An early method, the replacement cost method, was commonly used but has some obvious and acknowledged problems (Usher, 1976). Other methods have been proposed which are derived from economic welfare theory as it is applied to non-market evaluation (Freeman, 1993). This chapter reviews the replacement cost method and other suggested methods. They are discussed to determine if they meet the purpose: to develop and apply a method of valuation of Aboriginal traditional economic activities that is consistent with Aboriginal values, consistent with Aboriginal legal rights and understandable by Canadian Government and Industry representatives for use as a basis for land use negotiations.

Replacement Cost Methods

The replacement cost method is simple and easily understood but suffers from considerable theoretical and practical problems. From a practical view the omissions and problems of this method are:

1. Grocery store foods are not as nutritional as traditional foods. Such foods do not represent the same nutritional value for Aboriginal people nor do they provide other health benefits such as the exercise associated with hunting and gathering. (Wien, et al., 1991)

2. Neither does using grocery store foods reinforce a traditional hunter in retaining important traditional or hunting skills (Usher, 1976).

3. Grocery store food does not include skins and other animal parts commonly used by Aboriginal peoples. [3]

[3] Studies of the fur industry do take into consideration the value of furs sold into commercial markets, however, studies such as Usher (1976) and Palmer (1973) term the other values associated with 'country food' as "non-quantifiable intangibles".

4. The purchase of grocery store foods as substitutes does not allow the hunter the pride and self-esteem of supporting himself using traditional skills and traditional tools.
5. Obtaining grocery store foods does not support linguistic, cultural or spiritual values of the Aboriginal communities, as do traditional hunting and gathering activities.

These practical shortcomings emphasize that this method does not measure the complete value of the traditional hunting and gathering activities of the Aboriginal economy by comparing the traditional food to food prices in a market based grocery store. However, there is a more fundamental theoretical problem with this method. It does not directly address the choices, preferences and desires of the Aboriginal people. The replacement cost method does not reflect the choices of the Aboriginal people and presupposes that food from a grocery store is an appropriate substitute for traditional foods. As discussed below, the preferences and choices of the consumer are a fundamental element of the theory of valuation.

Methods suggested for the Exxon Valdez Case

The problems with the replacement cost method are well known among those who have produced replacement cost studies (Usher, 1976). Consequently, economists have suggested and implemented other non-market valuation methods. Following the Exxon Valdez oil spill in Prince William Sound on the coast of Alaska, some advances towards theoretically sound methods were made by studies associated with that litigation (Duffield, 1991; Brown and Birch, 1992; Hausman, 1993). Several new methods of Aboriginal subsistence valuation were proposed in an attempt to measure the losses of the Alutiiq Aboriginal People (Braund & Usher, 1993). The oil spill affected marine mammals, salmon and other fish, clams and crabs and marine birds reducing the availability of these traditional foods to the Aboriginal peoples of the area (Duffield, 1997). Economists were retained to make estimates of the losses incurred by the

Aboriginal peoples. Duffield, (1997) stated that according to economic welfare principles, the possible methods that could be used to evaluate such losses are market methods, contingent valuation, travel cost, hedonic techniques and factor income.

After considering the case, economists on both sides of the litigation suggested that hedonic methods be used to value the losses. The hedonic method involves attempting to impute an appropriate value for the activities of the Aboriginal peoples by comparing their subsistence activities to the value of alternative wage earning activities. Although the hedonic method may have had some problems, it is theoretically robust since it assesses the choices made by the people to participate in one activity rather than another (Freeman, 1993). Hunting and gathering are assumed to be preferred activities because they are the chosen activities. Therefore, they would generate more satisfaction or be worth more to the Aboriginal people than the alternatives. The hedonic method considers choices made by the Aboriginal people to value a subsistence or traditional life relative to wage earning and market opportunities.

The Exxon Valdez Court refused to accept the recommendation by economists on both sides, that the hedonic method be used (Duffield, 1997). Instead, the court limited the loss assessment to a measure of pounds of resources per capita lost, i.e. the grocery store or replacement cost method. The court effectively eliminated any consideration of more theoretically robust methods that might collectively address economic, cultural, nutritional and social losses to these Aboriginal peoples (Braund and Usher, 1993).

The fact that the U.S. court refused to accept the methods suggested by economists from both sides emphasizes the need for a consistent and widely accepted analytical approach to

valuing Aboriginal subsistence production. Such a method should be consistent with valuation theory[4] and incorporate Aboriginal preferences within an Aboriginal cultural context.

Another important issue in subsistence economy valuation is the legal rights of the people. Rights vary depending upon the laws of the jurisdiction and the specific treaty or unextinguished Aboriginal entitlements. Therefore, different valuation methods, which are consistent with the theory of value and preference, may be applicable given different legal environments. As stated above, whatever method is used must be consistent with Aboriginal values and sensitive to their nutritional, cultural and social conditions in order to be a valid reflection of their preferences.

Direct Valuation Methods

The range of approaches to value Aboriginal subsistence production suggested by Duffield (1997) includes standard non-market valuation techniques within the scope of conventional modern economic thought. These methods were developed in the context of valuation of non-market environmental values (reviewed by Adamowicz, 1991). Adamowicz divides non-market approaches into direct (or survey) methods and indirect (or inferential) methods. An example of the direct approach is the contingent valuation method (CVM), which generally involves asking questions about willingness to pay. Indirect methods include hedonic and travel cost methods.

The CVM approach involves designing and asking questions to elicit responses about willingness to pay, values or preferences. Willingness to pay is a measure of the welfare of the individual (Chapter Three). In designing CVM questions the researcher must be conscious of potential pitfalls, for example, the researcher must avoid allowing the respondent to strategically

[4] I refer to the valuation theory that is based upon the actions, preferences and choices of people. This theory is based upon an analysis of preferences in order to determine the values assigned to goods. It is the basis of the neo-classical theory of value (Freeman, 1993).

influence the results of the study. Also, questions that give hints or signal a range of answers or a starting point may cause biases. However, designing a CVM for culturally diverse economic structures presents additional challenges. Adamowicz et al. (1998) reviews a range of problems associated with applying contingent valuation systems for evaluating values of indigenous peoples, including:

- The lack of substitutability of many subsistence goods,[5]
- The difference between western and Aboriginal concepts of property,
- Differences in group and individual rights and welfare
- Satiation assumptions, and other different cultural variables,
-Aggregating indigenous and European values.

However, even if one could address each of these problems, there are cultural and economic capacity problems that limit the effectiveness of a CVM. Aboriginal people who have spent most of their lives in a traditional economy are skillful people but because of their lack of participation and lack of familiarity with the market economy they may be less able to assess values of non-market goods using dollars defined in a market economy. Chibnic (1978) also makes the point that those who consume subsistence production likely value these commodities more than the market values of these goods. It may be difficult to translate that value into a monetary value required by a conventional CVM analysis. Thus, the *scenario misspecification* (Freeman, 1993) of the CVM analysis is likely to be very large, perhaps so large as to render results unreliable.

Also, studies have shown that on average Aboriginal people have a lower ability to pay,[6] a consequence of low income. Consequently, their marginal valuation of money is likely to be

[5] For example, it is difficult to substitute any other animal for caribou in the early Chipewyan caribou economy or bison in the Plains Indian bison economy since their reliance on these animals was so great.

different than those in the mainstream economy. If Aboriginal people may be willing to accept lesser amount of money when they are in difficult circumstances, (caused at least in part due to their losses of traditional opportunities) or they are unable to pay because they have little money, the responses to willingness to pay questions and willingness to receive compensation questions may be biased by their circumstances.

> "Willingness to pay is of course constrained by ability to pay, such that the number of "votes" a market participant has in the determination of economic value depends upon his or her income, the more one's income, the more one's influence on economic values." (Brown and Burch, 1992: p. 215)

Adamowicz et al. (1998) discusses a similar issue, stating that there are systematic differences in income levels between indigenous and European cultures and that this may cause systematic differences in valuation. Because of these problems, the contingent valuation method is difficult to apply to traditional Aboriginal subsistence economies. Indirect valuation methods may be more applicable.

Indirect Valuation Methods

A second approach to valuation involves inference based upon market-based indicators. For example, the hedonic method (Freeman, 1993) would assess the value of an oceanfront property separate from other attributes of a house by comparing the value of the house with similar houses not on the oceanfront. In this way the value of the location can be inferred. In the Exxon Valdez case Duffield (1997) suggested using a hedonic wage model where an inferred wage rate could be obtained for the Aboriginal people by comparing their choice of hunting to other wage earning opportunities. This method incorporates choices made by the Aboriginal

[6] Canadian studies have shown that aboriginal peoples have lower average incomes. In addition, hunter-gatherer participants tend to rely less upon and have less experience in settler society economies. (Armstrong, 1999)

people to hunt as an alternative to pursuing other livelihood activities, thereby reflecting their occupational preferences. It is difficult to assess how much a premium should be associated with the preference, since it is difficult to measure how much they prefer a traditional livelihood to a wage based livelihood. However, if this premium could be measured, occupational preferences could be used to value the choice of Aboriginal people to participate in the traditional economy.

The hedonic method is particularly appropriate when the Aboriginal people have no choice but to choose between wage opportunities or remaining subsistence opportunities. However, if the Aboriginal group has special rights that protect or maintain their traditional livelihood, that is if they are not legally required to choose, other methods must be considered.

Despite its advantages, there are also problems with applying the hedonic wage method to diverse cultural situations. The hedonic wage method must measure the increased level of satisfaction that the Aboriginal person would receive for participating in traditional activities over industrial activities. However, the Aboriginal person may have less skill or cultural familiarity with industrial jobs. As a result, the Aboriginal person is likely to have fewer opportunities in the settler society than the average American. The available jobs used for comparison in settler society may not represent a fair wage for the Aboriginal hunter. Those wages may not properly represent their status or skills within their own culture or economy. It is difficult to measure losses of a separate economy because such specialized skills and talents may not be salable in comparable occupations within the market economy. Therefore, the applicability of the hedonic method depends on the ability of the Aboriginal people to identify occupations that can be used to appropriately infer the relative contributions of their losses. Although the values of the Aboriginal people may be significantly different than those in the settler society, it is difficult to defend their cultural and economic preferences when the

prevailing view negates cultural diversity as valuable. In such an environment, the value of the Aboriginal traditional economy is only measured by what they are prepared to give up in the settler society, rather than by assigning an inherent value to their traditional ways.

The trapping economy provides an example where the skills of a traditional hunter are reflected in a market economy. Trapping has generated significant revenue for successful trappers (Palmer, 1973; Berger, 1977). The traditional economy supported the trapping economy by providing foods, skills and local knowledge. [7] Therefore, trapping represented an important compromise between the market economy and the traditional economy. For example, in the Athabasca Chipewyan First Nation community in northern Alberta, Elders reported that they preferred to remain on the land and would trap to provide the cash required to continue their traditionally based subsistence (ACFN Interviews, 2002). It may be possible to use the market value of trapping to measure the relative value of the subsistence economy. However, Aboriginal people have been willing to accept the low returns of trapping because it supported their cultural preference to remain on the land. Because of this fact, it may be more accurate to identify a hedonic wage where Aboriginal people were completely removed from the land to estimate what they would truly accept as a complete alternative.

The travel cost method was also suggested as a theoretically robust method by Duffield (1997) and has been used by Haener et. al. (2001) to measure the value of hunting. The travel cost method involves measuring the amount a person would have to spend to engage in an activity such as hunting or sightseeing. Costs might include equipment, the cost of gasoline, depreciation on the vehicle and the opportunity cost or the amount of time allocated that could otherwise have been used to earn income. This method is used, for example, to measure the

[7] In Tanner et. al (2001) and Tanner and Rigney (2003), through interviews with aboriginal Elders in northern Alberta, I was able to measure the contribution of traditional activities to trapping efforts and observe how one occupation supported the other in several ways.

value of tourist destinations or the value of recreational hunting trips (Freeman, 1993). Although the concept of using costs is theoretically consistent with methods suggested later in this paper, the problem with it is that it does not analyze the Aboriginal economy as an independent sustainable economy rather it assesses it in relation to another separate economy. Traditional Aboriginal hunters do not have the same income or the same opportunity costs in wages that would allow the valuation of hunting, trapping or fishing in the same manner as industrial society's vacationer, recreational hunter or average consumer.

Composite Methods

During the Exxon Valdez litigation, Brown and Birch (1992) proposed an interesting model to measure subsistence losses. They suggested that the subsistence harvest involved two elements of value, product value and activity value. This method attempted to compensate for the omissions of substitution valuation by adding an activity value, which would account for the other benefits of traditional foods and gathering such as lifestyle values noted above. Brown and Birch (1992) suggested that the product value could be estimated by using a replacement method and that the activity value could be estimated by using a hedonic method. However, the activity value would need to be carefully defined in order to capture the value of the Aboriginal economy. If the activity value is not defined properly, this technique may suffer from double counting or omissions.

Another composite method, proposed by Haener et. al. (2001), combines revealed preference and stated preference. The preferences of the Aboriginal peoples are integrated within both sections of this model. Revealed preference involves actual behavior or choices and stated preference asks hypothetical questions about their preferences. Haener et al. (2001) obtained values from travel and opportunity costs associated with hunting activities, producing

some interesting results. The revealed preference method considers the costs, success and locations of the hunting trips. Preferences are "revealed" by choices made to undertake hunting trips to various regions or environments. The stated preference method measures preferences based upon responses to questions about hypothetical activities. Haener et. al. (2001) compares the results of this model to an estimate of losses based upon the replacement cost method and concludes that the results are of a similar level.

An interesting advantage of this model is that it uses revealed preference or actual hunting data to measure the value of activities. The actual activities of the Aboriginal people are the best data available reflecting Aboriginal preferences and the nature and structure of their subsistence economy. However, valuation of hunting using a travel cost method suffers from the problems of comparable economies discussed above. The travel cost method is more appropriate to measure the benefits to the recreational hunter or even a Métis hunter who has adopted the settler economy. The stated preference method is a valid method of measuring the relative importance of the qualities of the hunting location to the Aboriginal person, if the hunting occupation is subject to such choices. If the Aboriginal people have a right to maintain their culture and hunting practices, and if they have a right to the original conditions, the value of the loss should be determined by their willingness to accept a change rather than their responses or willingness to pay to avoid an imposed infringement (Freeman, 1993). The willingness to pay to avoid and the use of a measure of travel costs may conform to the rights of some Métis[8] (Powley, 2003) or the recreational hunter, but it does not address the legal rights to maintain the traditional culture and livelihood of Aboriginal people having a right to the original hunting conditions.

[8] The Métis are included in the Constitution as aboriginal people and therefore their existing rights are protected. A recent decision (Powley, 2003) defined further the hunting rights that the Métis people have. They have rights to maintain their culture, language and religion but their hunting rights may be limited depending upon their life ways.

It is clear that valuation processes must consider entitlements or rights. A method used to value an entitlement is quite different from the method used to value a privilege (Freeman, 1993). Removing an entitlement generally requires consent. Therefore, the value attributed to a perturbation would depend upon a willingness to accept (or reject) an alternative. The value of a privilege could be measured by the willingness to pay. Measuring the travel cost is a willingness to pay method. If the Aboriginal people have a right to practice hunting, value should be measured by their willingness to accept an alternative. The questions become:

Do Aboriginal people have the legal right to continue their culture and traditional livelihood?

Do Aboriginal people have the right to protect their traditional economy?

If they have those rights, as Canadian Aboriginal people clearly do,[9] traditional culture has its own value and can only be valued through a process by which Aboriginal people agree to accept alternative opportunities in industrialized/ settler society. [10] In environments where they do *not* have such legal rights, the hedonic wage method or the composite preference model may appropriately value their alternatives.

The key theoretical concept in these valuation problems is that valuation methods should reflect the values and entitlements of the people for which the valuation is done (Freeman 1993). Yet in the legal environment these principles are often ignored as in the decision of the Exxon Valdez court in Alaska (*Exxon Valdez,* 1994), which is reminiscent of the ethnocentric justice historically experienced by of Aboriginal peoples (Syliboy, 1928).

Conclusion

[9] Aboriginal rights are guaranteed by Section 35 of the Canadian Constitution.
[10] The choice of these people to accept an alternative must be without coercion. They must be free to make the decision without pressures that might bias the valuation process.

Now that Aboriginal rights are protected in the Canadian Constitution there can no longer be any doubt that the legally protected subsistence economy of Aboriginal peoples embodies an inherent value.[11] Aboriginal rights stem from the traditions, practices and customs in existence before the effects of the settler society were felt. (*R. vs. Delgamuukw*, 1997; *R vs. Van der Peet*, 1996). Therefore, a valuation system used to evaluate such an economy needs to be based upon their traditional economic framework and their values.[12] Their system should not be valued with respect to their capability to earn income, purchase compliments or buy substitute foods in the settler society.

None of the proposed methods suggested above base a valuation system on the Aboriginal traditions, customs and practices. All of these systems are based on competitive or market based values or western based concepts.

The goal of this paper is to propose and apply a system of valuation that values Aboriginal economic activities based upon their traditional economic decisions and respects their legal rights under the Canadian Constitution.

[11] Chief Justice Lamer (as he was then) explains in Delgamuukw (1997) some of the considerations in arriving at the precise value of the Aboriginal interests in "land and any grants, leases or licenses in various resources." He states that when the government permits uses of lands in which there are aboriginal rights there is always a duty of consultation upon the Crown. He states that in most cases the obligation of the Crown will be significantly deeper that consultation. "Some cases may even require the full consent of an Aboriginal nation…" The practical result of full consent involves the willingness to accept a change and defends their right or entitlement. The value of the entitlement would not be determined externally by a substitute or market process but by its inherent value as part of the Aboriginal culture.

[12] *Van der Peet* (1996) defines the characteristics of Aboriginal Rights. In this decision Chief Justice Lamer discusses how existing Aboriginal rights were recognized under common law and were recognized and affirmed in s. 35 (1) of the Constitution. Lamer discusses the nature of these rights and states that "The practices, customs and traditions which constitute Aboriginal rights are those which have continuity with the traditions, customs and practices that existed prior to contact…" The numbered treaties state that "the Indians shall have the right to pursue their usual vocations of hunting, trapping and fishing throughout the tract surrendered…" (Treaty 8) The references to the practices "before contact" and "their usual vocations" defines their rights as stemming from their traditional activities. The nature of their rights defines the approach to valuation. It is therefore the value of the rights to continue traditional activities that is of interest.

CHAPTER THREE: IS THE THEORY OF VALUE TRANSCULTURAL?

Humans make choices. We chose one object or action instead of or in preference to another. We make choices between different actions based upon our "values" and we assess the relative worth or desirability of objects based on a range of criteria. Values are intuitively felt, yet there are many different ideas about value. Human values have captured the attention of great philosophers and the concept of value has had a long history of development. Werkmeister (1970; 1973) reviews the historical spectrum of value theories in two volumes. In his introduction, he states "I might as well confess to the belief that, so conceived, value theory is the very core of philosophy – if the latter is taken to be a search for a way of life."

Classical philosophers have held very different views about the essence of value represented by two major philosophical schools: subjective and objective values. Both claim value holds a primary importance in the human condition. Frederick Nietzsche (1883) held the view that values are important, but are entirely subjective and part of what he believed to be the ultimate quest of mankind, the "will to power".

> "No people could live unless it had values; but if it wants to preserve itself it must not have the same values as its neighbour. Many things that one people called good, another called ridiculous and shameful: that is how I found things. Many things I found which in one place were called evil but which in another place were adorned with purple honors."
>
> "Things had no value until man put them there for his self-preservation; he created an aim, a meaning for things – a human aim and meaning! That is why he calls himself "man," that is "value-giver." To give values is to create: note it, you creators! Value giving itself is the most valuable and precious jewel of all things that have value."

"Values are the result only of value giving; without value giving the nutshell of existence would be hollow. Note it, you creators!" Nietzsche (1883, p. 257)

To Frederick Nietzsche giving value was important, but each person or group assigns values, which will be entirely different from the neighbours'. Nietzsche stated that values are completely subjective, as they exist only because man creates them.

On the other side of the spectrum Immanuel Kant presented values as an objective ideal.

"Man as an End

… Now I say: man and generally any rational being exists as an end in himself, *not merely as a means* to be arbitrarily used by this or that will, but in all his actions, whether they concern himself or other rational beings, must be always regarded at the same time as an end. All objects of the inclinations have only a conditional worth, for if the inclinations and the wants founded on them did not exist, then their object would be without value. But the inclinations themselves being the sources of want, are so far from having an absolute worth for which they should be desired, that on the contrary it must be the universal wish of every rational being to be wholly free from them. Thus the worth of any object which is *to be acquired* by our action is always conditional. Beings whose existence depends not on our will but on nature's, have nevertheless, if there are irrational beings, only a relative value as means, and are therefore called *things*; rational beings, on the contrary, are called *persons*, because their very nature points them out as ends in themselves, that is as something which must not be used merely as means, and so far therefore restricts freedom of action (and is an object of respect). These, therefore, are not merely subjective ends whose existence has a worth for us as an effect of our action, but objective ends, that is things whose existence is an

> end in itself: an end moreover for which no other can be substituted, which they should subserve merely as means, for otherwise nothing whatever would possess absolute worth; but if all worth were conditioned and therefore contingent, then there would be no supreme practical principle of reason whatever.
>
> If then there is a supreme practical principle or, in respect of the human will, a categorical imperative, it must be one which, being drawn from the conception of that which is necessary an end for every one because it is *an end in itself*, constitutes an *objective* principle of will, and can therefore serve as a universal practical law. The foundation of this principle is: *rational nature exists as an end in itself.* Man necessarily conceives his own existence as being so: so far then this is a subjective principle of human actions. But every other rational being regards its existence similarly, just on the same rational principle that holds true for me: so that it is at the same time an objective principle, from which as a supreme practical law all laws of the will must be capable of being deduced." (Kant 1763, p. 43) (Italics in original)

In this passage Kant is establishing a fundamental moral position with respect to the value of man. He maintained that men are not objects that have worth only with respect to human will, wants or needs, but man has objective worth. He explained that the objective worth or end of rational beings constitutes the 'supreme limiting condition on our subjective ends' or goals. Kant outlined the basic moral standards upon which the concepts of human rights can be based. He provided the objective concepts of absolute worth and objective ends.

If Nietzsche's basis of value were correct, then it would be difficult or even impossible to reconcile the values of distinct cultures into a common system of valuation. However, if there are objective values, as Kant suggested, it may only be a matter of different cultures

discovering them. Most people recognize that there are often similarities in what people value. However, it is difficult to derive the concept of universal values from the idea that we as human beings have many similarities. Perry (1926) developed a 'General Theory of Value' where he discussed this idea. In his introduction, he made the following statement:

"No one would be disposed to deny that there is a common something in truth, goodness, legality, wealth, beauty and piety that distinguishes them from gravitation and chemical affinity. It is the express business of theory of value to discover what this something is;" (Perry 1926, pp. 4-5)

Perry developed a theory of value using the idea that a thing has value when it is an object of interest. He developed the concept of the interest of the totality, which provides the basis for concepts of "good," "right," "duty" and "virtue". Within the context of the interest of the totality and the concept of harmonious happiness, Perry described the purpose of society's institutions. Governments, for example, have the purpose of stabilizing human relationships with social order and adjusting diverse interests for the sake of the good life of 'harmonious happiness'. In describing the purpose of institutions such as government, laws, science and art, Perry made a connection between individual interests and ideal or universal interest which he called harmonious happiness. Perry supported the concept that objective values are ideals that form the basis of institutions such as law and government.

Some writers have discussed the separation between moral philosophy and the theory of value. (Dewey, 1939; Loring, 1966) Loring separated the ideas of ethical and non-ethical standards of value. She noted the differences between a good watch or a bad watch, pointing out that one watch may be well made and therefore be more valuable. This is in contrast to the *good* man who would be an ethical man following an ethical code. The word *good*, in

these two contexts has different meanings, yet there is a thread of consistency between the character of the good man and the actions of a good watch. The same distinction exists with the word *values*. The good man has moral values, which are important but only make up a portion of the different factors in deciding the value of a good or commodity. Moral value is a different concept than the value of a commodity although they are related. Although the theory of value may include discussions of both ethical values and non-ethical values, within this discussion I am concerned only with values as they contribute to the valuation of services and commodities. Philosophers like Perry and Kant tied ethical considerations to the concepts of universal or objective values. These objective values affect non-ethical values by setting a framework (laws and institutions) within which non-ethical values are established.

So called non-ethical values are framed within the context of institutions or frames of reference which are themselves framed by what may be called ethical or generalized concepts of value. Even the good watch must be assessed using some scale of goodness. The three levels of value are individual valuations, general values held within a group or society and broader values that may be consistent between societies or even objective or universal. It is important to note that Nietzsche's concept (that different groups have different values) emphasizes cultural differences between societies. Perry (1954) noted it might be possible to obtain significant agreement with respect to fundamental issues of value not only among individuals but between different groups or societies. Should one go so far as to claim that we have identified an objective value? Werkmeister (1970) discussed Alfred Stern's (1932) idea that there is a tendency for society to impose its values upon the individual. The process of imposing values is often coercive and oppressive, and oppression is not consistent with the concept of perfect universal value. Stern differentiated between individual values, collective

values and universal values. He noted that individual values and collective values may not be consistent with universal values. He proposed that an ideal society would embody a system of universally valid values, but he stated that no society actually measures up to that ideal. Stern discussed the evolution of history as moving towards a future, dreamed of as more perfect. In this light, he commented on the different values of different cultural epochs. He stated that even though there may be different values within each epoch there are also certain values that transcend cultural relativism and have supra historical validity. He cited human health as one of those universal values. In the same light, it would not be a significant extension to propose that different cultures existing during the same time may also concurrently understand such transcendental values, yet hold different value systems. However, a dominant culture must also be aware that it may be oppressing the values of a less dominant culture and that simply because one nation is stronger, does not make its values universal.[13]

[13] In the context of northern Alberta, this is particularly relevant to the assessment of the values of aboriginal peoples where the Aboriginal value system was attacked within the Residential School System. (Tanner and Rigney 2003)

It is likely that the debate over objective values will continue. However, as social beings, we have developed institutions like governments and legal systems, which play a role, as Perry stated, of providing social order. These institutions are based upon what Perry considered universal ideals. In western civilization, one of the basic ideals is that maximum freedom generates the most personal satisfaction (Mill, 1859). This freedom is to be limited only by the rights of others. Because this simple and powerful concept is based upon individuals, it is not likely to account for societies where collective rights are important or account for values of other societies not yet conceived. However, the principle of maximum freedom appears to allow a maximum opportunity to pursue whatever occupation one may wish regardless of the culture or society. These ideals are put forward as universal principles upon which the legal framework of a nation should be based (Mill, 1861). The modern legal framework of human rights is based upon individual freedoms as conceived by the early liberal philosophers like John Locke (Locke, 1690). Within the context of these western universal principles, modern philosophers like John Rawls (1971) developed a discussion of what basic justice and fairness imply in a free and democratic society.

The 20th century philosopher John Rawls (1971) presented a modern theory of the importance of the objective concepts of justice and fairness in his book *A Theory of Justice*. Rawls detailed the principles upon which judicial systems are meant to function. He discussed fundamental rights that an individual must have for a procedural system to be just. Western civilization has developed a sophisticated institutional structure to protect individual rights juxtaposed first against the power of the monarch, then the state and more recently interest groups. Within western thought it has often been the spiritual leaders who have reminded us that we are still social beings rather than simply individuals with rights. In the early 17th century in

England, as the early scientific method was being popularized, poet clergyman John Donne stated in Meditation XVII:

> "No man is an Island, entire of itself; everyman is a piece of the continent, a part of the main. If a clod be washed away by the sea, Europe is the less, as well as if a promontory were, as well as if a manor of thy friend's or if thine own were. Any man's death diminishes me because I am involved in mankind, and therefore never send to know for whom the bell tolls; it tolls for thee." (Donne, 1623)

As Donne is pointing out, individual interests and individual rights may not adequately represent the public interest. We are social beings and we rely upon each other for our very existence. Western society has promoted individual rights but limits those rights to protect the public interest. Current issues in Canadian politics include the age at which children can determine what is good for them or the degree to which the use of drugs should be up to individual choice. The issues of abortion, pornography, gambling, and prostitution are all difficult to decide only on the basis of individual rights but are decided on the basis of a balance between the public good and individual freedoms. Each society may have a different emphasis on the public interest versus the interests of the individual.

However, it is through generalized legal principles, based upon the concepts of justice and fairness that a trans-cultural concept of value can be applied. Just as the early British common law and laws of equity developed from concepts of natural justice and the rights of individuals, early international law developed through commonly accepted principles between nations comprised of many diverse cultures (Starke, 1958). International laws by their nature should be more sensitive to different cultures and values expressed by different nations.

Values and the Development of International Law

The international community developed legal rules based upon generally accepted principles of justice and equality (Starke, 1958). These laws have developed from the mutual rejection and abhorrence of crimes against humanity and support for basic human rights upon which peoples holding a wide range of value systems can agree. States sought practical solutions to the conflict of laws between nations and to avoid war and other destabilizing conditions (Schmitthoff, 1954). Throughout history, the interaction between cultures with different value systems has often resulted in the destruction of one culture and the predominance of another. As a result, international principles developed to protect cultural diversity to the extent that the values contained in that diversity do not contradict basic human rights. (United Nations Commission on Human Rights: 1994) In this way, principles of international law place fundamental constraints on approaches to value, which are consistent with basic principles of fairness, equality and justice. These principles provide a basis for a theory of value that can apply to diverse cultures.

As a practical matter, international law provides limits upon the acceptability of subjective values regardless of their cultural origin. In order for local subjective values to be acceptable in the context of international laws, they cannot violate the basic human rights and the principles of justice and equity upon which international laws are based. In this way objective (or at the very least consensus) values and ideals are reflected in international laws and provide an important role in valuation. However, in the application of these principles we should be careful to ensure they are truly universal and do not, as Stern (1923) observed, become oppressive or ethnocentric.

International law continues to develop in this area. Indigenous peoples are asserting their rights to maintain their cultures and values within modern nation states and have taken this issue to the United Nations (United Nations Commission on the Rights of Indigenous Peoples, 1994). However, an important principle of international law is the sovereignty of the state (Schmitthoff, 1954), and modern states are reluctant to give up any portion of their sovereignty to indigenous people within their boundaries (United Nations Draft Declaration on the Rights of Indigenous Peoples, 1994). The laws of a state often support economic development values, or the values of the non-indigenous majority whereas Indigenous peoples' values tend to be oriented towards the ecosystems from which they garner a living (United Nations Convention on Biodiversity Working Group 2000, Article 8j). In addition, indigenous systems often emphasize the values of the group rather than a concept of individual rights.

Tools of Valuation

A variety of valuation tools has been provided throughout history. The objective of valuation is to find the "value" of a good (commodity) or service. Value is a measure of the good or service, which can be represented by its exchange price, its usefulness, or its cost to produce. It is a challenge to find a method that can be effectively applied to diverse societies. Early philosophers maintained that exchange value was based upon labour cost (Smith, 1776; Ricardo, 1917; Marx, 1867-95). Other philosophers proposed utility as the basis of value (Bentham, 1780; Mill, 1859). Eventually, western economics developed into a complex social science where exchange value was determined by the marginal analysis of the interaction between demand and supply, which was a synthesis of cost and utility (Marshall, 1890; Walras, 1874; Jevons, 1884).

Classical Concepts of Value - Use and Exchange Value

The classical economist Adam Smith (1776) discussed two types of value: use value and exchange value. Smith used the diamond – water paradox to make his point. He explained that while water has many uses, it has a very low exchange value. On the other hand, diamonds have obscure uses but significant exchange value. Smith developed the idea that the exchange value of items was based on their costs, specifically the labour costs to obtain them, e.g. water would exchange for the value of the cost of obtaining it. This could be represented by the effort in time and energy that it takes to get water from a stream or well to the table. A diamond, on the other hand, is more difficult to obtain. It requires exploration and excavation to find and produce. The higher value of the diamond is determined by the greater amount of work or labour required to obtain it. Smith maintained that labour is the basis of exchange value and explained that this was the object's 'natural price'. Even though temporary fluctuation in economic factors may alter the actual price away from the natural price, there would be a tendency to move back to that natural price level. He expanded this theory to the valuation of gold and other precious metals and explained relative price levels using the concept of the variable production costs of gold (A. Smith, 1776).

Smith's concept of exchange value is based on socio-economic relationships between individuals and was shared by Karl Marx (1867-95) and David Ricardo (1917) who understood and shared his major assumptions.[14] One of Smith's important contributions to economic thought was the concept of the invisible hand; that self-interest leads people to find the least expensive method of obtaining goods and this is beneficial to everyone. Smith reasoned that in a

[14] Ricardo, in his critiques of Mathus, specifically outlined some of those assumptions, "And let me further observe that I say this is true only in cases where there is no monopoly and everyone is free to supply the commodities in such quantity as he chuses." (Ricardo, 1917, PP. 49.)

competitive situation an individual would be forced to sell a good at its cost[15] (the cost of the labour required to obtain the good) because if one tried to sell the good for more, others would compete to supply it. This is the mechanism that drives an efficient market under competitive conditions. Smith defined perfect equilibrium value as the fair or 'natural' value of a good. It was defined in terms of how much it costs in labour to obtain or produce it.

Some apologists of Adam Smith (Douglas, 1928; Richardson, 1975; Bowley, 1975) have maintained that Smith's labour theory of value was adapted to fit into a more complex system when he introduced payments to other factors of production and discussed more complex economic patterns. But, Smith did not deviate from this principle in the subsequent development of his theories of factors of production. Bowley (1975) maintained that he either replaced the labour theory or at the very least only considered the labour theory of value to apply to hunter-gatherer societies. Adam Smith's original theory of value remained consistent throughout his analysis of other factors of production, which included capital and land. Smith explained both the ownership of property and the use of capital using the labour theory.

> "The real value of all the different components of price, it must be observed, is measured by the quantity of labour which they can, each of them, purchase or command. Labour measures the value not only of that part of price which resolves itself into labour but of that which resolves itself into rent, and of that which resolves itself into profit." (Smith, 1776: p. 153).

Complexities were introduced with the concept of ownership as owners of land took payments, which would otherwise go to labour. Smith's analysis provided Karl Marx (1867-95) with tools for the development of his economic theories of exploitation and alienation and

[15] Cost in this sense would include some profit. In Smith's view the profit portion was just enough to provide the incentive for the individual to undertake the task.

provided Proudhon (1840) with the analysis to declare that, “Property is Theft”. These philosophers reasoned that if resources were shared there would be no unfair allocation of returns. Smith was not as judgmental with respect to the propriety of property rights as were Marx and Proudhon; he simply used the logic of his system to analyze the economy.

Karl Marx looked for the fundamental measurement of value between individuals. He identified labour as the basis of such socio-economic relationships. Those who worked created value. Those who did not, did not create value. Marx was concerned about the justice of a system that rewarded those who did not work and he was able to identify essential elements of the business cycle based upon his labour based analysis of the economy. (Karl Marx, 1867-95)

The weakness of the labour theory of value is not the relationship of labour to land or capital but its failure to account for the effects of scarcity on economic behavior (Marshall, 1890). Even in the absence of property rights, when goods become scarce, their exchange value changes. In such cases, the exchange value of a good is determined by supply relative to demand. The exchange value may be much higher than the cost of obtaining or producing it. The limit of Smith’s labour system of analysis was not that other factors of production affect the “natural price” of a good, but that relative and absolute scarcity cannot be adequately explained using a labour cost system. Marshall (1890) used imaginary rocks falling from the sky to illustrate the fact that a scarce and productive substance can be valuable without containing labour (Marshall, 1890). In designing the theory of the natural price, Smith’s assumption was that these basic economic factors were not scarce. In an individualistic society, scarcity raises prices above their costs. True scarcity (that is scarcity not created by ownership or social or legal hierarchies) is not an interpersonal issue. Scarcity affects everyone in a group or society. Labour can only measure scarcity to the extent that applying more labour will result in obtaining

the good that is scarce. Once no amount of labour can produce more, the value of scarce goods is determined by how much they are needed or wanted.

Mill (1859) proposed that utilitarianism or attaining pleasure or averting pain were the true basis of human values. However, this happiness principle was to be pursued only within the parameters of justice and the objective values of Christianity. Mill maintained that the philosophy of utilitarianism was so magnetic that even those who repudiated the theory obeyed many of its principles. The School of Utilitarianism, which represents the beginnings of modern utility theory, was based upon the ideals of "utilitarian morality" (Bentham, 1780). This school taught that a true utilitarian would sacrifice ones own interest to increase the sum total of happiness, to promote the general good.

> "In the golden rule of Jesus of Nazareth, we read the complete spirit of the ethics of utility. 'To do as you would be done by,' and 'to love your neighbor as yourself' constitute the ideal perfection of utilitarian morality." (Mill 1861: p. 204).

Mill also emphasized the relationship between the individual and society in terms of freedom and the public interest (Mill, 1859). This principle allows maximum freedom for the individual to experience fulfillment, limited only by actions that would harm the society. From this base, economic philosophers imagined a condition where goods would be allocated in such a way as to maximize the satisfaction of an entire nation, where the reallocation of goods or services could not increase the summed satisfaction of the whole (Bentham, 1780). Utility became an important system of measuring value.

Utility; Objective and Subjective Values

Although the concept of absolute worth or objective value may be morally attractive and useful in establishing institutional standards, the translation from an ethical precept to a complete

system of measuring exchange value is a large leap. Even though objective concepts of value have played an important role in the development of institutions, subjective values have formed the basis of measurement methods. Objective values are very difficult to observe. Early Utilitarianism wanted to measure value using the concept of a util or a standard or objective unit of utility (Bentham, 1780). However, it was difficult, if not impossible, to measure or observe the utility or quantify the satisfaction that a particular good would produce in a particular individual. We can observe that individuals make choices with every purchase they make. Using a defined currency, we can observe how they rank goods in terms of preference. A robust system of valuation can be derived from this preference ranking. The subjective choices of individuals generate an exchange process and a market system from which market or exchange values can be obtained. In addition, measurements of the willingness to pay can generate demand profiles that inform values without considering supply. Therefore, the subjective expression of preferences can generate a system of valuation without attempting to apply an objective measure of value such as a util.

However, total willingness to pay does not incorporate the idea of the public interest. The total willingness to pay only reflects the sum of wants, needs and desires rather than a true estimate of value. The laws that define the limits of accepted human behavior must be in place to defend the public interest. Subjective values must be tempered by general moral or objective principles that reflect our social nature before the system is complete.

The Importance of Scarcity

The neo-classical economists emphasized use value (utility) and scarcity as the fundamental variables in establishing value. Economics was defined as the application of scarce resources to alternative uses (Samuelson & Scott, 1966). Smith (1776) discussed the principle of

scarcity in determining rents of land. When land is scarce, an owner can extract rent from the land by paying labour only the costs of maintaining the labour with food and shelter, and the costs of seed for the next year. Labour becomes a commodity rather than the basis for exchange. Ownership of scarce resources forces a change in social relationships (Marx 1867-95). It causes labour to be sold at the cost of labour's maintenance, in much the same way that one would "value" a slave or "price" a competitive commodity. A slave labour society was not the free, egalitarian society imagined in the writings of Mill (1861). If equally productive land were in unlimited supply, there could be no rent. If a landlord attempted to charge rents, then farmers would cultivate other land and commodities would again trade based on only their labour value. Therefore, it is scarcity that causes rents, not ownership.[16] The laws of ownership determine to whom the rents will flow. However, laws permit owners to decide what use land shall be put to and in this way, can influence the quantity of resources available for different productive activities.

When there is a limit in the finite supply of a resource, when labour cannot produce more of a commodity, scarcity plays a role in its value. Therefore, it is important to look more generally at the role of scarcity in the economy and its role in the determination of value.

Can the diamond / water paradox be explained by scarcity? Is water cheap because it is plentiful and diamonds expensive because they are scarce? No. Water trades at its cost of production and diamonds are not truly scarce. More diamonds can be obtained through more

[16] Rents can be obtained by the temporary scarcity of capital. This topic has not been discussed above, yet it is an important source of rents and is an important scarcity. Capital can play a similar role in obtaining scarcity rent as land in circumstances where the specific capital is difficult to produce in a timely manner. The rents of capital are eventually reduced to the natural value (cost) as the market produces more capital. Ownership of patents, copy write and other legal forms of creating scarcity are based upon the same principle.

effort.[17] [18] Therefore scarcity does not explain the value of water or diamonds, unless scarcity is artificially caused by the ologopolistic activities of the diamond cartel.[19]

However, there are absolute scarcities where no amount of labour or resources can produce more product. For example, there may be a one-of-a-kind painting or object d'art. From the labour point of view, an object d'art could be valued by measuring the skill or store of labour of its creator. The labour theorist may even propose that some people have more skill – created by practice (stored labour) and education (stored labour) in their craft. They may stubbornly maintain that the object d'art is made up of the labour embodied in the product. But practice, education and stored labour cannot explain the great fortunes for which some paintings are exchanged.

When there is no ability to produce more product of a particular type, demand for that product can push its price or value higher without a change in the characteristics of labour or costs. This type of scarcity affects the exchange value of items beyond the contribution of labour. This is the fundamental limit of the applicability of the labour theory of value[20] (Marshall, 1890). Modern analysis of demand and supply completes the neo-classical theory of value by incorporating scarcity (Walras, 1874).

Scarcity is common in a hunter-gatherer society even with no ownership of land and a relatively small amount of capital. In such a simple economy, there still can be competition, e.g.

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[17] Diamond production is not close to being exhausted. Scarcity is introduced into diamond markets by marketing organizations not through lack of diamond mining opportunities.

[18] The marginalists have shown how supply costs or labour costs can increase as more of a product is required. The initial production of the product may be quite a bit lower than incremental production. As a result of this process, the price of the commodity may be determined by the higher marginal cost and the lower cost producers may have an opportunity to reap differential rents. These rents are caused by the scarcity of resources that are equally productive. Ricardo was the early marginalist.

[19] The price of diamonds has been promoted by the marketing practices of large mining and distribution companies. Debeers has "managed" the diamond market. However, recent discoveries in Canada may introduce more competition into this market.

[20] A. Marshall described using the labour theory of value as "cutting with one side of a pair of scissors."

over an attractive mate or an excellent sled dog for which there is no replacement. In these cases, scarcity is absolute; the goods cannot be duplicated by labour. In such circumstances scarcity relative to demand will play a role in determining the value of a good. However, this does not destroy the usefulness of the labour theory of value. In fact, it liberates it, because the limits of the theory are more clear and it becomes easier to apply properly.

The Neo-Classical Concept of Value

Neo-classical exchange value is determined by the interaction between the demand and the supply of various goods in a market. Demand is established by the choices made by consumers based upon their wants and needs. Supply is determined by the ability of producers to provide goods and services to the market place.

Altruistic or objectively based values such as the preservation of species or egalitarianism only exist in such a system as values held by some individuals. Values are dependent on the focus and understandings of those doing the valuing. There is no objective value in such a system. This theoretical approach is philosophically equivalent to the idea that when the tree falls in the wilderness and no one hears it, it makes no sound. The idea that all value is determined by the sum of individual behavior omits the fact that society or groups have their own interest and values which often conflict with the sum of individual desires. These social values exist even if we choose to ignore them, and so if the tree falls in the desert it creates sound even if no one is listening.

The system of subjective values also depends upon the rationality and efficiency of human judgment. Galbraith (1965) has described the capacity of advertising to create or control demand. If willingness to pay can be manipulated by economic actors with significant economic power, does demand for such products represent real value? Despite the lack of inclusion of

objective values and human frailty, the subjective concept of value has been very effective in defining both restitution values and exchange values within a market economy. The market system facilitates the valuation of or replacement of goods and services lost due to torts or expropriations. Both costs and preferences are included in methods of valuation and in many cases the relative valuation of effects of scarcity can also be measured. This system does not contradict the labour theory of value; it represents a more general and complete system. However, it too has important limitations.

Institutional Limits of Valuation Theories

Just as the labour theory of value does not measure absolute scarcity, the neo-classical model of valuation also has constraints and limitations. Despite the efforts of institutions to create an environment that contains efficient markets, most markets suffer from imperfections (Samuelson and Scott, 1966) and in some cases markets or economies fail (Marx, 1867-95). As Ricardo (1917) remarked, valuation systems require that the assumptions hold and there is institutional stability. Scarcity can have the effect of breaking down the stability of the society's institutions when people begin to fight or struggle for survival.[21] As the stability of society breaks down choice is replaced by coercion and value is not measurable in the same sense. Physical force or violence or even full-fledged war can result when essentials become scarce. In such circumstances, goods are taken by force, not exchanged.

Market imperfections can also cause exchange values to vary. For example, if theft is high, those who steal obtain their goods close to free and prices may increase to cover the cost of theft. Neither condition involves a true exchange value.

[21] Such situations such as the 19th century potato famine in Ireland can cause markets to break down.

Within a market economy, purchasing power represents one's ability to participate. When income and wealth are unevenly distributed, a true picture of wants and needs may not be reasonably represented by the purchasing system. Markets may be affected by uneven allocation of information, e.g. insider trading problems, or by errors, because people err in producing or purchasing what they really want or need. Markets are affected by a lack of sufficient sellers or buyers, such as in monopolies or monopsonies, and by imbalances in resource ownership or property control. Each of these effects can cause problems with market valuation methods.

Markets require cooperation and an institutional structure to function; the role of objective values is to provide the basis for that structure and stability. Although the interaction of demand and supply may be able to measure the relative value of some forms of scarcity, it can only measure these values if the scarcity does not produce instability within the institutional structure.

This idea of fairness has been associated with value as in the expression "the fair market value" indicating that there was not any manipulation or failures in the market from which the valuation was obtained. Stability is relevant in the context of subsistence and developing societies where the essentials of life may not always be available. Markets are often dominated by monopolies, or they suffer from lack of information, insufficient consumer knowledge, and inequality of income distribution. Therefore, there are significant institutional limits to using neo-classical market analysis to measure value in these societies. The measure of value in the market system is not only molded by the underlying value system but is affected by the efficiency with which the system is implemented.

As noted above, laws create the institutional environment within which goods are valued. Laws may promote the principles of equality and freedom but the realities of ownership and

monopoly affect the way things are valued. In current market economies, mainstream values and laws tend to support economic development whether it is in the form of free access or official monopoly. Indigenous people, who have foraged for their livelihood, may not have the legal ownership to support their values and their economy. The preservation of the ecosystem or the subsistence economy may be more or less "valuable" depending upon the legal context. Laws and institutions may or may not be based upon universal principles.

The Contribution of Neo-classical Economics: Consumer Surplus as Social Value

A very useful analysis of individual consumer values is well defined in the concept of surplus value (Marshall 1890). In the theory of market demand, the value provided by a good can be represented by the consumer's willingness to pay. A demand curve represents the amount that consumers would buy at each price the good is offered (Figure 3.1a) (Marshal, 1890). If a good is inexpensive as denoted by Y2, consumers may be willing to buy more, as in quantity X2. As the good becomes more expensive (Y1) consumers can afford to buy less (X1). Therefore, the area under the demand curve is a representation of a consumer's willingness to pay for that good at various different prices. The demand curves of individuals can be summed to generate a total demand curve of all consumers' demand for a particular type of good (Figure 3.1a).

Theoretically, the potential value of the good to society could be measured by the amount that all consumers were willing to pay at the various prices the good could be offered.[22] The

[22] This idea assumes that all relevant values are expressed within the context of the market. In other words, there are no benefits obtained that are not quantified by the marketplace. The demand curve is a measure of the quantity of goods that would be consumed at exchange-values. The basis of the curve is an exchange value within a market context not a measure of the entire willingness to pay under all circumstances. We assume that the normal assumptions of the market apply including that the market is stable and there is appropriate knowledge about the products. Given a limited and stable market for drinking water, one could not assume that the long-term value of

area of the triangle ABC in Figure 3.1b represents this value (Freeman, 1993). If through the interaction of demand and supply a market price is established at a level D, then there would be two areas of surplus under the demand curve (Marshall 1890). The costs to society are represented by the cost curve, which passes through the demand curve just below the price level at E. The area DEF would be *producer surplus*, or the total quantity the *producers* would receive above the cost of production for the goods. The area ADE would be *consumer surplus* or the net value to the *consumers* above the price of the goods – which would be their cost. This represents a level of willingness to pay prices above the market price.

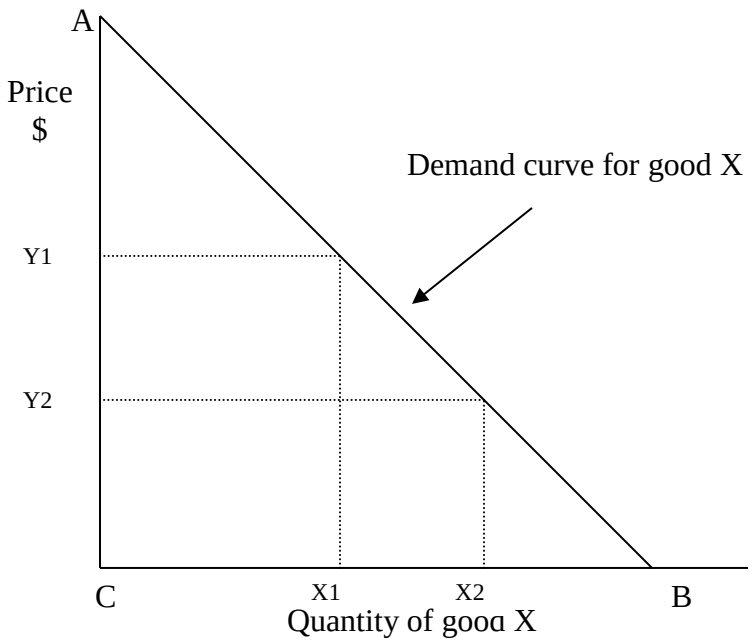

Figure 3.1a – Demand curve - a representation of willingness to pay

water to the society could be measured by the area under the demand curve for water. Clearly, because water is essential for existence, under conditions of scarcity, its value could be priceless. However, given normal goods within a stable market system exhibiting an ability to substitute, the value of any one good to the society could reasonably be represented by the value determined by the area under the demand curve.

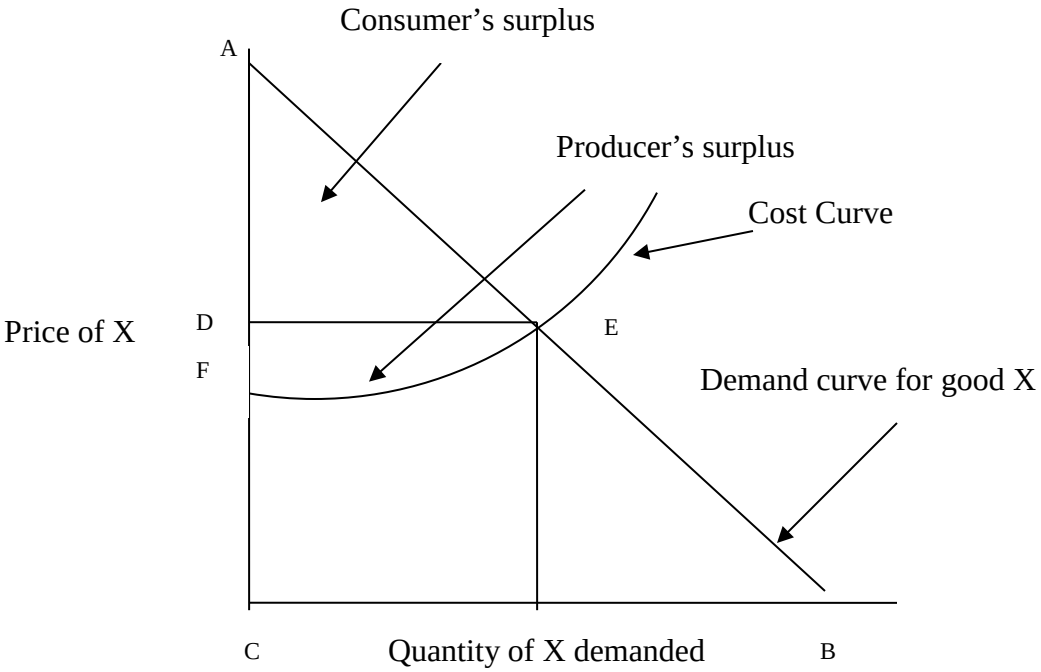

Figure 3.1b – Demand curve showing surplus values

The interaction of demand and supply in each market involves the application of the willingness to pay for each good. A change in the supply or price of one good may affect the amount purchased of another good. The system is complex and inter-related. Surplus value represents the basic concept of economic welfare and provides a conceptual framework for measuring changes in welfare. A more in depth discussion of neo-classical economic welfare theory is presented in Chapter 4 as the time / labour valuation method is explained.

A Socio-economic Theory of Value - Beyond Markets

Anthropologists have long been involved in assessing the range of value systems of different societies. They have supported the concept that the value of a commodity is measured

by its value to the consumer (Chibnic, 1978). This concept is consistent with neo-classical economic theory in that utility theory is also based on such consumer values. Such an approach allows one to assess the value of different commodities without the presence of markets or when markets may not properly represent the value of a good to a particular group. For example, a common currency used by some Anthropologists in non-market assessments is calories or weight of meat. The principle of measuring consumer value rather than market value is also applied by the common law system when assessing losses to an individual in cases of expropriation (Mainville, 2001). In such cases the value is identified by the direct values of the individual rather than the exchange or market value. The value held by an individual is specific to the relationship between the individual and the property being expropriated and therefore must be measured in terms of the specific utilities lost by that person having the property expropriated.

The field of economics also addresses the issues of non-market assessment of values. These approaches are discussed in more detail in the next chapter. The field has extensive literature focusing on valuation of environmental amenities.

The key principle is that those who consume or hold the values determine value.[23] The challenge is to create systems of measuring values that can be applied to diverse cultures and legal circumstances.

Socio-economic Values

The values of every society are set in a social and environmental context. Even when no market is involved and no exchange takes place, values are still expressed. Can a concept be defined that encompasses the expression of such values in any society? Values are defined by the actions of peoples within a stable economic and social context as they make choices and

[23] Within the context of the institutional framework discussed above.

decisions to maintain their livelihoods. Exchange or market values are only one form of a larger set of values, which could be called socio-economic values. Socio-economic values would include values not only assessed by a market structure but also values expressed in subsistence economies as people make choices about their livelihoods. **Socio-economic values must also include the values expressed by societies and groups in their laws, traditions and cultural practices.**

By using some of the tools provided by history and economic and anthropological theory, one should be able to design fair and consistent methods to measure social or socio-economic values in different societies.

Application of Valuation to Aboriginal Traditional Economies

One interesting tool was to measure the way hunter-gatherers allocate a most scarce currency, their time. The allocation of time provided me with a method to assess their willingness to pay, in units of time, for any particular good or a group of goods. In this way, I was able to measure the various amounts of time that a family or livelihood unit is willing to allocate or pay for different commodities or groups of goods. This method is not only consistent with the idea of willingness to pay (Freeman, 1993), but it is also consistent with the theories of labour value espoused by Adam Smith (1970: 1776). However, I know that the use of allocation of time may be unable to capture or measure all values such as group values. If the allocation of time is considered equivalent to labour and we were to use labour as the measure of willingness to pay (the currency or as a measure of value) we know that the experiment must meet specific conditions.

I know that individual ownership of land can cause misallocations in the relationship between the price of labour and value. However, the hunter-gatherer society I studied generally

did not have individual land ownership, their land tenure systems although well-developed were quite different than the exclusive ownership that caused reallocation of returns in a market economy (Kelly, 1995).

According to Smith, those who own capital can trade with those without capital to obtain their labour for a price different from the price embodied in a good. However, in many hunter-gatherer societies capital accumulation is relatively low (Hearne 1789; Kelly, 1995; Winterhalder, 1997) and capital is often shared between hunters (Kelly, 1995; Winterhalder, 1997; Helm, 1965). Capital allocation decisions should not affect valuations based on a labour allocation since simple capital contribution calculations can be included in the analysis.

The economy must be stable and that the relevant goods must not have significant elements of scarcity involved in their supply or the supply of goods used to obtain them. In a stable sustainable hunter-gatherer society resources must meet the requirements of the society. Scarcity may be an issue in some circumstances when resources are overused or catastrophic events such as wars or volcanic eruptions occur. Because it does not seem to violate the required assumptions, it appears that the use of labour as a measure of value in a hunter-gather society could be appropriate. This is consistent with Smith's initial theory.[24] Using labour time as a currency should allow me to measure the 'revealed preferences' of the aboriginal subsistence hunters and gatherers. However, is all labour time equivalent? For example, some labour may be more important to the society, such as the labour of the male hunter is more important to the survival of the group than the labour of a child. Further, is the labour of one hunter equivalent in value to the labour or time of another? Also, is all time equivalent in value? Are there more or less productive times? Are leisure times less productive and therefore less valuable than hunting or preparation time? These issues are discussed below.

[24] Adam Smith's quote about deer and beaver from Wealth of Nations (1970:1776) page 150.

Welfare Measures

By measuring the labour allocated to various tasks I can measure how they "spend" their time. In many hunter-gatherer societies the allocation of time determines the group's survival success. Time is a scarce commodity that they must allocate carefully to different occupations, not only to obtain the goods they require or desire, but to ensure their survival. By selecting different occupations, the hunter-gatherers reveal their preferences for certain goods and provide us with an opportunity to record their revealed preferences. The productivity of each hunter-gatherer may vary depending upon their experience, their skill and their relative efficiency. The fact that the productivity of each hunter-gatherer varies makes it difficult to sum or compare the time or labour of different hunter-gatherers or the same hunter-gatherer doing different tasks at different skill levels. However, ethnographic studies of the nature and structure of hunter-gatherer societies may offer some answers in how to deal with these challenges.

Measuring the allocation of time in a stable hunter-gatherer economy allows the observation of a specific combination of choices given a resource allocation and specific needs and wants of a community. However, when the costs or required time to obtain a commodity changes, how can the welfare effects of such a change be measured? The following chapter includes a more detailed discussion of welfare economics and the measurement of the effects of such a change.

Conclusion

Different philosophers claim that value stems from either objective or subjective principles (Kant, 1763; Nietzsche, 1883). Both subjective values and objective concepts must play a role in modern valuation. As discussed above, objective values (human rights, equality,

freedom, justice) provide the philosophical underpinnings of our national and international legal institutions (Perry, 1926). Subjective values form the basis of demand theory (Marshall, 1890). Perry (1954) draws the connection between principles and the structure of our institutions and laws. The laws, in turn, create the institutional environment within which values are set. Even though these concepts stem from western philosophy, they could be applicable to other value systems, cultures and societies if one pays particular attention to the differences between western civilization and other cultures. The example of residential schools in Canada reminds us to avoid the tendency to impose dominant values upon a less dominant individual or group (Stern, 1932).

Within the ethical framework of western thought, Smith (1970:1776) divided values into exchange value and use value. From this classification come the ideas of labour (supply cost) and utility (demand), the basic tools for valuation. Investigation shows that the labour theory functioned under limited assumptions. Labour would not command its full value when dominated by capital or land and does not account for scarcity. A more complete theory of value includes both supply and demand (Marshall, 1890).

However, it is apparent that even when market values are used the accuracy of such evaluations depends upon the adequacy of the market process. Markets often have imperfections and can even break down. Neither do markets exist for most environmental amenities, nor can they measure the long-term value of an essential resource.

Classical valuation methods are based on the choices that consumers make within their economic supply structure. Aboriginal peoples spend their time producing and consuming the things that they want which is similar in many ways to the way money is spent in a market economy. Therefore, their time could be used to assess their valuation of various goods. This is a variation of the labour theory. I conclude that it can work if land and capital do not interfere,

the economy is stable, there are no dominant scarcities and individual choices are representative of the general values of the group or society. Therefore, measuring aboriginal values using labour can work. This method appears to be consistent with both utility and labour theory and relies upon the values and culture as the Aboriginal people express them. Aboriginal people include considerations of their institutions, customs and social structure in their allocation of time. Therefore, this method is not simply a minimization of cost but a complex system of socio-economic value distribution.

CHAPTER FOUR: THEORETICAL, ANTHROPOLOGICAL AND LEGAL CONSIDERATIONS

As stated in Chapter One, the goal of this research was to find a method of valuation that would be acceptable, understandable and applicable for use in negotiations involving significantly different Canadian cultures. Such a method could provide a basis for negotiations between Aboriginal peoples and Canadian governments and corporations. To be acceptable, a method that measures the value of an Aboriginal subsistence economy should be consistent with fundamental human values. To be understandable the method must be consistent with a range of philosophical value theories and to be applicable it must ensure consistency with the legal entitlements of the Aboriginal peoples of Canada. This chapter discusses the theoretical requirements of such a system in the context of Aboriginal rights.

The Impact of Aboriginal Rights on Valuation Methods

Canadian Aboriginal legal rights are defined in the context of the pre-contact distinctive culture of these peoples (*Sparrow*, 1990, *Van der Peet*, 1996). Section 35 of the Constitution Act, 1982, defends these rights. The constitutional protection of Aboriginal cultural rights raised the stature of Aboriginal cultural and economic practices to a level equal to or above other Canadian cultural and economic standards. This legal structure introduces requirements into a valuation process that are not necessarily present in other valuation problems. As a result, Aboriginal traditional preferences and cultural frameworks can no longer play a secondary role in valuation theory.

Aboriginal philosophies and worldview are different from European philosophies and worldview (Batteste and Henderson, 2000). Their traditions may contradict conventional

economic assumptions. For example, their standards of resource use include sharing rather than competing (Kelly, 1996), satiation instead of assuming more is better, and different concepts of ownership (Kelly, 1996).[25] Because their activities reflect different understandings, a method used to value the traditional aboriginal economy must be sensitive to the cultural basis of their economy rather than defaulting to the neo-classical economic paradigm. The Supreme Court of Canada has acknowledged the connection between aboriginal land use, aboriginal traditional activities and maintaining aboriginal culture (*Sparrow*,1990; *Delgamuukw*, 1997). Because the Aboriginal relationship to the land is key to maintaining cultural identity (Daes, 1994; Battiste and Henderson, 2000) Aboriginal peoples' ability to access their lands, continue their cultural practices and traditional economic pursuits, are important parts of their constitutional rights.

Aboriginal people have the right to continue their hunting traditions in their preferred manner (*Sparrow*, 1990; *Delgamuukw*, 1977) and they can defend their rights to do so. The law will allow such rights to be infringed (justified infringements) if the infringement is in the public interest and the infringement process follows a specific procedure. However, according to the Supreme Court, (*Sparrow, 1990*) there are limits and preconditions to justifiable infringements. Some infringements may only require notification. But some Aboriginal rights (those which are so fundamentally important to the maintenance of Aboriginal culture) can only be infringed with the full consent of the Aboriginal people (*Sparrow*, 1990). In any case, infringements of Aboriginal rights require consultation, an assessment of damages and payment of compensation. Unjustified violation of Aboriginal rights may involve punitive damages.

In *Sparrow* (1990), Chief Justice Lamer outlined a now well-known formula for deciding whether or not an infringement of aboriginal rights was "justified" or "unjustified". Before any

[25] Robert Kelly's 'The Foraging Spectrum' surveys hunter gather societies and provides a range of ownership systems and relationships to the lands.

infringement can be justified, a process of consultation must take place. The consultation must determine the significance of the infringement. Significant infringements are considered unjustified if they substantially and permanently affect aboriginal peoples' ability to maintain their culture and traditions. Therefore, the consultation process should include an assessment of a project's effects on the culture, traditions and traditional economy of the Aboriginal groups. Significant infringements can only be justified after obtaining the consent of the Aboriginal people. In each infringement there may be an economic loss for which the Aboriginal people might require compensation. A major challenge in consultation and negotiation is to obtain a mutual understanding of the economic value of various traditional activities. Such an understanding will aid in the assessment of infringements and facilitate agreement and the consent of the Aboriginal people. Because the definition of aboriginal rights relies upon distinctive characteristics and practices before contact, a value assessment of the aboriginal rights must consider the historical and anthropological context of the aboriginal culture and utilize a currency which is consistent with their preferences and cultural paradigm.

Specific Treaty 8 Property and Harvesting Rights

Currently, different Canadian Aboriginal societies have a range of rights depending upon their legal and social circumstances (Borrows and Rotman, 1998). Aboriginal hunting and gathering rights in northern Alberta are identified in a clause of *Treaty 8*, in the *Natural Resources Transfer Agreement* of 1930, and are affirmed in the *Constitution Act, 1982*. The *Treaty* allows lands to be taken up for the purposes of settlement and sets conservation limits to the rights to hunt, trap and fish, (Treaty 8, 1899). The courts have stated that Aboriginal people may exercise the right to hunt, fish and trap in their preferred manner (*Sparrow*, 1990; *Delgamuukw*, 1997). In *Halfway River*, Justice Southin, in her dissenting opinion, stated that

there is a limit to the lands taken up clause in *Treaty 8*. She maintained that the ability of the aboriginal people to continue to hunt, trap and fish cannot be entirely removed through the lands taken up clause without a material breach of *Treaty 8* (*Halfway River*, 2000). In economic welfare terms, these rights to hunt, trap and fish could be characterized as rights to maintain threshold levels of harvesting opportunities. These must be viewed as an entitlement and a charge against the area ceded by Treaty 8. This point is forcefully contested by the Provincial Government (Alberta Government, Aboriginal Position Paper, 2000) but the Provincial Governments have no better title to their lands than the title transferred to them in the Natural Resources Transfer Act of 1930. The rights to hunt, trap and fish were present on the lands when they were transferred. The loss of such harvesting rights must be measured as a loss of an entitlement and this implies the use of a willingness to accept measurement. This is discussed further below.

Not only do these rights represent a burden upon the Treaty areas, the burden may be onerous. What may be viewed from an industrial perspective as a subtle environmental change may be very significant to the Aboriginal hunter-gatherer. Proper consultation is one of the important provisions for determining whether or not an infringement is justified or not. Consultation must determine if the changes are significant and if so how significant. In addition, the *Sparrow* (1990) decision outlines a threshold amount of traditional resources must continue to be available to allow the Aboriginal people to harvest those resources in their preferred manner and grants Aboriginal peoples a priority over other Canadians for use of these traditional resources for food, subject to conservation (*Sparrow*, 1990). Given the strength of the aboriginal rights and the great extent and intensity of oil sands and other commercial resource development in the traditional area of Fort McKay, I inferred for my research that development is already

infringing aboriginal rights and that further development will continue to directly reduce their ability to obtain traditional resources. This assumption would of course have to be tested in the courts.

The 'plenty of hunting land remains' Argument

According to *Treaty 8*, the Aboriginal people are entitled to harvest resources "as they had in the past" (*Treaty 8*, Fumaleau, 1973). Yet their hunting area in northeast Alberta is being reduced by massive oil sands and other development. After each square kilometer is razed, hunting becomes more and more difficult and their preferred methods of hunting less possible as less habitat is available for the animals they hunt. It is difficult to measure the amount of incremental change to the Aboriginal traditional economy caused by these developments when the hunters can theoretically move to new locations and substitute other resources for those displaced by development. The idea that hunters can move to other areas is only true to a limited extent. Their ability to travel long distances following traditional sources of game has long since past (Mathewson, 1974). Traditional hunters of the 20th century were familiar with certain specific ecosystems and the environment of a designated area. Their ability to substitute new areas was limited. The Supreme and other Courts have acknowledged this in decisions that outline preferred hunting rights (*Sparrow*, 1990; *Halfway River*, 2000).

Aboriginal Values versus Western Based Values

Aboriginal communities of northern Canada originally shared goods based upon social relationships rather than exchanging them in a market (Kelly, 1995; Winterhalder, 1997). They organized themselves into extended family structures rather than individuals (Helm, 1965; Krech, 1984; Kelly, 1995). They employed innovative sharing and bartering systems (Kelly, 1995; Winterhalder, 1997) and their concepts of ownership of lands and possessions were

culturally determined (Kelly, 1995). These characteristics existed within separate cultures and economies existing before European immigrants arrived. After the arrival of the settler society Amerindians maintained their cultures and livelihoods separate from the settlers.

The early American jurisprudence (Marshall, 1832) using the principles of common law, acknowledged, accepted and protected aboriginal cultural and livelihood within their communities, subject to the prior establishment of European sovereignty. The laws of the Aboriginal peoples were enforced by North American lawmakers. Their inherent rights to self-government and their unextinguished rights were recognized. In 1982, when these rights were included in section 35 of the Canadian Constitution, they could no longer be unilaterally extinguished by an act of Parliament. The Constitution now forces Canadians to accept Aboriginal values on an equal footing with western based values. Because many of the Aboriginal values are based upon a different social structure, a change in the approach to valuation methods is required.

Objective values are reflected in institutional structures such as laws, markets and social rules. The Canadian institutional framework (including our legal institutions) is based upon these widely accepted rules, which have developed from western concepts of universal or objective ideals such as justice and fairness. These same concepts of justice and fairness have acknowledged the Aboriginal inherent right to maintain their culture. It is a testament to the common law system that it has acknowledged these rights. The ongoing challenge is to understand how the rights will be maintained and how compensation will be calculated.

Within the bounds of the Canadian system of governance and justice, subjective values expressed in individuals' choices, provide the data used by economists to value particular goods or services (Freeman, 1993). The same basic requirements of any human society: food, clothing

and shelter and other important social relationships, are of course key values of Aboriginal communities in northern Alberta. People value certain basic aspects of their environment and act on those values within their own cultural and spiritual context. For this reason I believe that, if I am careful not to ignore key cultural values of the aboriginal hunter gatherer, I can use the actions of Aboriginal people participating in traditional activities to represent how much they value various products they produce and consume. However, those actions must be observed within their social and spiritual context and not within the context of the western classical assumptions or within the market paradigm that destroyed so much of their traditional livelihood (Tough, 1996).

Since welfare economics involves the analysis of consumer preferences typical in a market context and uses money as currency, (Freeman, 1993) it is difficult to directly apply these methods to subsistence economies (Brown and Burch, 1992). However, I considered it should be possible to analyze subsistence economies characterized by sharing and cooperation using the choices implicit in their economic (livelihood) decisions. In a similar manner to people in industrial economies, hunter-gatherers reveal their values through their decisions and actions (Samuelson, 1948). By observing choices, revealed or stated preferences can be defined (Samuelson 1948; Haener et. al, 2001). If a method can be designed to measure revealed preferences these preferences could be used to value their activities. However, to function properly non-market valuation needs a currency or scale for measuring values. In this chapter I look at the specific issues in designing a valuation system using time as a currency in a welfare model based on consumer choice, within the context of existing aboriginal rights and culture. I propose the use of labour time as a currency that is more consistent with Aboriginal worldviews, ownership systems and preferences and consistent with Aboriginal rights as protected by the

Constitution. Below, I discuss valuation tools based on this concept. I also discuss how anthropological research may assist in understanding Aboriginal economic behavior.

Is it Possible to Use Traditional Values?

From Chapter Three, we know that for subjective choices to define values, the institutional setting must be stable and not suffer from imperfections that would cause the valuation structure to fail. In the context of the Aboriginal society this means their traditional institutional setting must be stable. Unfortunately, Aboriginal institutional stability has been challenged by western immigration in northern Alberta for at least one hundred years. Western immigration and economic pressures had already destabilized the society as of 50 years ago, the earliest that we can obtain significant traditional harvesting data (Fumaleau, 1973). Therefore, it is difficult to assess the intervening 50 years. This issue has been complicated by the cultural extermination policies of the residential schools, federal policies against cultural practices such as sun dances and other assimilation policies. The best we can hope for is to discover some of the culture, values and livelihood that have survived from those earlier times.

However, northern Alberta communities like the community of Fort McKay were relatively isolated until the mid 1950s or 1960s and because the northern environment remained less depleted of wildlife, aboriginal people of the area were able to combine their traditional lifestyle with commercial trapping activities maintaining a significant traditional economy until the mid 1960s (Tanner et al., 2001). As a result of the preservation of a portion of the traditional economy, I was able to obtain some time based data from Elder interviews.

I searched for a system that was consistent with Aboriginal cultural, social and economic paradigms, but the dominant and pervasive effect of western thought and epistemology continued to be a significant challenge to finding an appropriate method. It is because of the

historical arrogance of western thought that we must be vigilant in avoiding convenient, familiar assumptions. The differences between Aboriginal and western thought are as basic as the structure of our languages. Latin based languages are object-based while many Aboriginal languages are verb-based (Battiste and Henderson, 2001). The implications of this basic difference may mean that a seemingly innocent change in assumptions of a behavior model could be absolutely contrary to Aboriginal experience and understandings.

Possible Valuation Solutions

Below I review some approaches that have been suggested or used to analyze aboriginal economic activities. First, I review the anthropological approach, then the mixed economy approach followed by the Household Production Model, the Travel Cost Model and a Hedonic approach.

Can Anthropological Methods Help?

Optimal foraging theory deals with the nature of allocation of time or energy to acquisition of resources, which vary in availability and quality (Pyke et al., 1977). Applied to hunter-gatherer behavior, optimal foraging theory can provide insights into hunter-gatherer economics and economic valuation methods. Optimal foraging studies contribute information about human behavior that is valuable and perhaps necessary to understand values and economic structure of the subsistence economy (Kelly, 1995). Ethnographic studies associated with optimal foraging provide significant information on subsistence economies that may be otherwise obscured by an ethnocentric dominant culture.

Aboriginal choices are of particular interest in valuation. An ethnographic study that applied diet breadth theory showed that on average the time to get a moose was reduced by 75%

with the advent of snow machines.[26] Winterhalder (1981) confirmed that when search costs declined, the diet breadth of the Boreal Forest Cree declined and they increased their relative consumption of moose.[27] This reflects the preference choices of the Cree related to the relative value of the moose compared to other food sources. As search costs declined due to the snowmobile, the Cree increased their relative consumption of moose rather than increasing their consumption of all types of game. The diet breadth model is an example of an optimization model using non-monetary currencies and uses currencies such as time and energy required to find and prepare prey.

In diet breadth models return can be defined as the amount of protein that can be obtained given search and capture costs. The costs of searching for and capturing different prey compared to the protein return from each prey helps to explain why, as travel (or search) costs decline, moose would be harvested more than other species. The diet breadth model is based upon responses to the differential net caloric value of resources. However, preferences may have developed from cultural factors such as the taste of the meat or the status associated with the type of animal killed (Marks, 2003). Optimal foraging analysis may be used to quantify and rank the labour cost or economic costs of acquiring different resources.

If one could estimate the effects of changing resources and technology using optimal foraging theory, compensated demand curves (Hicks, 1946) might be simulated providing a method to better estimate the real value of resources to Aboriginal peoples.

[26] This result has been reported by Winterhalder (1977) and has been confirmed by Elder interviews in Fort McKay by Tanner et al. (2001)

[27] The search curve shifts to the left thereby shifting the optimal point to the left, decreasing the optimal number of animals included in the diet.

Biological Fitness or Preferences and Utility

Winterhalder (1983) modeled hunter-gatherer choices using an optimal foraging model wherein time is invested to produce various levels of fitness (rather than utility). These optimal foraging models were originally adapted from economic theory to fit into animal and human ecology. Fitness is used to be consistent with the field of human ecology, which is based upon theories of survival and reproductive success. There are important assumptions made in this modeling framework, which I believe do not properly represent the hunter-gatherer societies. There appears to be no good reason to limit the aspirations of the hunter-gatherer to ecological fitness. In fact, such an assumption limits these people to motivations usually attributed to much less complex beings. Making such a limiting assumption about fellow human beings could expose the researcher to accusations of racism or ethnocentrism. Certainly, hunter-gatherers share the human diversity of interests embodied in the concept of utility. Nevertheless, optimal foraging literature discusses the concept of time optimization in hunter-gatherer foraging activities. Hawkes et. al. (1985), Hawkes (1986) and in E. Smith (1987) discuss whether hunter-gatherers pursue "quantity maximizing" behavior or "time minimizing" behavior. E. Smith (1987) argued that the micro-economic theory of time optimization provides an adequate explanation of both activities on the same continuum. Hawkes (1986) argues that empirical research will help determine the possible shape of fitness curves and time allocation. She notes there is significant variation of activities within hunter-gatherer societies not only between sexes but also between hunters of different skill levels and she laments the inability of fitness to measure the value (costs and benefits) of non-foraging activities in terms of fitness. Again it is unfortunate that they have restricted the discussion to fitness optimization rather than assuming

these hunter-gatherer societies optimize the broader concept of utility. Utility explains the relative value of leisure, reproduction and even tolerated theft. Hawkes quotes Marshall Sahlins to bolster the criticism of utility theory as a flawed method of representing human ecological behavior. I believe that it is the use of fitness as the objective function that limits the scope of the optimal foraging analysis of Hawkes et al. (1985) and E. Smith (1987). Utility can accommodate the variations in behavior and so called non-economic decisions. Why not assume that hunter-gatherer human beings are able to make decisions based upon their preferences rather than assuming that their decisions are hard wired to some biological imperative? Rather than focusing upon biological fitness, I believe that the key to understanding the values of aboriginal peoples is to understand their preferences within the context of their choices and their culture. An appropriate valuation model should include their expressions of value rather than measuring their survival efficiencies.

Two Separate or One Mixed Economy?

It is apparent that aboriginal peoples in northern Canada are in the midst of a radical social change, which is having a large effect upon their evolutionary development. Hunter-gatherer societies have been and continue to be impacted by major modern industrial and social developments (Usher et al., 2002). The culture, spiritualism and economies of these societies are also changed and impacted as a result of both external influences and their preferences. Usher et al. (2002) discusses the changes in the northern aboriginal communities, which were formerly hunter-gatherer societies and now they characterize them as having a '*mixed subsistence-based*' economy. Usher et al. (2002) note that:

> " …(S)ubsistence activity does not constitute a separate and distinct economy in northern communities, but is combined, at the individual, the household, and the village level with

wage labour and transfer payments. People move between subsistence and market activities, depending on opportunities and preferences."

Usher et al.(2002) then develop a model based on the household as the economic unit of these arctic communities. The model proposes that the consuming and producing household functions are a "micro-enterprise" but instead of maximizing profits and accumulation, it minimizes costs. The basis for this division is that, due to cultural traditions, there is considerable sharing between households and as a result the effective efficiency parameter is the minimization of cost rather than the maximization of profit. It is interesting to note that they propose the use of neo-classical definitions of land, labour and capital to structure the production model, and they maintain that these categories are appropriate for modeling the mixed, subsistence-based economy even though some village economies may not be significantly integrated into the market economy.

Usher et al.(2002) makes the argument that "Individuals who operate in both the market and subsistence spheres must use some form of common measurement of opportunities and values because they are frequently calculating the returns on both cash and non-cash earning activities so as to maximize efficiency or minimize costs." (Usher et al., 2002)[28]

Usher et al. (2002) used a version of the household production function originally introduced by Becker (1965), which broadens the simpler neo-classical analysis by combining productive capacity with the typical consumption activities of the household. As Usher et al. stated, this analytical framework seems to fit the aboriginal mixed economy perfectly by adding some assumptions such as the observation that the objective is to minimize costs rather than maximize profits. However, there are several issues not addressed by this model. First, Usher et al. (2002) do not specifically address the valuation of subsistence or non-market production,

[28] Usher et al. refers to Smith's article on Inujjuamiut Foraging Strategies – Evolutionary Ecology of an Arctic Hunting Economy (Aldine de Gruyter, New York).

which is the basis of the hunter-gatherer economy. Second, they do not address the fact that Aboriginal peoples have lost access to their traditional economy against their will and contrary to their rights as protected by the Canadian Constitution; therefore, they have not chosen to change their livelihood or their preferences. In addition, Usher et al. proposes that by participating in both the wage economy and the traditional economy that the Aboriginal people now have one "mixed economy" rather than two separate economies, one traditional and one market-based. This assumption implies that the Aboriginal person assesses their opportunities on the basis of a common measurement effective in both cultures, economies and societies. Unfortunately, this proposition denies the true duality inherent in their situation. It denies the cultural importance of their traditional activities and the systemic destruction of their traditional society.[29] As argued in Chapter 2, the replacement cost methods used by Usher in the past suffer from significant problems associated with the true preferences of Aboriginal people. Perhaps more important is the effect of Aboriginal constitutional rights on how traditional activities should be valued. Since 1982, Canadian law no longer supports the assimilationist view of the traditional economy. The assumption that the Aboriginal economy is a 'mixed' economy does not allow a separate evaluation of the aboriginal rights and lends itself to an assimilationist approach.

Is The Household Production Function Appropriate?

The household production function framework includes relevant and interesting information that may contribute to the construction of an acceptable method of valuation. Gary S. Becker (1965) developed the household production function. This model adds a layer of variables between the purchase and consumption of market goods by individuals and households.

[29] I discuss the implications of the assumption that market based dollar values are transferable to the Aboriginal traditional economy below. The implication of this approach is that the value of the traditional economy is only a reflection of its value in the market economy, an implication that is contrary to its constitutional status. The value of this economy, if it can be valued, must take place in a negotiation context.

This layer includes the production of commodities within the household by using the inputs of household technologies, labour time and market purchase of goods. This framework could be very useful in that it models activities outside of the market. Such models have been used to evaluate the value of non-market household production. (Chadeau, 1992; Jackson, 1996). However, Robert A. Pollak (1999) states that the major contribution of Becker's approach is to call attention to the application of economic analysis to the allocation of time among activities. Given that the household production model is a suggested method of assessing non-market time allocation within a family unit such a model might be appropriate to assess Aboriginal traditional values.

Pollak (1999) describes the household production model as "Bentham updated" or an application of the rational action model. The idea of the rational action model is that "economic man" makes rational (logical) decisions and acts in such a way as to maximize benefits and minimize costs or as Bentham (1780) says, maximize pleasure and minimize pain. However, as noted above, the aboriginal traditional society does not fit the mold of the typical free market economic paradigm. Nevertheless, literature on the household production function (Juster and Stafford, 1991; Pollak, 1999) discusses many of the challenges that are presented in analyzing the use of time as an economic datum. Further the household production function analysis, particularly of Pollak and Wachter (1975), outlines possible errors and alternative analytical approaches.

One of the analytical problems that arises in the household production system is that joint products are common. Often people perform two tasks at once such as watching a child and washing clothes or cooking. They are producing a safe child and food at the same time. Joint

products make it difficult to identify the costs and benefits associated with different products and therefore it creates problems with deriving demand curves or costs functions for such products.

Another problem identified is that there may be differences in the satisfaction obtained by performing different tasks. For example, cooking could be preferred to cleaning but the same person involving the same technologies and time may perform both. How can one account for the extra satisfaction (utility) gained from cooking or the disutility experienced by cleaning? Within the market place, difficult or unpleasant jobs are rewarded according to market prices but within the household there is no price adjustment.

Pollak and Wachter (1975) discuss the difficulties in deriving the demand relationships when using the household production function when joint products are common and the labour inputs in different household commodities contain different utilities. They argue that the relationship between the price of the commodity and the demand will be affected by the different utility preferences of different households and that this should be taken into account.

This is an important observation when considering the Aboriginal traditional economy. Not only are joint products common but the importance of the utilities that are obtained from simply participating in various livelihood activities may dwarf the otherwise apparent purpose of the activity (the "commodity" obtained or produced).

Pollak and Wachter suggest alternatives. One such alternative is to focus on the utilities rather than the commodities in the household production function.

> "Activities which generate "utilities" can be studied, but the analysis must focus on the household's allocation of goods and time among these activities rather than their

"output".[30] The resulting analytical framework is closer to traditional demand theory than to the household production function model." (Pollak and Wachter 1975, p. 256).

Also, the household production function is also often used in the context of the valuation of non-market activities for the purposes of national accounts assessments. In this context, the time allocated to various functions is valued using different methods. One method is to use a wage rate; another is to attempt to use the value of a substitute good for the products produced in the household. Kulshreshtha and Singh (1997) state that the use of a comparable wage rate for time does not account for profits; using time often does not account for different skills of different workers; measuring only time does not account for different intensity of work or all the different benefits of different types of work in the household. Clearly time as a method of measurement has been commonly used within the household production framework and significant analysis has been made of the problems one might encounter using this method.

Theoretically the household production model can accommodate the non-market allocation of time. But the underlying conceptual framework of the model is the interaction of non-market activities connected to a market. This is the approach that Usher took. However, to analyze the Aboriginal traditional economy using a method that was born and has as its underlying basis in a market paradigm may represent a cultural oversight. Can Aboriginal culture and economy be understood in the context of a market based paradigm with certain assumptions changed? The constitution has affirmed the inherent rights of the traditional aboriginal culture. Eurocentric culture cannot assume that Aboriginal people's choices must be expressed within an intellectual framework established for a market-based paradigm. Their livelihood model, like their Aboriginal rights, should be *sui generis*, a new system. Concepts and ideas can be adapted from other systems to arrive at such a system but the basis of the

[30] (numbers representing preference orderings) rather than "commodities" (the outputs of the production process)

system must be Aboriginal or based upon Aboriginal values. However, Pollak and Wachter (1975) note that the use of utilities instead of commodities is closer to traditional demand theory and it is basic demand theory that may be useful in comparing the Aboriginal economy with modern market economies.

Travel Cost and Hedonic Methods?

Labour time is not a new currency. Western civilization has been struggling with the value of labour for centuries. Labour was addressed by the classical economists and throughout history it has been the issue upon which class battles have been fought.[31] More recently, welfare economists attempting valuations in the environmental area addressed the use of time in the context of the travel cost model and the household production model described above. The travel cost recreation demand model was proposed by H. Hotelling (1947). The model is based upon the idea that visitors pay an implicit price to visit a site and this price is representative of the value of that site to the visitor. This model has been considered an effective way of assigning a value to sites or environmental qualities that did not have market prices (Ward and Loomis, 1986). The implicit price was represented by the amounts that the consumer was willing to pay in travel costs to visit such sites. The factors that affect the cost of visiting a site included the *time* spent traveling to the site and *time* staying at the site and the expenses incurred to travel and stay at the site (Freeman, 1993). The valuation of that time spent traveling or staying at the site might be valued by comparing it to amount that could be earned working, the opportunity cost of work and leisure or the use of a portion of the wage rate. (Smith, Desvouges and McGivney,1983; Bockstael, Strand and Hanemann, 1987).

[31] I am referring to the history of the labour movement beginning during the industrial revolution and extending to current union/ management agreements.

The idea is that the visitor is willing to pay in time and money to "consume" the attributes of these sites and this willingness to pay is a measure of the demand and value of the qualities of the site. Time is valued as a function of alternative uses of time, given time constraints and opportunity costs. This approach is based upon the idea that the consumer has other income sources and chooses to experience an environmental site as a recreational activity. This is quite different than time allocated to a subsistence economy which occupies the principle source of livelihood of the participants. There are difficulties in using alternative opportunities as a proxy for the value of the time spent on Aboriginal subsistence activities. Because of their skill sets Aboriginal people may not have significant or comparable alternative income or wage earning opportunities. A second problem is that Aboriginal people may have the right to participate in their subsistence economy without taking alterative wage earning opportunities and alternatives would not appropriately measure their right to continue their traditional practices.

John Duffield (1997) suggested that the time allocated by Aboriginal people to hunt, fish trap and gather within their traditional economy could be valued by using their opportunity costs. This is essentially an application or a version of the travel cost method. However, because their opportunities may be limited and alternatives may not appropriately measure their true preferences, he suggested that a type of hedonic wage could be developed that identified what wages were being given up to pursue hunting and fishing. Because the wages were being given up the time value or wage value of the preferred hunting and trapping was considered to be higher. The method used to determine how much higher might include an assessment of other attractive opportunities not taken. This method of assessing the monetary value of the time that aboriginal people spend on hunting, trapping and fishing assumes that the choice between a wage or monetary remuneration and a traditional hunting activity is a legally appropriate choice. In

some legal circumstances this hedonic approach may be the most appropriate time valuation method but it fails to measure appropriate values if the aboriginal people have a right to maintain their traditional livelihood.

Measuring the Value of a Traditional Product- Time as Currency

Above I discussed the legal status of Aboriginal livelihood activities and the requirement to find an appropriate method of valuing these activities. I also discussed whether or not traditional values could still be captured or were socially different from western values. I then looked more closely at some anthropological approaches, the approach used by Usher et al. (2002) and the approach suggested in the context of the Exxon Valdez legal case (Duffield, 1997). In this section I discuss the use of time as a currency in a system similar to a modern economic utility optimization model using aboriginal preferences. I suggest that time or the amount of labour allocated to different activities measures the relative value of the goods produced.

When using the labour or time method, value is not based upon the ownership or allocation of land and resources, but upon what could be produced from the land. Labour is a currency and the valuation is based on the relative amount of labour expended by the family in obtaining products. The use of labour as a measurement of value, or as a currency, is consistent with neo-classical principles given certain assumptions: labour measures value when it is not distorted by land ownership, or allocation of capital or resources; labour value functions when the economy is stable and does not encounter absolute scarcity. In a stable subsistence economy, the hunter or gatherer allocates his time according to what he/she wants to produce and consume. The labour is allocated by the family organization to those products desired most. Therefore, I should be able to use labour time as a measurement of their preferences or values.

However, this method has important limitations. For example, if no values associated with scarcity were included the total value of their economy would be equivalent to the total time worked. Using this method, the value of their economy therefore cannot be higher than the total of their available hours. No value is assigned to the intrinsic value of the land or resources. This limitation was discussed in Chapter 2 with the limitations of the labour theory of value. The implication of this limitation is significant. For example, water is essential but because of its wide availability it often has a relatively low market price usually related to the cost (labour) of obtaining it. However, as water becomes scarce its value becomes very high because it is required for life itself. Once water has become very scarce, it is difficult and not appropriate to measure its value using a measurement of the labour required to obtain it. Labour should not be used to value the loss or continued existence of an entire culture. Once the stability of institutions is challenged most value measurement methods collapse, including the labour method. However, within a stable economic framework the labour required to obtain increments of a product would vary depending upon the availability of the resource sought. For example, the amount of time required to kill a moose would depend upon the density of the moose population. A small decline in the moose population would require additional time to acquire the same number of moose. This emphasizes that a time based labour model can only be used in certain circumstances one of which is that the economy be stable and not subject to radical social and economic changes.

Does this mean that because of the radical changes introduced by the European destruction of the buffalo and trapping opportunities, hunting and fishing economies and the subsequent cultural domination, that the labour theory cannot be used to value Aboriginal traditional economies that form the basis of Aboriginal rights? I believe that if the traditional

economy is to be assessed using labour time it must be done using statistics from a time during which at least a portion of the traditional economy was intact. This condition relates directly to the consideration that there are many Aboriginal utilities associated with their cultural lifestyle. These utilities should not be measured by replacement products or commodities or by the household production framework. They should be measured by their revealed preferences. However, it is only when the traditional economy is stable that these utilities are preserved and labour value is not distorted by scarcity.

It is also important to note that capital goods were formerly produced in the aboriginal society by applying labour to their available resources. In more recent times and in fact during time when data is available (Tanner et al., 2001) various types of external capital was used by these aboriginal people. This provides another challenge in valuation using only their labour sources. Capital goods obtained outside of the economy must also be measured in terms of how much traditional labour it would take to obtain such a capital good. For example, in early times a musket could be purchased by trading beaver pelts. It would take a period of time to capture and prepare the beaver pelts. This would be the value of the gun in labour time.

Another important question when addressing valuation is how much of the massive Aboriginal livelihood changes are justifiable or chosen by the Aboriginal people and how much has been a violation of their aboriginal common law and constitutional rights. Normally, economic analysis assumes that people *must* adjust to the changing market forces. However, the inclusion of Aboriginal rights in the Constitution of Canada should protect these Aboriginal economic, cultural, spiritual and social functions and grants them an entitlement not to accept certain changes. The cultural functions were formerly discouraged and even prohibited by Government policies against the will of the Aboriginal people (Frideres, 1998). As a result the

courts are filled with specific claims, land claims, residential school claims and breaches of fiduciary duty claims (Smith, 1995). Further, due to an assortment of choices and these external factors, the traditional economies upon which aboriginal cultures were based have become less stable (Tough, 1996). Since contact with Europeans, the Aboriginal peoples have been exposed to an invasive cultural and economic system. The fur trade changed their view of fur-bearing animals. Furs became commodities allowing them to obtain goods in exchange for furs (Fumaleau, 1973; Tough, 1996). This brought about a change in their relationship to their environment and began to change their social and economic relationships. One may argue that many of these changes were caused by their choices and therefore are legally and economically justifiable. Although it appears that they accepted new tools such as guns, knives and beads very quickly, in many respects they were forced into the market system of the fur trade (Hearne (Gillespie) 1975). For example, once guns were introduced, others needed such weapons to defend themselves and they had to participate in the fur trade to obtain the weapons (Yerbury, 1976). As Fumaleau (1973) discusses, one of the responses of the Aboriginal people to the white over-harvesting of furs in northeast Alberta was to attempt to out-harvest the white trappers. Despite the fact that this went against their spiritual, cultural and ecological relationship with their lands, they had little choice. Perhaps the most difficult question to address, given the protection of pre-contact Aboriginal rights, is the extent to which Aboriginal peoples have willingly accepted European economic structures and to what extent they have been forced to accept them. This is particularly relevant when viewing Usher's article on the mixed economy of the north. When observing the existing situation it is clear that these Aboriginal peoples are currently involved in a dual economy not a mixed economy. However, if a portion of the dual economy has been forced upon them in violation of their constitutionally protected rights, a

portion of their participation in the dual economy was created under duress and therefore was not a valid choice or preference.

The solution suggested in this thesis is to value the traditional economy of the aboriginal people separately from their other more modern methods of subsistence or separately from market methods as much as possible because their traditional economy is constitutionally protected. This valuation process can be made using time or labour as a currency and that this type of evaluation can also be very useful in calculating the value of minor changes in that stable economy. If we can value the stable traditional economy we may be able to contribute to an assessment of losses of traditional opportunities and reasonable compensation for the same. This type of valuation can be used to educate and inform those involved in compensation negotiations and provide a beginning point upon which negotiations can be based.

Measuring the Value of a Traditional Product- The Production Unit

The basic productive and consumption unit in the traditional aboriginal economy of northern Alberta was the extended family (Helm, 1965; Kretch, 1984). Within a family, division of labour and priorities were set for efficiently harvesting traditional products (Winterhalder, 1977). Labour was allocated to obtain preferred foods and products by allocating the time of the better hunters and tanners within the family unit according to their skills.[32] The time allocated to production would not be affected by sharing decisions with other families or strangers. The total available labour for a production unit would be the total labour of all family members. The total

[32] Stuart A Marks discusses the various roles and hierarchy of the Valley Bisa people of Zambia. These transient agriculturalists, who also hunted and gathered natural products, used systems of role allocation based upon lineage and family relationships. The systems of the northern Alberta Aboriginal people were clearly based upon family relationships (Helm, 1965; Kretch, 1984, Winterhalder, 1977) but did not appear to be based upon lineage. Rather, Elder interviews (Tanner et al., 2001) suggested that some families would rely upon the hunting skills of hunters from other families to provide large amounts of meat. The roles of these hunters were determined by their skill at hunting.

available labour could be considered a budget constraint used to acquire the different subsistence products desired.

The value of a product would vary by the amount of labour required to capture or process the product. When the labour required increases (decreases) it is similar to a price or cost increase (decrease) in the neo-classical economic model (Marshall, 1890). The value of a product can be estimated by the amount of labour that a family is willing or required to spend on the item.[33] This idea is based upon the assumption that the family allocates a limited amount of available labour resources to each desired product. The family searched for and obtained the products they valued the most. The proportion of total labour allocated to each product could determine the relative value of the product. I present the model formalizing these concepts below.

Valuation of a Finite and Changing Traditional Harvest

The Fort McKay Aboriginal people of northern Alberta are tied to specific traditional lands (Tanner et al. 2001). They prefer to harvest in their familiar hunting and gathering area. When it becomes more difficult to obtain a moose within that specific area, it is equivalent to a price increase for the hunter. If one could measure the change in value of a traditional good or service, such as the value of obtaining one less moose than normally required, to the aboriginal hunter exercising his original aboriginal right, one could use a welfare analysis to help measure the losses caused by a change in that value. However, given the rights of the aboriginal people, the appropriate measure of the welfare effect given a price increase of an environmental good would involve a 'willingness to accept' measure as outlined in welfare theory when the consumer has a right to the status quo (Freeman, 1993). If the consumer has a right to maintain

[33] In this context the family refers to a related group of hunters and gatherers including a primary hunter and his close relatives. This group could include the hunter, his wife and children, his mother and father and even a brother or sister and spouse. Helm 1965 discusses the size and composition of these hunting units.

the status quo, the question that welfare theory asks would be: How much would a hunter be willing to accept to allow a specific change in the status quo? The aboriginal peoples would be made worse off by a 'price' increase of a resource to be harvested and they would have a right to be able to kill a moose in the same time it took in their original state. Using the labour assessment it may be relatively simple to obtain a willingness to pay measure for a decline in moose availability by measuring how much longer it would take the hunters to obtain the normal number of moose or equivalent caribou or bison. It may also be possible, in limited circumstances to estimate what the willingness to accept measure may be as a function of the willingness to pay measure (Freeman, 1993; Hanemann, 2003). Below I discuss some tools that use traditional demand theory and welfare theory to addresses valuation of the traditional economy and changes within the economy in terms of labour time required.

The Use of Economic Welfare Models

Now that I have reviewed legal, anthropological and economic parameters of valuing Aboriginal activities, if we are to apply the labour / time method I need to lay out how this method is consistent with economic welfare models. This section builds on the description of neoclassical concept of value begun in Chapter 3. The economic theory of welfare changes is based upon the ordinal utility theory (Chapter Three). Ordinal utility theory involves the ordering of commodities by consumer preference (Russell and Wilkinson, 1979). This theory postulates a consumer will maximize the choice of commodities or maximize utility subject to a budget constraint. This theory has been extended to measure changes in welfare as prices or other variables change (Freeman, 1993). It accounts for both substitution and income effects of changes and presents different measurements of welfare change. The theory identifies a difference between concepts based upon the Marshallian demand curve such as surplus value

(Marshall, 1890) and concepts based upon the Hicksian (or compensated) demand curve such as equivalent and compensating variation (Hicks, 1946), which are useful in determining the extent of welfare changes under different circumstances.

This theory, with modifications, can provide a method for measuring welfare change within a hunter-gatherer society as economic conditions change. Compensating and equivalent variations might be calculated in the hunter-gatherer economy if labour could be used as the currency. In order to allow such a model to function, I assume that a hunter-gatherer allocates time in the same manner as a consumer allocates a money budget. The hunter-gatherer allocates labour to various tasks according to what he wishes to consume. The basic analytical principles are very similar to the classical model of welfare economics (Varian, 2003) and yet they do not appear to contradict aboriginal worldviews.

Maximizing Utility Subject to Income Constraint

The basic theory encompasses different perspectives on the same model. These perspectives originate from the type of objective function chosen and how the function is constrained. One alternative is to maximize utility subject to a finite income. Another view is to minimize costs subject to a constant level of utility. If I take the maximization of utility first I can specify that relationship as follows:

Maximize U (Utility), which is a function of (generated by) a vector (or basket) of goods defined as a vector X,

Where: (X = x1, x2, x3 etc.)

Therefore: U = u (X)

To pay for these goods each good needs a price, which is represented as the vector P that is made up of p1, p2, p3 etc. If I multiply all goods purchased by their prices and add them I get the total budget constraint

$$3p_{i\,A}\,x_i = M$$

This is the budget constraint on the utility function. Using an optimization technique gives a series of optimal values of X that make up the optimal utility generating set. This optimum depends upon the prices (P) and the total income (M). If any p_i or M changes it will change the optimal set. The system is a dynamic model that can be used to analyze welfare relationships. The relationship between goods and prices given a particular income, is commonly referred to as a demand curve (Marshall 1890).

Changes in M will cause a shift in the curve as shown in Figure 4.1.

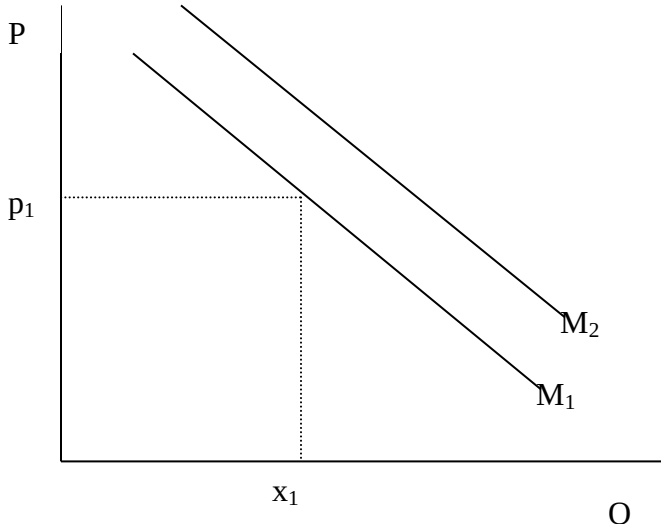

Figure 4.1 Demand curves at M_1 and M_2 income levels

Mathematical systems can be represented by a system of equations or by using a method called comparative statics. Comparative statics commonly uses two-dimensional graphs to analyze relationships between variables. The graph above, the well-known demand curve (Marshallian Demand Curve), is an example of such a comparative statics graph. The two income levels represent a change in income that can be analyzed using the two dimensional graph. Other aspects of this system can be represented in other two dimensional graphs displaying the relationships between these and other variables. For example, I could present the combination of possible quantities of goods x_i, representing an important good, and x_j, representing all other goods in all possible 'baskets'. This set of possible combinations would be represented by the line Xj Xi in Figure 4.2. The highest utility would be reached by purchasing the amounts of Xj and Xi so as to touch the highest possible utility curve U1 at the point A.

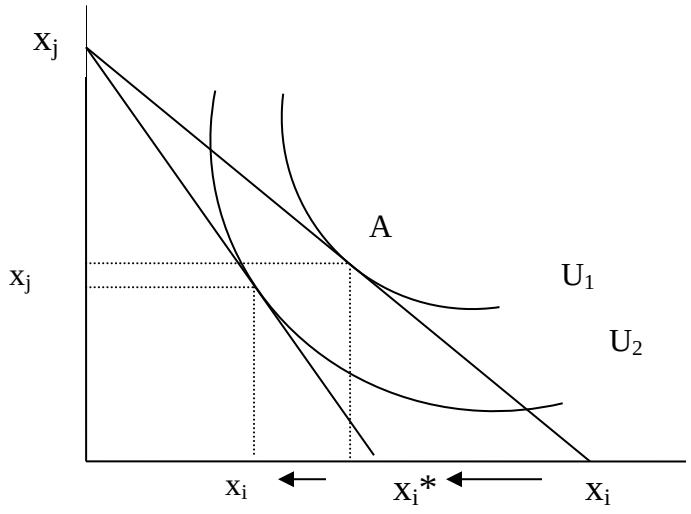

Figure 4.2 Optimal quantities of x_i and x_j in a Marshallian Demand Curve (adapted from Freeman, 1993)

If the price of good x_i were to increase, the budget line between the two goods would change in slope where less of good x_i could be purchased as shown by the lower value of Xi*. The new

budget line would then be XjXi*. The increase in price would force the consumer to accept a lower level of utility because the level U_i could no longer be achieved given the new budget line. A new optimal point would be chosen that involved less consumption of both goods. However, because the price of x_i changed relative to the other goods, the relative quantity of x_i consumed will also change (x_i will fall further than x_j). This shift in proportions is called a substitution effect. The balance of the change is called an income effect. It is very useful to differentiate substitution effects from income effects in welfare economics since income is often used as compensation. One of the goals of welfare economics is to measure the amount of income required to place the individual in a previous position or utility level.

The ability to substitute one good for another is also an important factor in welfare assessments. If the consumer can substitute good Xj for good Xi and obtain almost the same utility, an increase in the price of good A will not have a large effect. If, however, one good cannot substitute for another, increases in the price of that good will have larger utility effects. The effects on the consumer are determined by how well one good can be substituted for another. The slope of the indifference or constant utility curves (labeled 'U' in Figure 4.2) mathematically describes the substitutability relationship. Each of these curves represents the combination of goods that will generate the same level of utility for the consumer. If there were no substitutability the welfare change would be entirely an income effect. In such a case, the welfare change and income effect will equal the change in the price of the good times the amount of the good not purchased as a result of the price increase. However, to measure welfare changes when substitution is possible one must take into consideration both the "income effect" and the "substitution effects" of changes in prices or qualities of goods (Varian 2003).

Minimizing Costs subject to Constant Utility

A Hicksian Demand Curve, can be created within the context of minimizing costs or expenditures by assuming that utility levels are held constant and income adjusts when prices change. In the comparative static space where price varies with respect to quantity, utility is held constant instead of income. As prices change, one good is substituted for another along this demand curve. Income changes to compensate and allow the consumer to maintain the same utility level. It is this income change I wish to measure.

The slope of a Hicksian demand curve will be steeper than the Marshallian demand curve because the Hicksian demand curve does not include income effects. The larger the relative income effect, the larger the difference in the slopes between the two demand curves. In the case shown on Figure 4.3, the Hicksian demand curve passes through the Marshallian demand curve at the original price equilibrium. In the lower graph of Figure 4.3, in the $X_1 - X_2$ space, the original price and quantity equilibrium starts at A, the price of X_1 falls causing the following effects: The new price ratio induces the consumer to shift the ratio of goods consumed from A to C. At this point the tangency of the new price ratio touches the old utility curve. Because the price has fallen, the consumer has more income and chooses to purchase more of all the goods. This raises his level of utility up to a higher curve. On the demand curves, from the starting point A, the consumer adjusts to the different prices by moving down the compensated (Hicksian) demand curve to point C.

Then the consumer can rise to the new point B taking advantage of the new utility level generated by additional available money or the income effect.

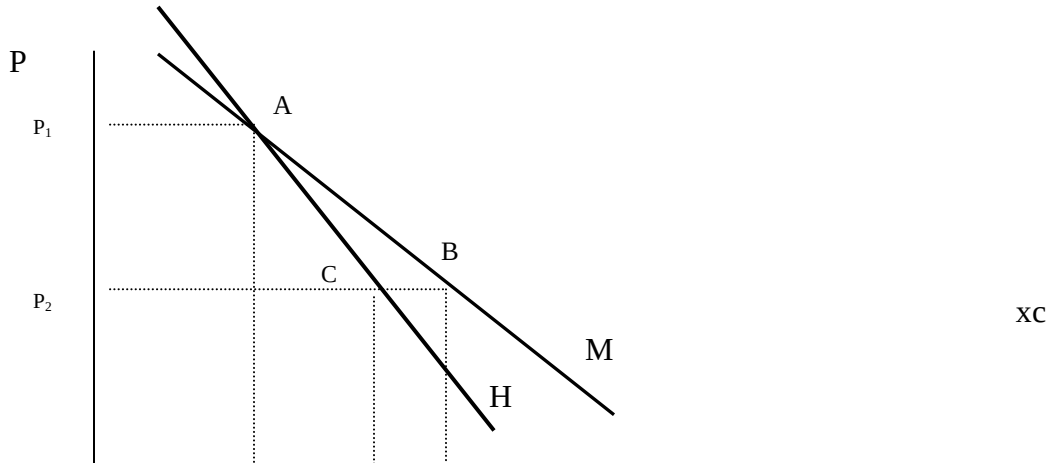

Figure 4.3

Figure 4.3. Hicksian demand curve - compensating variation – price decrease

Compensating and Equivalent Variations[34]

Welfare economics has defined different methods for measuring welfare changes as the result of a price change. Equivalent variation (EV) can be considered the monetary equivalent to a price change (Freeman 1993). In other words EV is the amount one would be willing to pay (WTP) to avoid a price increase or the amount one would have to be paid to forgo a price decrease. Compensating Variation (CV) measures the amount required to put the consumer back

[34] Descriptions of equivalent and compensating variation were derived from A. Myrick Freeman's "The Measurement of Environmental and Resource Values, Theory and Methods, 1993.

in the original position. It measures the willingness to accept a price increase or the willingness to obtain a price decrease.

In Figure 4.3 the price of good Xi falls. The Hicksian demand curve shows the substitution effect. The Hicksian curve passes through the Marshallian curve at the original price. This will allow me to measure the compensating variation because I am measuring the income change required to return to that utility level. As a result of the price decrease, the consumer will increase purchases of X_1 moving down the Hicksian demand curve for good X from point A to point C. The consumer also purchases more of good X_2 and X_1 as a result of the income effect. The income effect is measured by the distance between the indifference curves using the tangencies C and B and can be read off the X_2 axis. The value of CV could also be measured by taking the area P_1ACP_2. This shows that CV is smaller than the consumer surplus, which would be measured by the area P_1ABP_2, the area below the Marshallian demand curve. In the case of a price decrease CV could represent the maximum amount a consumer would pay to obtain a price decrease.

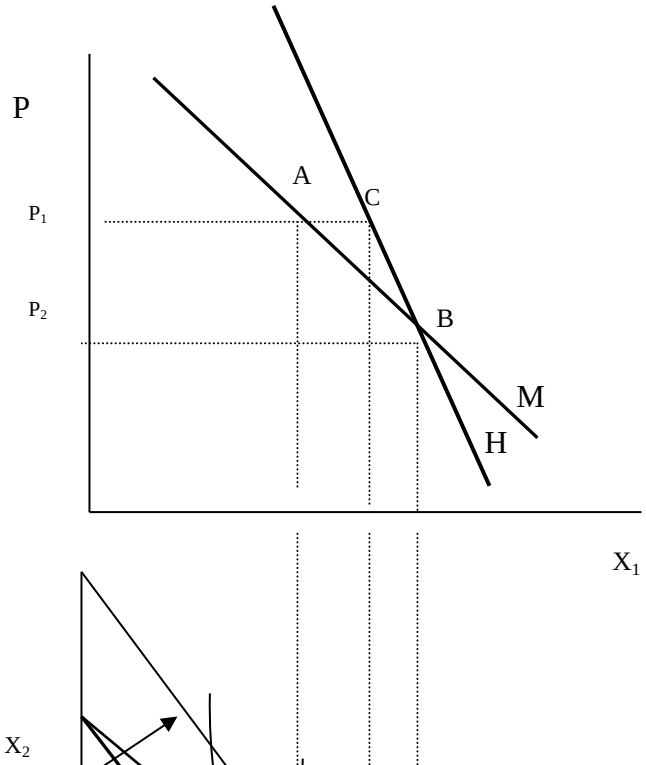

Figure 4.4 Equivalent variation – price decrease (Freeman 1993)

Intuitively, this amount is smaller than EV and consumer surplus because income is being given up and opportunities for substitution are lower.

When the price falls EV is measured when the Hicksian demand curve passes through the Marshallian curve at the *final* price ratio. This is shown in Figure 4.4. EV would be equivalent to the area P_1CBP_2 and would be larger than a measure of consumer surplus. EV is larger than CV and consumer surplus for price decreases. Intuitively, the reason that this measure is larger is that the cash value of a price decrease includes opportunities for increased income and substitution above the value added from the decrease in price. If the consumer were asked to forgo this price decrease, the value of forgoing the decrease would be above the consumer surplus by the income benefits induced by substitution opportunities.

EV and CV can be interpreted to measure consumers holding different rights or entitlements. CV can be used when the consumer has a right to the original price ratio. EV is used when the consumer has a right to or must accept the new price ratio.

How Can Welfare Economics be used to Measure Aboriginal Losses?

Accepting that labour can be used as a currency and that Treaty Indians have legal rights to practice traditional resource use, I propose that it should be possible to use labour time for measuring the relative value that subsistence land users place on the various resources that form their economy. These values can then be used as a basis for negotiations of losses. However, there are challenges in obtaining appropriate data, understanding various aboriginal rights, and applying such a method in the context of a radically changing aboriginal society. Earlier I described analytical methods, which could account for substitution and income effects of a change in the availability of a resource in a subsistence economy. However, different aboriginal peoples may have different rights to substitute or not to substitute. A valuation system must be based upon an appropriate defined suite of aboriginal rights. Also, use of such valuation procedures is dependent upon the stability of the economy being assessed. Aboriginal subsistence economies have been and continue to be destroyed, assimilated and destabilized throughout Canada (Tough, 1996). It is important to understand how such a system could be adapted to measure unstable transitional values. In the remainder of this chapter I attempt to deal with each of these issues.

Substitution Effects

As noted earlier, Treaty Indians have a right to define a status quo or an original state that supports their preferred manner of harvesting. The compensating variation measure is one alternative that could be used as a valuation measure when the consumer has a right to the status

quo (Freeman, 1993). However as noted above, compensating variation includes accounting for substitution effects. Given aboriginal rights to the status quo, some aboriginal people may not be required to accept any substitution at all. I believe that because most aboriginal economies had within them an ability to adapt to environmental changes they all included *some* ability to substitute goods, and it would be normal to expect the Aboriginal peoples to accept *a similar level of substitution effects* when exposed to environmental losses caused by settler society.[35] Therefore, one would not expect to use a method that did not contemplate substitution within their traditional economy unless one could make a case that substitution was not legally or physically permissible. Compensating Surplus or Equivalent Surplus concepts measure welfare changes when no substitution is possible (Freeman, 1993) and may be useful in evaluating aboriginal losses, especially in the case where there has been an important reliance upon one particular species.

Measuring Welfare Changes

The analysis of the relative value of a commodity within a stable subsistence economy is straightforward. However, when welfare changes occur the problem becomes more complex. The Hicksian approach provides a method of finding the income effect while keeping the consumer at the same level of utility. In order to perform this analysis we have to know:

1) What substitutions are available and what are their limits?

[35] The Alutiiq people of Alaska substituted various species in their subsistence harvest after the Exxon Valdez oil spill of 1989 (Braund and Usher, 1993). However, the substitution effects referred to involve the substitution of one traditional species with another within their traditional economy and not substitution of a store bought good for a traditionally produced good. The pitfalls of the later problem are discussed in Chapter 2.

2) What is the cost of production for each product and how will costs change if more or less of that product is required or harvested?

3) What is the budget constraint? How much leisure time and work are allocated to obtaining a livelihood? What capital goods are used and what is their value?

Using labour as currency, the budget constraint is determined by the total amount of labour available. (Labour could be 'stored' as capital goods) Labour can be divided between leisure and work or between obtaining livelihood and other activities. The allocation between labour and leisure may change as the labour cost of necessities changes or as the 'price' of essential commodities change.

Within the welfare model indifference curves may be determined by the rate of substitution between obtaining different products to maintain the same level of satisfaction. It is difficult to determine the appropriate rates of substitution because one resource unit can provide a range of products, e.g. meat, hides, tools and other benefits. One simplifying assumption that has been used as a proxy for utility is the quantity of protein or weight of meat available from a moose or caribou. This proxy is not a complete measure of the satisfaction obtained from the animals but is a useful approximation particularly when the animals supply similar joint products such as tools and hides. Also, there are issues of taste preference of people and significant differences in size of the two species. However, within a limited range, bear and moose provide some similar products. The amount of meat in each may be a proxy within a limited substitution range.

The original average cost of a moose or bear are relatively easy to obtain by averaging the times taken to capture and prepare these animals during a year and by adding the costs of any capital consumed to capture and prepare them. However, changes in relative costs depend upon

relative resource abundance, distribution, and relative travel distances required. The changes in costs are more difficult to capture.

Changes in Prices of Other Commodities

For simplicity, one could assume that the prices of other substitute goods do not change. However, when one species must be replaced by a larger quantity of another, it will generally become more difficult to obtain more of the alternate species, given equivalent initial availability. Therefore the average cost of a bear could increase as more bear are harvested to substitute for fewer moose. This increase in bear cost would add to the loss and would have to be included in the estimate of the total loss.

Calculation of Welfare Loss

Using labour as the currency provides one simple answer to the calculation of welfare loss. When the availability of moose declines as a result of an industrial activity, the aboriginal family may try to maintain their livelihood by searching longer for moose or obtaining more meat form another source like bear, bison or caribou depending on cost. If I assume that the weight of the moose or bear meat is a proxy for satisfaction then, if the family wishes to maintain that preferred level of meat consumption, the family will either increase the time allocated to harvesting moose or increase the time to harvest an equivalent number of bear or both.[36] The incremental labour required to replace the meat will measure the loss. The benefits or costs of substitution are implicit in the increased time expended. The time cost of replacing moose protein with bear may be less than replacing it with moose because of the ability to harvest the

[36] The comparison between Bear and Moose was made as a result of the data obtained in the study. However, during interviews some Elders reported that they would hunt barrenland caribou as an alternative to moose. This activity was discontinued because of the nomadic migration of the Dené people south to Fort McKay. Also, bison were a common substitute with moose. However, harvesting of bison became illegal at the turn of the century and Elders were very reluctant to talk about poaching activities.

lower cost bear. Thus the loss may be less than the original cost of the lost moose due to a substitution effect.

Since labour is the currency, the measurement of the income effect or change in welfare would be the increase in the amount of labour required to obtain the same level of protein. This increase in labour would come from two sources. There would be an increase in the unit cost of the lower number of moose harvested. There would be an increase in the average amount of time to obtain a bear and an increase in the number of bear harvested. The initial level of labour would be subtracted from the new level of labour effort to determine the welfare loss.

I have limited this analysis to substitution of bear for moose. If I assume that the hunter-gatherer can achieve the level of indifference by obtaining an equivalent amount of protein, then I can measure the change in welfare by measuring the increase in time that is transferred from leisure to work. This will be equivalent to the additional time spent finding bear plus the additional time spent obtaining moose times the lower number of moose obtained. There may be other substitutions (such as fish) or other protein sources (beaver, caribou, bison, muskrat). Measuring other substitutions would require measuring increases in each of the substitutes; however, welfare changes could still be calculated by measuring the total increase in labour to achieve the required levels. However, this method is an example of a willingness to pay measure rather than a willingness to accept measure. Willingness to pay measure does not measure the loss of leisure time.

Different Entitlements Requires Different Valuation Measures

As discussed above, the valuation of losses can be divided into different categories depending upon the nature of the Aboriginal rights and the degree to which an economy is affected. If the aboriginal people have their traditional rights protected and they have a right to

the status quo at the time of a treaty, then I assume they should be paid compensation according to their willingness to accept a payment for the loss of such economic opportunities. If the loss is small and does not threaten the stability of their economy I could measure their **willingness to accept** using an amount that is equivalent to a **compensated variation,** which would place them in their previous position.

However, if they were required to accept the changes and had to obtain the same resources by increasing their effort, the extra time or cost (adjusted automatically by their ability to substitute within their economy) would be equal to an **equivalent variation** measure. This is the amount that they were **willing to pay** (in time) to avoid the loss of consumption (Mäler, 1974). If the aboriginal people have no right to the original state, as seems to be the case in jurisdictions such as Alaska (Brown and Birch, 1992), then the equivalent variation value is likely a reasonable measure of loss.

The CV measure will be greater than the EV and surplus value measures for price increases (loss of resource abundance). The increase in labour performed by aboriginal people attempting to achieve their initial level of meat consumption is only a useful method for calculating the EV or the amount they are willing to pay to avoid increases in price. However, if the aboriginal people have a right to the original state then I must use a willingness to accept or compensating variation measure. Until recently Aboriginal peoples have not been given the opportunity to exercise their right to refuse development before losses were incurred.[37]

It is important to note that under assumptions used to create simple economic models, consumers are assumed to rank their preferences according to certain rules. These rules often

[37] Land claims agreements that have been completed in northern Canada since 1982 may meet many of the requirements of a willingness to accept measure since the nature of the negotiations and relative power relationships of the parties was more in tune with the current Aboriginal rights regime in Canada. Distilling these agreements down to be able to measure the value of a specific moose or an other resource to their economy would be complex and difficult.

include the idea that more is better and commodities can be exchanged or substituted in small or continuous increments. The assumptions include the idea that products can be substituted for each other and that there is a point at which the consumer would be indifferent between two product bundles. The assumptions about the preferences of consumers are the same for both equivalent variation and compensating variation measurements except that in one case the consumer has a different legal entitlement. The consumers have the same desires and tastes in either scenario. Robert Willig (1976) demonstrated that EV and CV are likely to be very close in value if the income elasticity of demand for the product was constant. In terms of the Aboriginal culture, using available time as the 'income' we know that as the 'wealth' of the hunter-gatherer increases (as game becomes very easily obtained) the hunter-gather reaches a satiation point and tends to hunt only when the products are required for consumption (Kelly, 1995). However, when a price increases it removes disposable income from the consumer. In the case of the Aboriginal hunter gatherer having to spend more time to obtain an equivalent amount of meat, what can we say about the relationship between the willingness to pay measure and the willingness to accept measure with respect to small changes in "prices" within their traditional economy?

Willingness to Pay (WTP) and Willingness to Accept (WTA)

There is a significant amount of literature discussing the willingness to pay and willingness to accept measures. Of particular interest is a study (Kahnemann and Tversky, 1979) which points out that there appears to be a consistent difference between willingness to pay and willingness to accept values and that this difference is likely associated with different consumer endowments. Michael Hanemann (1991) reviews the theoretical explanation of the effects of

income elasticity and also demonstrates that the condition and availability of substitutes likely has a large effect upon the differences between WTP and WTA.

When viewing the behavior of the hunter-gatherer within their cultural context we can ask what might be the income elasticity conditions of a moose hunter. The hunter has an expectation of the time required to obtain a moose (Tanner et al., 2001). Within a range of time costs the hunter will hunt until he obtains the moose. Once the moose has been consumed the hunter will venture out again to hunt for his next moose. If moose are more easily obtained he still hunts until he obtains one moose (or two if they are found together). The traditional hunter does not increase his demand for red meat significantly when resource (bison, moose and caribou) availability increases. His demand for the product does not change significantly and he will find that he has more "income" (Spare time) to allocate to other activities. Therefore his income elasticity of demand is quite low within the stable traditional economy. As long as the hunter can achieve his expected harvest, his willingness to pay (in terms of increased hunting) may be similar to his willingness to accept (allowing another hunter to hunt in his territory) a decrease in availability. However, once the hunter can no longer obtain their preferred level of moose regardless of the amount of additional hunting effort, then they no longer accept other hunters into their territories. Their willingness to accept any decline in income changes significantly. This suggests that their willingness to pay may be similar to willingness to accept within a range of income values under stable conditions.

Substitution effects are also very important. For example, if moose availability declined yet the availability of bison or caribou was still plentiful, there would be less concern about the decline in moose (Elder Interviews, 2001). In elasticity terms, if the cost of moose increased, the demand would shift to bison or caribou allowing them to reach their red meat satiation levels.

It appears that under stable circumstances, willingness to pay may be an appropriate proxy for willingness to accept. However, significant or dramatic infringements of the rights of aboriginal peoples must be evaluated using a willingness to accept measurement rather than a willingness to pay measure because they have rights to the original state, the original resource endowment that allowed them their preferred hunting levels. The data that we have access to allows us to calculate willingness to pay not willingness to accept estimates and would only be used appropriately if their levels of satiation could be reached through increased hunting or substitution of other similar meats.

As Hanemann notes the relationship between willingness to pay and willingness to accept measures becomes greater as the income elasticity changes and substitutes are less. In massive environmental destruction caused by oil sands mining, opportunities for substitution decline and the need to maintain a basic level of wild meat becomes very difficult. Their economy begins to become unstable and willingness to pay measures become lower than willingness to accept measures. However, the willingness to pay figures can be used as a starting point for negotiations.

Labour versus Dollars for Compensation

The method I propose measures the value of traditional activity in terms of time or labour. It is difficult to replace time or opportunity. Time cannot be created. More time cannot be given to a family to compensate for the decline in availability of resources. Scarce resources will require more time to find and obtain. Compensation could occur through preserving or providing equivalent moose hunting opportunities in other areas and by transportation to those locations. Paying these people monetary compensation will not provide a replacement of traditional opportunities.

It is interesting to note that the differences between the equivalent variation measure and the compensating variation measure vary as a function of the marginal utility of income. The larger the marginal utility of income, the larger is the difference between the two measures. The marginal utility of income of aboriginal people is likely to change depending upon their degree of participation in settler society. If marginal utility of income increases as a function of the degree of infringement, money income should not be used as a method of measuring utility since its traditional value changes as the aboriginal economy is de-emphasized. On the other hand, no one can give aboriginal people more time than they have even if technological advancements may replace labour or decrease the amount of labour required to obtain traditional products. For example the skidoo reduced the time required to hunt and harvest certain animals. This technology had value to the subsistence economy. Protection or replacement of habitat or harvesting activities also avoids effects upon traditional products and represents a preservation of their opportunities. Preservation and replacement of habitat could also be a non-monetary proxy for compensation. The labour time assessments of the traditional economy will help determine the requirements or practicality of preservation and replacement of habitat as compensation.

If a monetary value is to be assigned to the labour time, a determination must be made about the marginal utility of income. If the traditional economy is stable it can be compared to the stable industrial economy. The marginal utility of income would be that of the average industrial citizen. The benefits of monetary income must be measured relative to the benefits of their time allocated to the traditional economy. If we assume that the economies are equal in the eyes of the law then, if a traditional economy is stable, supporting culture and a way of life, average salaries of the industrial economy could be considered to be a reasonable proxy for

traditional values. I compare two independent societies rather than inferring a value of one on to the other (see Chapter Five).

Comparing Economies

The method above can provide willingness to pay values measured in labour time. Perhaps the most daunting issue is how one might translate or compare labour or time value to hard currencies or compare values in one constitutionally protected economy with those in another. The answer to this question is that there can be no a priori method or external method of assessing the value of one constitutional right over another. The Supreme Court has ruled that the aboriginal people have the right to withhold consent in cases where the infringement is very significant. Therefore the valuation of such losses can only be determined by discovering the value which they are willing to accept. For the purposes of discussion or even a starting point for negotiation, I suggest that one could value labour time using the salary of a person with equivalent responsibility in another society. This assumption would imply that such a comparison should be made or that such a transfer from one society to another would be possible. In practical terms, when large infringements such as oil sands plants are considered to be in the public interest, compensation must be paid or alternatives must be found for the aboriginal people to replace their losses. Monetary compensation of any amount may not be adequate. This is one of the reasons that the Supreme Court introduced the idea of consent. However, the oil sands plants are going ahead and are considered by many to be in the public interest. In this case compensation may be in the form of providing other natural areas with an equivalent opportunity to hunt, trap and fish. If the replacement alternative is not possible then another alternative would be the replacement of their economy in some manner. Negotiations may include more limited opportunities or environmental offsets combined with compensatory

monetary payments. The guide or rational for such payments may include an assessment of equivalent salaries within industrial society.

The Choice of Hourly Rates for Labour Time

The aboriginal economy can be compared to a modern industrial economy if the value of labour in each separate economy can be compared. Because the aboriginal livelihood is protected by the Constitution, I make the assumption that the aboriginal economy is of equal importance in law to modern settler economy.[38] The value of their economy, as an independent economy, provides a level of satisfaction, which we assume is on average equivalent to the satisfaction obtained in our society. If their economy was to be replaced, I can ask what level of wage or salary within our society would provide them with that same level of satisfaction as they had within their economy? This assumption ignores their language, culture and spiritual relationship with the lands. The question of whether financial compensation can provide satisfaction for the loss of culture, spirit and economy can only be answered by obtaining a measure of willingness to accept and not a measure of willingness to pay which is the basis of the labour time method.

However, if the subsistence economy is stable and we wish to make some reasonable comparisons between equivalent lifestyles, I have no constitutional or other justifiable grounds to assume that the value of the two societies to their members are not equivalent, therefore the proxy rates within the traditional economy could be comparable with the average rates earned by individuals with comparable experience and prestige within the market society. This assumption involves declaring that the utility of labour as a source of income in the traditional economy is

[38] Inalienable rights are those rights, which cannot be violated, and the compensation for their violation will invoke punitive damages and restitution or complete replacement of the right lost. In such cases measuring the economic value of the economic activity may only be one portion of the damages when complete restitution cannot be obtained.

equivalent to the utility of income within the settler society. This would imply that the chief or experienced hunter would earn as much as a successful business man or experienced professional in our economy where a less skilled younger person could be compared to a less skilled person in a market economy. This I think to be the most reasonable basis for selecting rates for valuing the economic value of the traditional economy assuming the significant costs of transition are also considered. Note that the rates chosen are based upon equivalent rewards in the market based economy rather than the wages for a particular job or task. The concept is quite different. We are looking to replace the entire livelihood of the Aboriginal person with a comparable livelihood in a totally different economy. In this way we are comparing economic satisfaction rather than wages as determined by a comparable marketplace. Note also we are attempting to value a portion of the Aboriginal economy in the context of a sustainable traditional economy rather than the total replacement of that economy. Clearly if the entire economy were to be replaced other considerations would have to be made.

Revealed Preference: A Simple Valuation Model

In the sections above I have discussed the complexities of subsitution and changes in welfare, methods of calculating welfare loss, changes in the nature of the aboriginal economy and similarities with the expropriation method of assessing losses. However, the basic revealed preference method of valuation provides a very useful and simple result when labour time is used as the budget constraint. The objective function:

$$U = u(X)$$

Is subject to the income constraint:

$$3p_{i\,A}\,x_i = M$$

Where each p_i represents the amount of labour expended to obtain the good $x_{i.}$

In the solution to the optimization problem there is a vector of prices representing a specific optimal amount of labour allocated to obtaining each good. The quantity of each good obtained would be the optimal quantity of that good desired by the hunter-gatherer. The amount of labour allocated to obtaining each unit of each good would represent the "price" of those goods. All these 'prices' times the total number of goods acquired is equal to the total available labour, which is the budget constraint. If I can measure the amount of labour allocated to obtaining a specific species I can measure the relative value of that product to the hunter-gatherer, measured in that valuable and scarce resource called time. Therefore, if I assume that the aboriginal economy is in such equilibrium, (or is in that equilibrium on average) I can measure the values of the products in the economy by measuring the average time allocated to obtaining those products. This simple result can be applied by measuring the way that the hunter-gatherer family allocates their time over their harvesting cycles. In order to translate the time allocation to a monetary value a rate or time value can be assigned. The methods used for assigning rates should be based upon the legal status of the economic rights of the economies. The equation would then be expanded to be:

$$3wp_{i\,A}\,x_i = M$$

Where w represents the rate assigned to the labour allocation.

Review of Assumptions and Limitations of this model

1. Labour or time values can only be used in a stable environment without scarcity values. Scarcity was common in the aboriginal traditional society particularly after contact as their economy was exposed to resource depletion (Tough, 1996). I have assumed that we can measure the labour time spent on traditional activities as a reflection of their value of

their traditional economy even though they have been exposed to depletions and market forces for over 300 years.

2. The stability of the economy is also required to ensure that cultural utilities are maintained. This method does not measure the degree to which cultural values are eroded by western pressures.
3. The labour time method is a measure of willingness to pay rather than willingness to accept. As the economy becomes less stable or preferred levels of traditional products become unavailable, the relationship between WTP and WTA likely becomes greater and the WTP method becomes an inadequate method of valuation.
4. In the aboriginal economy joint production is common. It is difficult to allocate the labour cost to an individual product consumed by the family unit. Therefore if one resource declines it is difficult to isolate the effect of that decline.
5. The model is only measuring the traditional subsistence economy. However, part of the existing economy has been consensually integrated with market products and market systems. These market products may have a value in the traditional economy that is different from the value in the market economy. The aboriginal person may only participate in the market economy enough to obtain the products required to maintain their traditional lifestyle. As they move away from the stable traditional economy, this may change so that the traditional economy becomes the flexible or secondary economy. (Usher, 2001). An important market economy that supported the traditional economy is the fur trade. The relationship between these two economies is important and not analyzed by this thesis.

6. Substitution effects between different products within the subsistence economy are limited to the ability of the family to maintain a stable economic livelihood. The reduction of the availability of an important species may be destabilizing and substitution may appear to be possible but be culturally or physically impossible or unacceptable.
7. The labour of any one individual may be of different productivity, effort or quality than another individual within the family. The different rates assigned to different participants can only estimate the average production of the groups of participants.
8. I have assumed that the aboriginal people minimize their costs in labour time to obtain their goods. They in fact may not minimize their time. Several interview discussions indicate that they in fact spend more time on occupations especially if they are teaching a younger member or confident of their success. (Fort McKay interviews 2000)
9. I have assumed that the family is the production unit. Often production and sharing extends beyond family boundaries.
10. I have assumed that a comparable livelihood in a market economy can be used to value and compare the labour of an Aboriginal person within his/ her sustainable economy. There are several problems with this assumption. Perhaps the most important is that the value of the labour will change depending upon with which economy the Aboriginal labour is compared because different economies have different average salary levels and standards. Another problem is that this use of a value is only for comparative purposes since it would be difficult for an aboriginal person to actually generate a viable life within a completely foreign economy.

11. The use of monetary values resulting from this method must only be done with care. As shown by Bodden (1981) there is a large difference between the manner that time is spent on available traditional goods and the manner in which money income is spent.

Conclusion

Understanding hunter-gatherer time allocation preferences could allow assignment of a relative value to each traditional resource used according to the values expressed by the hunter-gatherer. This time allocation is a revealed preference of the hunter-gatherer and is consistent with neo-classical theoretical concepts of valuation. The hunter-gatherer has *sui generis* legal rights, which must be included as axioms of the subsistence valuation model. These rights imply that specific valuation measures such as equivalent variation and compensating variation can be used. Equivalent variation might measure the increased time that hunter-gatherer is willing to spend (*willing to pay)* to avoid losses, when marginal negative effects are caused by industrial sources. When Aboriginal rights require that a *willingness to accept* measure such as compensating variation be used, this may be difficult to measure using stated or revealed preference. Modern land claims likely represent a willingness to accept measure, but they are so complex that they are difficult to dissect into specific valuation categories. Compensating variation may be calculated in marginal change situations by making assumptions about its size relative to consumer surpluses and equivalent variation. However, when a traditional economy is rendered unstable, e.g. when small marginal changes no longer apply, other methods must be used. An unstable subsistence economy forces aboriginal people to search for alternative economic livelihoods (Tough, 1996). The method I suggest is to use the labour time method and appropriate labour rates to measure the economic value of the economy as one would measure an asset. This method may provide a fair and culturally sensitive method of calculating an

appropriate value as long as other effects of the loss of their economic base are also considered. This method attempts to measure the value of their stable economy using their preferences. This method does not measure the cost or value of replacing their economy once it has been lost or destroyed but measures the value of a stable and healthy traditional economy in terms comparable to a healthy industrial economy.

Other considerations must be made if one were to estimate the compensation that must be paid of the entire economy were to be destroyed. These additional considerations may be re-education, psychological adaptations, stress, and other adaptation costs and losses, or creation of new equal opportunity to practice traditional resource harvesting. In addition, the legal framework will determine if the economic loss was "justified or unjustified" in which case punitive damages may come into play.

CHAPTER 5: MEASURING THE VALUE OF TRADITIONAL LAND USE ACTIVITIES OF THE FORT MCKAY FIRST NATION

The objective of this thesis was to develop a method of valuation of traditional Aboriginal economic activities which is consistent with the Aboriginal culture and Aboriginal rights and can be used as a tool in negotiations for compensation for losses due to infringement of Aboriginal rights. Common methods used for evaluating traditional Aboriginal economic activities fail to take into consideration the full suite of traditional economic values associated with Aboriginal natural resource use (Usher, 1976) including the nutritional value of country foods (Wein et al., 1991), the production of tools and non-meat byproducts (Usher, 1976), and the social, cultural and spiritual value of resource production activities. The replacement cost methods have been rejected by Aboriginal groups as appropriate methods to measure Aboriginal values.[39]

The replacement cost method has been most frequently used to measure the value of 'country food' (Lu, 1972; Palmer, 1973; Usher, 1976; Bodden, 1981; Adams & Associates, 1998; Surrendi & Associates, 1998) and marketable furs (Lu, 1972; Palmer, 1973; Bodden, 1981). The replacement cost method measures value based on the market value of a substitute product rather than a value attributed by the consumer of the product. The method is commonly used to measure the value of subsistence production against the recommendations of economists (Duffield, 1991; Brown and Birch, 1992; Hausman, 1993) and it has been used in legal proceedings (Duffield, 1997). Given the theoretical and practical limitations of the replacement cost method, there is a compelling need for an evaluation method for subsistence economics that accounts for the full suite of production values for natural resources produced and used by a community.

[39] Fort McKay Industry Relations Corporation (Personal Contact); Athabasca Chipewyan First Nation, Compensation Negotiations, Mikisew Cree First Nation IRC, Policy, (Personal Contact).

An ideal method would measure the value of subsistence economies by using the choices, tastes and values of consumers in subsistence society and would be understandable and acceptable in different cultural paradigms. Freemen (1993) and Duffield (1997) reviewed several alternative valuation methods consistent with economic theory represented in the non-market environmental valuation economic literature. They can be classified as direct or indirect methods (Adamowicz, 1991). The contingent valuation method is an example of a direct method, whereas Hedonic and travel cost methods are indirect. Adamowicz (1998) reviewed some of the theoretical and practical problems (e.g. data collection) in using these methods. Centrally, the basic assumptions of these methods contradict traditional Aboriginal cultural and economic structures. To overcome these contradictions, Brown and Burch (1992), Adamowicz et al. (2002) and Haener et al. (2001) suggested combining methods to model and value subsistence production. However, combination methods typically involve measuring Aboriginal value systems using a market-based paradigm and are created because one method alone is not considered to be optimal or adequate.

Among more suitable methods the revealed preference method (Heaner, 2001), which involves observing Aboriginal subsistence activities, is consistent with Aboriginal cultural and social structures because it uses aboriginally defined values. The labour allocation method suggested in this paper is closely related to the revealed preference method.

I proposed that the labour allocation method was consistent with Aboriginal culture and economy and can be suitably used to value an Aboriginal subsistence economic activities. This method is consistent with early theories of valuation (Smith, 1970). It values goods and services from the viewpoint of the consumer (Chibnic, 1978) and can be reconciled with modern welfare theories of equivalent and compensating variation (Chapter Four). The labour allocation method

measures the amount of effort (labour) given to each activity and assumes that this effort is a measurement of the relative value of that activity to the Aboriginal economy. Since the Aboriginal family has only a limited amount of time to produce the goods they require, they must allocate that limited resource between the various opportunities that the environment presents to them. This approach is similar to methods used by anthropologists applying optimal foraging theory to subsistence hunting and gathering (Winterhalder, 1977; McNair, 1982; Hawkes, et al., 1985; Smith, 1987; Hawkes, 1996; Kelly, 1999). This method is similar to household production functions and the travel cost methods currently use in welfare economics. However, this method avoids assumptions that tie these methods to a market or industrial paradigm. The labour allocation method can be compared to basic neo-classical demand theory by using the total labour time as a budget constraint allocated to select an optimal basket of traditional harvest opportunities (Chapter Four).

In this chapter I applied the labour allocation model developed in Chapter Four to an available dataset for a hunter-gatherer society, the Fort McKay First Nation (Tanner et al., 2001). I used estimates of the time (labour) allocated to harvesting and processing each resource. The study was completed in 2000/2001 when I was under contract to the Fort McKay Industry Relations Corporation, before I registered as a graduate student at the University of Calgary.

Community Context

Members and ancestors of the Fort McKay First Nation traditionally harvested natural resources in northern Alberta in an area along the Athabasca River north of the Clearwater River for hundreds if not thousands of years (Mathewson, 1974; Yerbury, 1976; Tanner and Rigney, 2003). A 1995 traditional land use study showed a concentration of traditional activities along the Athabasca River, including the area between Fort McKay and the Birch Mountains to the

northwest (Fort McKay First Nation 1994). The Hamlet of Fort McKay, located 20 miles north of Fort McMurray and close to the centre of the Fort McKay First Nation traditional lands, is now almost completely surrounded by oil sands mining projects (Canadian Natural Resources Limited, 2002; Shell Canada, 2002; Tanner et al., 2001). These large oil sands projects have severely reduced the ability of the Fort McKay Aboriginal community to continue their traditional livelihood in the area.

The Industry Relations Corporation of Fort McKay conducted a time and labour study for this Aboriginal community bench marked in the mid 1960s, prior to rapid growth of the oil sands mining industry. The objective of the Fort McKay study (Tanner et al. 2001) was to obtain data on the practice of traditional activities before 1965 when the subsistence economy was more active. The expectation was that this time frame would provide information on traditional economic activities not greatly influenced by industrial or settler society. Tanner et al., (2001) expanded upon an earlier traditional land use study (Fort McKay First Nation, 1995). During the traditional land use studies community Elders placed animal, plant and human use icons on a map to identify where traditional activities took place. Fort McKay members became increasingly aware that oil sands developments had taken up large areas of the traditionally used lands and was imposing significant changes on traditional land use activities. The study was commissioned to measure these effects.

Methods

To test the labour/time method of evaluation I required an existing data set on time allocation for subsistence activities by an Aboriginal community. Data was available from a previous study, of a community in the oil sands development region of Alberta (Tanner et al., 2001).

The Fort McKay community operated a trapping and subsistence economy until the end of the 1960s, when the oil sands development began. Interviewing Elders about their activities during this era allowed the capture of time allocation data from a relatively stable subsistence based economy. The methods used to obtain this data on time allocation are described below.

Initial Consultations

In order to record time allocations of the traditional activities of the people of Fort McKay during the period before the development of the oil sands plants I needed to obtain a fundamental understanding of their traditional economy. I needed to understand the nature of their subsistence activities. Before proceeding with interviews or other data gathering, I undertook initial consultations with Bertha Ganter and some community Elders to gain an understanding of the traditional subsistence economy. The Elders and Bertha described their traditional activities including what animals they harvested and when, where and during which season they harvested. These discussions provided the basis for the construction of a yearly cycle of annual harvest activities, which was used for identifying specific questions about each harvesting task.[40]

Preparation and Review of Questionnaire

Once the annual cycle was understood, a questionnaire was designed to obtain information about major traditional practices before the traditional economy was dramatically affected by oil sands developments circa 1965. Initial interviews were conducted to test the efficiency and consistency of the questionnaire. The objective was to determine if the Elders would provide information about the time and energy allocated to different traditional practices.

[40] A copy of the questionnaire is included as Appendix A and the annual cycle analysis is included as Appendix B.

The original design of the survey took several weeks as the researchers struggled to gain enough knowledge about the nature of the traditional economy to ask appropriate questions. Ms. Bertha Ganter, a community member, reviewed the questionnaire and a survey containing 360 questions was finalized.

Elder Interviews

Elders occupy an important role in the Fort McKay Aboriginal community. The Elders are responsible for maintaining and passing down the wisdom, culture and knowledge of their ancestors. Today Elders also represent those people who were most active in traditional hunting and trapping activities during the mid 1900s. Due to budget constraints not all the Elders of the Fort McKay community could be interviewed. Twenty (20) Elders (10 men and 10 women) from the total Fort McKay community were selected by drawing their names at random from a list of 65 Elders in the community. A sample of twenty Elders was considered large enough to saturate the local traditional knowledge experts in the community. Elders are defined in this community as those individuals who had reached the age of 50.

A member of the community was chosen as the interviewer to provide the most effective interview conditions for the Elders. The Elders felt most comfortable talking in their own language to a friend. The community member, Bertha Ganter, participated in the test interviews and assisted in the design of the final questionnaire.

The interviews were generally carried out in the Elders' homes and in the language preferred by the Elder. Although the interviewer tried to follow the questionnaire, the Elder was encouraged to tell stories or discuss and describe activities in detail at their own rate and preference. The interviewer recorded additional information such as traditional stories when they were described. The interviews were all taped. To supplement previously created

traditional maps (Fort McKay First Nation 1996) additional maps of some traditional areas were prepared and used in the interviews to record the location of additional activities described by the Elders. The results of the interview were transcribed to English immediately during the interview and recorded on the questionnaire form. Once the original interviews were complete, I requested that Ms. Ganter ask the Elders some additional questions related to the interpretation of the results to obtain information omitted by the original interview results. Although the questionnaire was originally structured to obtain responses based upon the activities of individuals, as the study progressed it became apparent that the family unit was the most important structure of the subsistence economy and was an appropriate base for the questionnaire structure. Additional information was gathered on family relationships as a result and we discovered how closely related some of the members of the community were and how the community contained both Chipewyan and Cree roots.

The same questions were asked of male and female participants. Questions focused on activities during four separate seasons. Examples and descriptions of the structure of the questionnaire are included in Appendix A.

Annual Rounds and Seasonal Methodology

The interviewer asked a series of questions about the time and effort required for various traditional activities. Both genders were asked how long each activity took, even though some tasks were generally only performed by one gender. For example, interviewees were asked how long in hours it took to hunt a moose or to sew a fur hat, even if they did not participate in the work. The survey results were then divided into men's responses and women's responses to evaluate gender roles. The first part of the survey contained essential information about the interviewee and the time and location of the activities. The second section of the questionnaire

included a diagram of a circle divided into the four harvesting seasons. The interviewer recorded the important activities undertaken in each season, the total length of each season and the basic travel or location of the people at the time of these activities. Then the time allocated to each activity was recorded. Each season had a separate survey page where the number of hours used for each activity, hours and the number of people participating in each activity or task were recorded. The roles of the individuals were also described.

Data Compilation and Assumptions

Once the results of the survey were recorded, they were verified by comparing the estimates of time to the general descriptions of the activities. Averages hours allocated to each activity were calculated separately for male and female Elders. The estimates of each male Elder were added together and divided by the number of male Elders responding to that question. Occasionally there were answers that did not conform to the description of the activities and were too high or low to be possible. Discussions were held with the interviewer to determine why these responses were so different. As an Elder and member of the Fort McKay community, the interviewer was able to verify that two responses were not possible and that these biased responses should be eliminated from the data before averages were calculated.

To supplement the questionnaire data I obtained detailed information on several topics including, moose processing, bear processing, fishing processes and the use of tree products. I asked Bertha Ganter to consult with 5 Elders of her choice to obtain this additional information. These more detailed information and processes were compared with the survey results to test the results of the survey.

Tanner et al (2001) reported estimates of the average time individuals spent in each activity including harvesting and processing recorded during the study. The total time allocated

to a task was the product of time required for the task and the number people performing it. Family structure, participation, and experience were important aspects of harvesting and processing. For example, when two hunters ventured out together, one was often an experienced hunter and the other was less experienced (e.g. father and son). The time allocated to harvesting and processing a moose, bear or caribou included the time for hunting, butchering, cutting, smoking or canning meat, and preparing other products such as leather, bone tools, clothing or crafts. The time for hunting included successful as well as unsuccessful trips. The estimates were made by 10 male and 10 female Elders. Estimates of hunting times were the average of the estimates of 10 male hunters whereas estimates of processing and preparation were made by averaging responses from 10 female Elders

The technological change from dog sleds to snowmobiles had important effects upon the traditional economy. This change occurred gradually over a 10-year period from 1970 to 1980. Community members bought the first snowmobiles in the late-1960s and early-1970s. Gradually machines replaced dogs for winter transportation. This had an effect upon the number of hours spent on various winter activities, particularly fishing, trapping, hunting and gathering firewood. Elders estimated that hunting time in winter was reduced by as much as 75% when a snowmobile was used. For my analysis I used time allocation data for the period when snowmobiles had become commonly used.

Some moose were shot when encountered on trapping expeditions rather than shot during dedicated hunts. The data indicated that an average of 2 moose were shot during the winter, therefore, an assumption was made that 2 out of the total average of 7 moose were taken using snowmobiles during the winter. Therefore the average time required to obtain moose during the period when snowmobiles were used was 78% of the time taken when dogsleds were used.

Unlike moose, bears were not hunted during the trapping season. To account for the longevity of tools it was assumed that tools were made from one in five moose harvested.

Fish were an important staple of the economy, providing human and dog food. The amount of fish harvested was reduced considerably by the change to skidoos since such a large portion of the fish harvest was used for dog food. However, fishing remained important in the traditional economy, taking approximately 100 days during the year. The value of an average fish was calculated as the time spent fishing and processing fish divided by the total number of fish caught.

In a similar manner, the value of berries was based on the hours spent picking and stringing, drying and canning. Additional data on the location and quantity of berries harvested was reported for the oil sands mining sites. Estimates were made by Elders of the quantity of berries formerly harvested on those sites. The valuation of medicinal plants was similar to berries. The valuation of waterfowl and other birds was based upon the amount of time hunting and preparing birds.

The valuation of tree products required a different approach. Tree products were harvested for many different reasons. They were used in smoking meat and fish, in stretching hides, building and maintaining cabins, and for cooking and campfires. As well they were used for making specialized products such as canoes and making soap. Double counting was avoided by including tree harvesting as a part of other occupations rather than a separate category on its own. In addition, it appeared that there had been no measurable loss in the availability of tree products as a result of industrial activities. Therefore the value of tree products was included only as they were used within the other categories.

When selecting an estimate of time to be used for measuring value, I selected the estimate of the gender more familiar with the task. For example, when women predominantly did a task, time estimates provided by women were used and when men did the job estimates made by men were used. Tasks such as fishing and berry picking were commonly undertaken by both genders.

I made the assumption that the average value of traditional labour was equivalent to the salary rate implied by the average Canadian two earner family income. The average annual income of a Canadian two-earner family in 1998 was $ 62,116.00 (Statistics Canada, 1998). This amount divided by two earners and divided again by 246 working days yields $ 126.24 per day or $ 15.78 per hour assuming an 8-hour day. Three rates were chosen for the various tasks of preparing and hunting, trapping, and gathering. One was for tasks requiring significant experience, one for intermediate experience and one for minimal experience. The level of these rates could be chosen so that they were equivalent to salaries earned by persons having equivalent years of experience in a comparative industrial economy. Using $ 15.78 as an average value, I assumed that ½ of that amount or $ 7.89 would be the rate for minimal experience and 1.5 times $ 15.78 or $ 23.67 would be the rate for significant experience. One hunter in each family was assumed to be highly skilled and one hunter was assumed to be less skilled. The balance of labour was considered intermediate and assigned a rate of $ 15.78. An estimate of the total income or income constraint is provided by the summation of these factors as represented in the income constraint equation above.

Evaluation model

I applied the model developed in Chapter Four to the labour and resource harvesting data compiled by Tanner et al. (2001) to estimate the value of various resources and the entire economy in the traditional economy of the community of Fort McKay prior to industrial development.

The time required to harvest and process goods and the quantities harvested of each resource is equivalent to the prices and quantities represented by the optimization equation outlined in Chapter 4:

$$\mathbf{U = u\ (X)}$$

Where **U** is equal to the total utility which is a function **u** of the vector of goods and services **X,** and

U Is subject to the income constraint:

$$\mathbf{3(v}p_i\mathbf{x_i)} = M$$

Where the vector $\mathbf{x_i}$ is equal to the resource categories big game, fish, berries, medicines and birds ($X_{BigGame}$, X_{Fish}, $X_{Berries}$, $X_{Medicines}$, $X_{Birds)}$ and p_i is equal to ($P_{BigGame,}$ $P_{Fish,}$ $P_{Berries}$, $P_{Medicines}$, P_{Birds}) each measured by the number of hours allocated to producing one unit of that resource category.

Trapping was not included explicitly in the estimate of traditional resource values because trapping is driven by a market based system rather than a traditional economic system. Estimates of the hours dedicated to trapping were useful in the analysis because trapping contributes to traditional activities and time divided between trapping and traditional activities must be reconciled to account for overlaps such as the consumption of meat from fur bearing animals and the harvesting of moose and fish while trapping. In addition, the total available time was divided between trapping activities and other traditional activities.

The vector $\mathbf{x_i}$ represents the quantities of each traditional resource category produced during the year. The selection of the values for **v** is based upon the idea that Aboriginal rights to hunt, fish and gather are constitutionally equivalent to other Canadian economic rights.

Time Allocation Data

I compiled data on the average time spent in each resource production activity from Tanner et al. (2001) and provide them here to allow the reader to follow the application of the labour- rate evaluation model (Tables 5.1 to 5.7). The annual harvest rate by a family for each resource type (Table 5.8) was used to estimate the total value of the family's traditional harvest. The equation used to measure this value is equivalent to the optimized budget constraint or M (total budget) = Σ (sum of) [P_i (measured in time units) * V (measured in dollars) * X_i (each resource quantity used by the family)]. The value of each resource type was multiplied by the average quantity harvested per year as estimated by the Elders. Estimates for each activity presented in the tables below are averages calculated from individual interview responses.

Table 5.1 Estimate of time allocated to hunting and processing one moose.

Activity	Gender[41]* Of Elder	Average Hours	Average Number of Participants	Total Hours
Moose Hunting Time	Male	35.0	2.0	70.1
Meat Cutting, Smoking& Drying	Female	32.6	2.4	76.5
Fat Extraction	Female	5.8	1.3	7.4
Hide Preparation	Female	71.9	2.0	143.7
Hide Products	Female	61.0	1.1	67.1
Making Tools	Male	36.8	1.0	35.0

Source: Tanner et al. (2001)

[41] Note that each Elder was asked to estimate all activities and estimated each activity even if they did not participate. The estimates were then divided by gender to check to see if there were systemic differences.

Table 5.2 The time required to hunt for and process a bear

Activity	**Persons**	Hours	Total Time
Hunting	2	35	70.1
Time to cut meat and smoke	2.4	13.2	26.4
Fat extraction	1	7.8	7.8
Hide preparation	2	71.9	143.7
Making tools	1	36.8	36.8
Hide products	1	45.1	45.1

Source: Tanner et al. (2001)

Table 5.3 Estimates of time allocated by male (M) and female (F) members of the community to activities associated with fishing.

Activity		**Total Average Annual Hours**	**Average Number of Participants**	**Adjustments**[42]	**Total Hours**
Fishing	M	454.10	1.93	2.00	908.20
Drying, Smoking	F	512.20	1.85	2.00	1024.40
Preparing	F	545.40	1.85	2.00	1090.80
Make Dog Food	M	224.30	1.33	1.30	291.59
Make Fish Net	M	37.15	0.98	1.00	37.15
Make Fish Trap	M	8.65	0.93	1.00	8.65
Make Fish Hook	M	0.20	0.60	1.00	0.20
Make Fish Snare	M	0.58	1.10	1.00	0.58

Source: Tanner et al. (2001)

[42] The number of participants was rounded to the closest integer.

Table 5.4 Estimates of time allocated to activities associated with hunting and preparing birds. Estimates for each activity are averages calculated from individual interview responses.

Activity	Number of Hours		Number of Participants	Adjustments[i]	Total Hours
Hunting Birds	M	186.76	1.80	2	373.51
Plucking Duck	F	27.6	1.00	1	27.6
Collecting Feathers (pillow)	F	3.65	1.03	1	3.65
Collecting Feathers (blanket)	F	20.12	0.90	1	20.12
Making Loon Storage Bag	F	9.48	0.43	1	9.48
Making Pelican Pouch	F	4.95	1.00	1	4.95

Source: Tanner et al. (2001)

Table 5.5 Estimates of time allocated to activities associated with gathering and preparing berries. Estimates for each activity are averages calculated from individual interview responses.

Activity	Numbers of Hours	Number of Participants	Adjustments	Total Hours
Gathering Berries	269.3	2.3	2	538.61
Stringing and Drying	24.5	1.0	1	24.5
Canning Berries	69.7	1.0	1	69.7

Source: Tanner et al. (2001)

Table 5.6 Estimates of time allocated to activities associated with collecting and preparing medicinal plants. Estimates for each activity are averages calculated from individual interview responses.

Activity	Gender of Elder	Number of Hours	Number of Participants	Adjustments	Total Hours
Gathering Medicines	Female	72.3	1.0	1.0	72.3
Preparing Mint	Male	15.4	1.0	1.0	15.4
Collecting Tree Sap	Female	99.1	2.9	2.9	287.4
Collecting Tree Balsam	Female	31.6	1.0	1.0	31.6
Collecting Willow Fungus	Female	39.1	1.0	1.0	39.1
Other	Male	2.0	0.7	1.0	2.0

Source: Tanner et al. (2001)

Gathering wood was an occupation that was done while hunting, trapping or at home base therefore the time used to gather wood was included in other activities. For example, the time allocated for gathering wood to smoke fish was included in the time spent preparing fish.

Each day while trapping or hunting, wood was gathered to build fires, and to make tools and other goods. The estimates for the use of tree products are included in the time estimated for other occupations. The amount of time spent only on tree products could be the equivalent of 200 human days per family per year.

Clearly the time taken for trapping occupied a significant portion of the year. It is important to note that traditional hunting and gathering activities took place during the trapping time and that many of these activities were performed to support trapping. For example, fish were caught to provide food for dogs that were used to pull a sled for trapping purposes. Although trapping is considered a commercial activity, traditional activities such as eating the meat of fur bearing animals were important traditional activities. The estimates of the time allocated to trapping are primarily presented to ensure that the total time available for traditional activities accounts for time allocated to commercial activities like trapping.

Table 5.7 Estimates of time allocated to activities associated with trapping. Estimates for each activity are averages calculated from individual interview responses.

Activity	Gender of Elder	Hours	Average Number of Participants	Total Hours
Trapping	Male	1889.70	2.00	3779.40
Collect Beaver Castors	Male	0.58	1.10	0.64
Skunk Juice Mix	Male	0.35	1.23	0.43
Fur Hat	Female	17.75	0.89	15.78
Skin, Flesh, and Stretch Hides	Male	180.35	1.93	348.68
Other Stretches	Female	22.88	1.03	23.64
Gathering Fire Wood	Male	678.20	1.65	1119.03
Hauling Water	Female	356.60	1.35	481.41
Repairing Cabins	Male	15.20	1.80	27.36

Source: Tanner et al. (2001)

Table 5.8 Resource harvest quantities for a family based on Tanner et al. (2001).

Species	Number Taken in a Poor Year***	Number Taken in an Average Year	Number Taken in a Good Year
Moose	8.2	9.3	10.4
Deer	1.5	2.2	3.3
Caribou	9.5	7.8	16.5
Bear	2.0	3.0	4.0
Grouse	140.7	166.0	189.2
Hares	137.5	171.6	211.9
Ducks	116.0	128.0	165.9
Geese	8.6	11.2	18.2
Cranes	0.6	0.7	0.8
Beaver	62.8	62.6	95.3
Muskrats	304.2	310.8	401.4
Lynx	23.2	25.2	34.6
Martin	5.8	7.2	11.0
Fisher	9.7	10.7	14.1
Ermine	69.4	70.4	101.3
Squirrel	740.6	628.6	1122.2
Wolf	2.8	2.7	4.9
Fox	15.9	20.4	30.5
Whitefish	2055.6	2227.8	2361.1
Pike	321.4	335.0	363.3
Walleye	192.2	245.3	231.7
Burbot	80.0	56.4	90.8
Berries*	193.9	201.9	206.9
Medicinal Plants**	13.4	14.1	14.3

* Berries are measured in gallons.** Medicinal Plants were measured in pounds.

Source: Tanner et al. (2001). *** Some values for poor years are higher than values for average years. This result was caused by some Elders responding in poor years and but not responding in average years or for responding in average years and not poor years. This caused inconsistencies in the averages.

Results

Resource Production Values

The greatest amount of time allocated by a family to resource harvesting and processing for an individual resource was for moose, both per unit and total time (Tables 5.9 and 5. 15), and the least for medicinal plants (Tables 5.14 and 5.15). Similarly, moose contributed the highest total value to the traditional economy among resources and medicinal plants the least (Table 5.15). Black bears were the next most valuable resource in the traditional economy, both per unit and overall (Tables 5.10 and 5.15). Similar amounts of time were spent by a family in harvesting and processing fish, small game, and berries (Tables 5.11, 5.12, 5.13 and 5.15). The value of these resources to the economy was similar, ranging between $9,283 and $10,089 annually per family.

Table 5.9 Estimated value of a moose using the labour-value rate method.

Activity	hours	people	P	(v_1)	(v_2)	X	Percent Used		Value $
Hunting Moose	28.0	2.0	56.0	23.67	7.89	1	*78*	$	687.24
Making Tools	36.8	1.0	36.8	15.78			20		116.14
Fire Preparation	5.36	1.0	5.4	15.78			100		84.58
Cut/ Smoke/Dry	39.6	2.4	93.0	15.78			100		1,467.54
Fat Extraction	7.8	1.3	9.9	15.78			100		156.22
Hide Preparation	71.9	2.0	143.7	15.78			100		2,267.59
Hide Products	61.0	1.1	67.1	15.78			100		1,058.84
Totals			382.5*					$	5,838.15

* Hours adjusted for percentage of tools used per animal.

Table 5.10 Estimated value of a black bear using the labour-value rate method.

Activity	hours	people	P	(v_1)	(v_2)	X	Percent Used	Value $
Hunting Bear	35.0	2.0	70.1	23.67	7.89	1	100	$ 1,106.18
Making Tools	36.8	1.0	36.8	15.78			20	116.14
Fire Preparation	8.0	1.0	8.0	15.78			100	126.24
Cut/ Smoke/Dry	13.2	2.4	26.4	15.78			100	499.59
Fat Extraction	7.8	1.0	7.8	15.78			100	123.08
Hide Preparation	71.9	2.0	143.7	15.78			100	2,267.59
Hide Products	45.1	1.0	45.1	15.78			100	711.68
Total			308.5*					$ 4,950.50

*Hours adjusted for percentage of tools used per animal.

Tanner et al. (2001) reported that there were approximately 2,864 fish caught by a family annually prior to the advent of snow machines, a result similar to that reported by Stanislawski (1998). Elders estimated that 2,000 of the fish would have been caught for feeding dogs (Tanner et al. 2001). Once snowmobiles became prevalent, the number of fish caught for human consumption annually would therefore have been approximately 864. The average value of a fish in the mechanized travel era was estimated as $11.55 (Table 5.15).

Table 5.11 Estimated annual value of a subsistence family fishery using the labour-value rate method

Activity	Hours	People	P	(v_1)	(v_2)	X	Percent Used	Value $
Fishing	137.0	2.0	274.0	23.67	7.89	864.5	100	$ 4,323.72
Making Tools	46.6	1.0	46.6	15.78			100	735.35
Fire Preparation	5.0	1.0	5.0	15.78			100	79.90
Cut/ Smoke/Dry	153.7	2.0	307.4	15.78			100	4,850.77
Totals			668.8					$ 9,989.74

Table 5.12 Estimated annual value of a small game production by a family using the labour-value rate method

Activity	hours	people	P	(v_1)	(v_2)	X	Percent Used	Value $
Hunting	186.8	2.0	373.5	23.67	7.89	139.9	100	$ 5,894.10
Plucking	27.6	1.0	27.6	15.78			100	435.53
Collect Feather Pillow	3.7	1.0	3.7	15.78			100	57.60
Collect Feather Blanket	20.1	1.0	20.1	26.4	15.78		100	317.43
Loon Storage Bag	9.5	1.0	9.5	15.78			100	149.91
Pelican Pouch	5.0	1.0	5.0	15.78			100	78.90
Hunting Grouse	100.0	1.0	100.0	15.78		166.0	100	1,578.00
Harvesting Hares	100.0	1.0	100.0	15.78		171.6	100	1,578.00
Total			639.4			477.5		$ 10,089.47

As shown on Table 5.13 the value of berries to a single family is significant relative to other traditional products.

Table 5.13 Estimated annual value of berry harvesting by a family using the labour-value rate method

Activity	hours	people	P	(v_1)	(v_2)	X	Percent Used	Value $
Gathering	137.0	2.0	538.6	23.67	7.89	201.9	100	$ 8,499.10
String and Dry	24.5	1.0	24.5	15.78			100	386.60
Can Berries	25.2	1.0	25.2	15.78			100	397.70
Totals			588.3			201.9		$ 9,283.40

Table 5.14 Estimated annual value of medicinal plant harvesting by a family using the labour-value rate method

Activity	hours	people	P	(v_1)	(v_2)	X	Percent Used	Value $
Gathering	72.3	1.0	72.3	23.67	7.89	14.1	100	$ 1,140.90
Preparing Mint	15.4	1.0	15.4	15.78			100	243.00
Gathering Tree sap	99.1	1.0	99.1	15.78			100	1563.80
Collect Tree Balsam	31.6	1.0	31.6	15.78			100	489.60
Collect Willow Fungus	39.1	1.0	39.1	15.78			100	617.00
Other	2.0	1.0	2.0	15.78			100	31.60
Total			259.5			14.1		$ 4,085.90

Table 5.15 Summary of the annual value of harvesting and processing of natural resources by a Fort McKay family in the mid 1960's.

Resource	***P*** Hours /unit	***W*** Average value rate	Unit value	***X*** # of units	***= M*** Resource Value	Total Hours
Moose	382.5	15.26	5,838.15	9.3	54,294.80	3557.3
Black Bear	308.5	16.04	4,950.50	3.0	14,851.50	925.4
Fish	0.8	14.93	11.56	864.5	9,989.74	668.8
Waterfowl, Hares & Grouse	1.3	15.78	21.13	477.5	10,089.47	639.4
Berries	2.9	15.86	45.98	201.9*	9,283.40	588.3
Medicinal Plants	18.4	15.75	289.78	14.1**	4,085.90	259.5
Total		15.45			$ 102,594.81	6638.7

* Units are gallons
**Units are pounds

Discussion

Relative Value of Resources to the Traditional Values of Fort McKay

The labour time method uses the average amount of time spent collecting, hunting and processing various resources and multiplies this time by a monetary value of that time. It is based upon the idea that the hunter gatherers are optimally allocating their time to obtain the various products they want. The objective of this thesis was to identify a valuation methodology that would be consistent with the Aboriginal culture and Aboriginal rights and would be acceptable and understandable by both sides in negotiations for compensation.

The results show that it is possible to use this method to estimate the relative values of various resources wanted by the Aboriginal peoples. Below table 5.16 provides the

relative cost in hours per pound of food produced in the diet of a family. This example does not include the benefits obtained by other products associated with each animal such as bear grease, hides, tools or other traditional products obtained by harvesting these animals. Therefore Table 4.16 is not a measurement of the total returns from harvesting each of these animals. However, pounds of meat do represent an important portion of the utility obtained.

Table 5.16
Fort McKay Returns Per Labour Hour

Item	Hours /unit	Lbs/ unit	Lbs/ hour
Moose	382.5	450	1.2
Bear	308.5	250	0.8
Hare	1.7	1	0.6
Fish	.8	2	2.5
Grouse	1.7	1	0.6
Waterfowl	1.8	1.8	1.0

The meat returns per hour include processing time and with the exception of fish, are all relatively close to one pound per hour of labour. This simple calculation supports the idea that one of the motivations of the Aboriginal people in allocating their time is to obtain quantities of food. The time allocation may not explicitly identify cultural and spiritual values, but these values are implicit in the time-based measure of activity. A variety of resource production activities and associated social interactions such as hide preparation, making dried meat and crafts, provide opportunities for maintaining culture and language.

The authors (Winterhalder, 1977; McNair 1982; Hawkes et al., 1985; Smith, 1987; Hawkes, 1987; Kelly, 1999) discuss how and with what motivations the subsistence hunter-

gatherer allocates time. By using the idea of revealed preference, I am assuming that they do what they want to do and that they allocate their time according to how much of each product they wish to obtain. In other words, they are expressing their valuation of each product by allocating time, their limited resource, to obtain it. If they desired more berries, they could allocate more time to obtaining berries, subject to the berry's seasonal constraints. If they wanted more moose meat, they could hunt moose more. Their time is their currency and it can be used to measure the importance or value of these items to the subsistence economy. When they spend over 3,500 hours on moose hunting, transporting and processing they are demonstrating the value of the moose to their economy. This time allocation implicitly includes their tastes, their nutritional preferences, their spiritual considerations and their cultural adaptations. The time allocation also accounts for the expected abundance or availability of each resource. A change in the expected abundance of various resources changes the expected cost of that resource. A change in the unit cost is likely to change the relative valuation. On average, given the expected costs based upon resource abundance and given the preferences, cultural and spiritual standards, the total time allocated to each of the resources listed above in Table 5.15 indicates the average relative value of each of the resources to a family of Fort McKay during the period studied.[43]

[43] Note that in addition to the number of moose taken there was also caribou and deer taken. The Tanner et al. survey results indicated that the type of caribou was not specified. In some cases the Elders referred to barrenland caribou in other cases they referred to woodland caribou however the Elders did not specify to which they were referring. Three Elders estimated the average number of caribou taken in one year to be over 25, 30 and 50. Given the abundance (or lack thereof) of woodland caribou in the Fort McKay region, these Elders must have been referring to barrenland caribou. Some Elders indicated that they occasionally had made special trips to harvest barrenland caribou. The interviewer indicated that these trips were not annual events and could not be considered annual averages. In addition, the female Elder who claimed 50 caribou also estimated that in an average year her family would kill 50 moose. The high estimate of 50 moose in an average year did not appear to be reasonable. In order to compensate for these apparent exaggerations I assumed that the average family harvested 9.3 moose per year representing the total number and weight of all ungulates harvested per family. This was calculated by eliminating the high estimates from each category. When the high estimates were eliminated and the remaining caribou and deer were added to the moose category it was equivalent to approximately 9.3 moose. However, the data makes it difficult to assign a separate value to each different ungulate harvested.

This method seems to properly represent the relative value that the Aboriginal people assign to each product of each class of products. It also supports an understanding of the Aboriginal cultural structure and religious and cultural preferences. Therefore this method has some of the characteristics needed in an appropriate valuation method.

The Value of Time in Context

From a critical perspective one might suggest that this system measures nothing because time could be spent on any activity regardless of what the time produced. If calories were used as a currency at least calories are a measure of potential nutrition. The critic may ask what if people allocated their time on something that was not productive. This is an important issue. This time labour method only provides a measure of value if time is allocated within the Aboriginal traditional economic context. In this context we know that the hunter gatherers have a limited amount of time to allocate to obtaining their livelihood. In this context their survival depends upon their appropriate allocation of time. Traditionally they lived within natural cycles of animal migrations, hibernation and reproduction. Their ability to create a livelihood out of what appears to others to be wilderness is nothing short of remarkable. One of the purposes of traditional land use studies is to determine the extent to which Aboriginal hunter gatherers consumed various resources, their preferred cycle of resource use and the cultural and spiritual characteristics of their successful livelihood. This information is important to assist in determining their preferred level of resource consumption which is protected by the Canadian Constitution.[44] Their preferred level of harvest and the average time or effort taken to obtain

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I also checked the time estimates for specific tasks. To validate the value of the time averages, tasks such as preparing hides were broken down by each individual sub-task and separate estimates of the time taken for each sub-task estimated and summed. These estimates were then compared to the averages to test the averages for reasonableness.

[44] The rights of Aboriginal peoples to maintain their hunting in their preferred manner is outlined in *Sparrow*, 1990; and *Halfway River*, 2001.

various resources in their traditional livelihood can be viewed as a behavioral model. Once the traditional subsistence economy becomes unstable, the optimizing behavior of these people breaks down. Time can no longer be used to measure the cost or the price of traditional goods. Time is only used to measure the value with in the context of the traditional subsistence economy where the time allocated to different resources results in the hunter gatherer obtaining a similar level of protein and supplies as shown it Table 5.16.

Comparisons with Other Methods

Various other methods have been proposed to value traditional production in hunter-gatherer societies in northern Canada. Bodden (1981) applied the replacement cost method in a study of country foods used by Aboriginal people of the Slave River Delta. He calculated the value of meat harvested by Aboriginal people as the product of the average cost of red meat in the local grocery store and the weight of meat harvested. The average retail price of red meat was $ 4.00/kg ($1.81/ pound) in 1977 dollars; chicken sold for $ 2.75/kg and berries for $2.50/kg. A 227.3 Kg (500 pound) moose would have been $ 909 in 1977 $. Using my labour-value method a harvested moose in 1977 would have been $2,005.03 because the labour-value estimate includes all harvesting and processing activities for the entire moose, not just the meat. Costs include the labour involved in hunting, processing meat, tanning the hide, rendering fat and making tools out of the bone and sinew of the moose.

Another study of country food value was done by Chang-Mei Lu, (1972) valuing country food use in the Northwest Territories during the years 1967 to 1970. The value estimated per pound for moose, caribou and deer meat was $ 0.65 per pound. Lu assumed that the average meat from a moose was 350 pounds. Therefore the value of each moose would be $ 227.5 dollars. However, in order to make a more consistent comparison we can assume that the edible

meat from a moose is 500 pounds[45]. Using Lu's meat value, the value of the moose would be $ 340.00. Tanner et. al (2001) estimated the value of the moose killed in Fort McKay at $ 793.54 (1967 $). The value of the labour method takes into consideration more than just the value of the meat. Lu's valuation of the meat of a bear in 1967 $ is $35. The value of the bear in Tanner et al. in 1967 $ is $ 635.86. The replacement cost value of the meat of the bear is considerably lower than the labour value. One may hypothesize that the preference for bear meat was much lower. However, if this were true the bear must be taken for other reasons. According to Usher the value of a bearskin was approximately $ 145.00 in 1968 $, which would still only bring the estimate up to $ 180.00 or 28% of the labour based total. If the Lu replacement value were correct, according to optimal foraging theory analysis as outlined in Winterhalder (1981) it does not appear that harvesting a bear would be worth the time of the Aboriginal people.

A recent study by Haener et al. (2001) used revealed and stated preference methods to develop a model of hunter preferences. Their objective was to simulate the effect of landscape change on behavior. The model was based on the idea that selection of a particular (hunting) site is based upon the attributes of the site and alternative sites. Attributes included factors such as the abundance of moose sign, distance from home, trails and forestry harvest condition. The model was estimated for different communities and information was available on the age and other characteristics of the Aboriginal hunter. The model was used to estimate the effect of a 25% loss in moose population; a hunter would lose $300 (Elders and middle aged hunters) or $1,425 (young hunters). The authors estimated that the replacement cost for 25% of the harvest (one moose) would be $ 800 and commented that the results were comparable to replacement

[45] Elders from Fort McKay estimated that one large bull moose would generate approximately 500 pounds of meats used in traditional methods of preparation.

cost values. With my labour-value method the value of loosing one harvested moose in 1999 would have been $6,035.

The replacement cost model consistently produces lower values than the labour-value model. This is primarily caused by the fact that the other benefits of killing or gathering and processing a moose, bear, birds, and fish are not included in the replacement cost method. However, even when some of those values are included as in the example of the bear skin above, the replacement cost values still were quite low.

In addition, the replacement cost method does not take into consideration the nutritional aspects of the traditional foods. A nutrition study (Wein et al., 1991), based upon surveys from 1985 to 1987, states that country foods contain a significant nutritional advantage over store bought food. This advantage is not considered in the replacement cost valuation methods and is another reason why replacement cost studies should not be used to measure losses to Aboriginal economies through industrial infringements. Even when economic losses are considered, nutritional and other losses should be added to determine the total loss. Nutritional losses may also include secondary health effects.

Use of Labour Method to Value Traditional Economy

The labour method can be used to model the traditional economy. This can provide a more systematic approach to valuation of losses. The labour allocation method can assist in understanding the relative importance of various foods in the total diet. The hunter-gatherers show their preferences for a certain diet and certain products by allocating their time to acquiring them. For example, a bear may be killed for its meat but it is also very important for the grease, which is added to various foods and used to supply energy during long winter trips. The number

of bear taken each year had an important correlation with the special products associated with a bear.

The labour method also helps provides a framework for analyzing losses in their traditional livelihood by analyzing their entire diet cycle. For example, through historical examples of the early hunter-gatherer diet, we know that a large percentage of the diet was meat (MacGregor (Peter Fidler) , 1966; Gillespie (Samuel Hearne), 1975). On the other hand, Wein (1991) stated that among older Aboriginal adults in the Fort Chipewyan and Fort Smith only 40% of their total weight of meat consumption was from country sources. In addition, the same study noted that the presence of a hunter in the household increased the percentage of country food consumed per day. Which would indicate that as hunters and fishermen became less involved in hunting and trapping the percentage of country food in the household fell. We know that opportunities for hunting and trapping have declined in the region as a result of industrial infringements. The correlation between hunting and traditional food consumption is a particularly important result when estimating losses from such industrial infringements. Since all of the activities associated with hunting and gathering are important for nutritional, culture and spiritual reasons, an appropriate estimate of loss would involve measuring the reduction in total time spent on hunting, gathering and fishing and the associated processing activities that occupy peoples time.

Also, analysis of the total economy can assist in determining the extent of cultural changes. Bodden's (1981) estimates of family meat consumption indicate that approximately $ 17,000 was spent on meat at the local grocery store for all residences of Fort Resolution. Bodden's estimate of the total value of country foods, based upon the same price assumptions, was $ 111,083. This would indicate that 87% of the meat consumption in Fort Resolution was

from country food sources during the mid 70s. However, given Bodden's total estimates of meat consumption and the total requirements for calories of that number of people, there must have been a significant amount of non-meat consumption to supply the calories needed. We know from ecological and historical accounts of early Chipewyan and Cree activities (MacGregor (Fildler), 1966; Gillespie, (Hearne), 1975) that access to other forms of calories was scarce and they used meat as a large portion of their caloric needs. Therefore, given Bodden's analysis, the Aboriginal people in this area are not substituting the loss of traditional meats with the same percentage of other meat products. We also know that the average income of Aboriginal people is lower than the Canadian average and that commercially available meat is an expensive commodity (Statistics Canada Average Family Incomes, 1998).

Bodden's study estimated that the human consumption of moose meat in the Aboriginal community in the Slave River Delta during 1976 was 6,278.4 kilograms (13,812.48 pounds), consumed by approximately 451 people making up 103 households. (Approximately 4.4 people per household.) This estimate indicates that the average consumption of moose meat was 0.37 pounds per day per family or 134 pounds per household per year.

For the total Aboriginal community in Fort Resolution he estimates that 32,702.8 kilograms (71,946.2 pounds) of "country food" was consumed by humans during 1976.[46] This would mean that on average approximately 0.43 pounds of country meat of all types was consumed by these people per day. If we assume that the average calories in this meat are approximately 640 calories per pound, the total calories obtained from this diet would be 276 per day. This would amount to less than 20% of the total diet requirements for these people. In earlier times the percentage of meat in the diet would have been over 80%. Given that average meat content may be approximately 640 calories per pound, in order to supply even half the

[46] This study was based upon 103 interviews of Aboriginal people in Fort Resolution.

calories in an Aboriginal country food diet one would have to consume approximately two pounds of meat per day. Therefore, in order for these people to survive, other food products must have significantly supplemented their diet, which represents a large change in their food mix and unknown effects on their nutrition and culture. Bodden displays a graph showing that significant amounts of non-meat food products were purchased at the grocery store in Fort Resolution. It is therefore likely that if the Aboriginal people were given an amount of money equivalent to the loss of the meat products that they would not be inclined to purchase meat but would substitute away from expensive products to cheaper food to spread their dollar further. Therefore, to estimate the loss in traditional foods by using alternative meat products is not appropriate when the actual purchases of the Aboriginal people are not meat products. Clearly, there were significant impacts on the traditional economy of these northern peoples by the time of the Bodden study was completed. A study of the actual consumption of these peoples showed these changes that had already taken place. By modeling the traditional economy of these peoples from the period of approximately 50 years ago we are able to estimate the likely diet and structure of the traditional economy. The labour value method allows us to estimate the partial loss of traditional economic opportunities if we assume that the economy is stable and sustainable. However, once limited cash payments are introduced into this economy and market purchases supplement the traditional foods, significant changes occurred in their diets. Although we can estimate the relative economic value of the traditional products in a stable economy, once the cash economy begins to dominate their livelihood, other losses, such as nutritional and re-educational costs must also be included in order to arrive at the total loss estimate. This example also demonstrates that hunter-gatherers spend their time in their traditional economy with

different priorities than they spend their cash in the market economy. This is a significant result and supports the idea that there are two economies rather than one mixed economy.

Limitations - Theoretical

Labour time values can only be used in a stable environment where scarcity values do not affect the allocation of time to the various products desired. Unfortunately scarcity was common in the Aboriginal traditional society as their economy was exposed to resource depletion (Tough, 1996). I have assumed that we can measure their traditional economy as a reflection of their labour time spent on traditional activities even though they have been exposed to depletions and market forces for over 300 years.

The stability of the economy is also required to ensure that cultural utilities are maintained. This method does not measure the degree to which cultural values are eroded by western pressures. The labour time method is a measure of willingness to pay rather than willingness to accept. As the economy becomes less stable or preferred levels of traditional products become unavailable, the relationship between WTP and WTA likely becomes greater and the WTP method becomes an inadequate method of valuation. I have assumed that the WTP is a good approximation of WTA. In the Aboriginal economy joint production is common. It is difficult to allocate the labour cost to an individual product consumed by the family unit. Therefore if one resource declines it is difficult to isolate the effect of that decline.

This model has only measured the traditional subsistence economy. However, part of their current subsistence is provided by market products and market systems. These market products may have a value in the traditional economy that is different from the value in the market economy. An important market economy that supported the traditional economy is the fur trade. The relationship between these two economies is not analyzed by this thesis.

Substitution effects between different products within the subsistence economy are limited to the ability of the family to maintain a stable economic livelihood. The reduction of the availability of an important species may be destabilizing and substitution may appear to be possible but be culturally or physically impossible or unacceptable. Limited substitution effects also increases the differences between willingness to pay measures and willingness to accept measures.

The labour of any one individual may be of different productivity, effort or quality than another individual within the family. The different rates assigned to different participants can only estimate the average production of the groups of participants. The rates that have been assumed above may affect the relative value of different products if those values are not appropriately chosen.

I have assumed that the Aboriginal people minimize their costs in labour time to obtain their goods. They in fact may not minimize their time. Several interview discussions indicate that they in fact spend more time on occupations especially if they are teaching a younger member or are confident of their success. (Fort McKay interviews 2000)

I have assumed that the family is the production unit. Often production and sharing extends beyond family boundaries.

I have assumed that a comparable livelihood in a market economy can be used to value and compare the labour of an Aboriginal person within his/ her sustainable economy. There are several problems with this assumption. Perhaps the most important is that the value of the labour will change depending upon with which economy the Aboriginal labour is compared because different economies have different average salary levels and standards. Another problem is that

this use of a value is only for comparative purposes since it would be difficult for an Aboriginal person to actually generate a viable life within a completely foreign economy.

The use of monetary values resulting from this method must only be done with care. As shown by Bodden (1981) there is a large difference between the manner that time is spent on available traditional goods and the manner in which money income is spent.

The most difficult challenge for this method is to compare values of the two separate economies. The direct comparison of the value of time in traditional economies and opportunities to earn wages in market based economies has not worked because of the significant difference between the two types of economies. Since trapping activities are so similar to the traditional life, there may be a method of assessing the value of a hunter and trapper's time by isolating returns from trapping per hour and using that figure as a proxy for the value of traditional activities. This should be investigated further.

The fact that declining traditional economies should be evaluated using the willingness to accept measure and the difficulties in establishing a firm value of labour time in the model indicates that the results of this method should be used as a guide and educational process to facilitate infringement negotiations.

Limitations in Methodology

Gathering information about the traditional economy of the past is difficult because one must rely upon the memories and experience of a declining number of Elders some of whom had limited exposure to their traditional ways. These factors limit our ability to apply the labour method to estimate the value of hunter-gatherer economies. As a result some of the responses may not represent the actual time or amount of resources harvested. To remedy this possibility

extra questions and modeling was constructed as described above. Since traditional activities continue to decline data sources are likely to become less reliable in the future.

The second limitation in methodology is that it is difficult to establish a value of capital goods not generated by traditional labour such as snow machines. Snow machines were used for both hunting and trapping and their use for hunting and transportation is likely a significant allocation in the value of these items. The value of snow machines is not included in these estimates.

Another factor that played a role was the role of men versus the role of women in the economy. The survey asked the same questions to men and women. However, during the study I discovered that there was a significant separation in women's jobs and men's jobs. In future surveys different questions should be designed for women and men.

The Best Uses of the Model

The labour time model measures the relative value of the elements of the Aboriginal economy. It measures the activities in which the Aboriginal people prefer to participate. In this way it accomplishes two important goals described below.

However, the labour-value method can play a role in estimating the losses as a result of infringements of their rights. The method can provide an approximate value of the sustainable traditional economy. However, the value of their stable economy is not necessarily the amount that should be paid in compensation to the Aboriginal people but may be one of the tools used in negotiations. Many Aboriginal traditional economies have been virtually destroyed and the resulting losses will include not only the loss of a viable culturally based economy but loss of a way of life. Costs which must be included would be the costs of re-education, psychological impacts, diet and health impacts and other considerations similar to those considered in an

expropriation proceeding. These impacts are discussed in the context of Mainville's (2001) work on Aboriginal rights and expropriation law.

Alternatively, if the Aboriginal economy has not been completely destroyed, their opportunities to hunt could be the replaced by finding a similar alternative environment. This type of compensation could be assisted by the labour time method by using the measurements of the relative importance of lost elements of their economiy.

Under the current Canadian legal environment the assessment of losses may be compared to the methods used under the law of expropriation (Mainville, 2001). Expropriation methods include methods designed to assess the value of the loss, which is the value of the commodity in the eyes of the owner or consumer. So losses will include future possible uses of the land that the owner may be deprived of or special non-replaceable characteristics that the owner would be deprived of when the land is expropriated. The assessment must be done based upon the value of the traditional uses to the traditional users. The labour allocation method measures those values and provides a method of measuring the economic value of the traditional economy to the Aboriginal people.

In the case of the US law, economists have suggested that methods consistent with neo-classical economic non-market theory be used. The hedonic method has been suggested as being consistent with Aboriginal preferences and market theory. However, the hedonic theory suggests that Aboriginal values can be compared to other opportunities available to them in the market economy. This method may be acceptable in the US where the market is the dominant paradigm, but it is not applicable in Canada where the Canadian Aboriginal person has a right to maintain their culture and traditional livelihood based upon their own preferences. In Canada, the

Aboriginal paradigm is now defended by the Constitution and exists independently and equally with the mainstream market paradigm and cannot be dominated by it.

In contrast to the hedonic method, the labour time method can apply to both the US and Canadian jurisdictions because it is based upon preferences of the peoples. The difference between using the labour method for Canada and that of the US is the method of selecting labour value rates. In the US, wages could be calculated using the hedonic method. In Canada the choice of values must respect the status of Aboriginal rights to protect their traditional activities under consent or justified infringements.

Conclusion

I applied the labour time method for estimating the value of subsistence production of the Aboriginal peoples of Fort McKay, Alberta. I showed that one can obtain estimates of the value of traditional activities by using a labour time based method and that the relative values of each activity can be measured by using this method. Further, the value of the traditional economy estimated using average Canadian salary rates yielded a value that is comparable to an average Canadian income for the same size of family and is therefore one possible equitable estimate of the value of the Aboriginal economic activities.

The labour allocation method has some important advantages over other methods such as the replacement cost method. The replacement cost method tends to measure only the portion of the traditional goods that are available in the market. They often exclude things like the value of hides, nutrition and cultural benefits. The labour time method measures the value of the preferred traditional activities related to resource procurement and processing within the context of the Aboriginal economy, which is the basis of the legal rights. This method is more consistent

with the preferences and culture of the Aboriginal people and therefore is an appropriate method to evaluate losses of traditional economic opportunities due to industrial infringements. Finally, the labour allocation method is consistent with both Canadian and US legal frameworks. The variable that must change when using it in Canada is the method for determining the value of the labour. In Canada the rate must allow the replacement of the traditional economy at an equitable and reasonable level.

CHAPTER SIX: CONCLUSION

There are many Aboriginal land claims, specific claims, treaty negotiations and infringement negotiations in Canada that require estimates and valuations of Aboriginal subsistence activities. Yet typical methods that were used to value subsistence economies are not acceptable to Aboriginal communities. Since 1982, Aboriginal rights to maintain hunting and gathering activities are protected and now have a status in law equal to other basic human rights. The new status of Aboriginal culture and traditional economic activities requires a new approach to valuation. The purpose of this project was to develop a method of valuation which was consistent with the Aboriginal culture and Aboriginal rights and can be used in land use negotiations for compensation and losses due to infringement of Aboriginal rights.

Various methods have been used to value subsistence economies. The replacement cost method was commonly used (Usher, 1991) and other methods have been proposed which are derived from economic welfare theory (Freeman, 1993). These methods of assessing subsistence economies have proven inadequate. They have been rejected by Aboriginal communities because they are not based on Aboriginal culture and thought. Methods such as the replacement cost method, have been found to measure only portions of the real value of subsistence economies to their participants and therefore are not appropriate to be used in compensation discussions.

In order to accomplish this task I reviewed the philosophical basis of the concept of value to more clearly understand the nature of the concept. Then I looked at the theoretical anthropological and economic models of value assessment and analyzed methods that have been used to value subsistence economies in the past.

Perhaps the most important event affecting how Aboriginal subsistence economies must be valued is the protection granted them by the inclusion of section 35 in the Canadian Constitution. Aboriginal culture, language and subsistence economic activities are now protected in a similar manner to other basic human rights. To develop a method of assessing value which was consistent with the principles identified, I chose to measure the value using the time allocated to each traditional activity and applied that method to the subsistence economy of Fort McKay in northern Alberta.

The Importance of the Aboriginal Perspective

Although the Aboriginal cultures of northern Alberta have a rich oral history and wisdom pours out of their many legends and stories, I have not been able to find any specific theory of value in their lore. I searched for a transcultural theory of value by reviewing western philosophical concepts of value. These concepts included both the subjective and objective values. Objective values provide a framework within which laws, traditions and customs are built. They give meaning to cultural structures. Subjective values provide individual assessments, which together form markets, priorities and individual motivations. Both concepts contribute to a complete value system.

Valuation systems are based upon culturally determined understandings. The western based philosophical tradition as given rise to a valuation system based upon subjective utilities within carefully structured objective axioms. The Aboriginal system of thought does not separate values into such categories (Battiste and Henderson, 2000) but looks at the universe through a more holistic view. Even by separating their activities into time spent obtaining different products, I may be violating their sense of wholeness. But negotiation requires some

compromises and using their preferences within their traditional economy is the least intrusive system that I could envision.

The legal status of unextinguished Aboriginal rights has been elevated and made equivalent to other human rights protected by the Constitution. Infringement of these rights cannot be valued by a system of thought that is foreign to their cultural values. The Aboriginal people now have the right to assign their own values based upon their culture and social organization. The Supreme Court of Canada has specifically required the infringement will require consent when the infringement strikes at the fundamentals of Aboriginal culture. The Court also demands that appropriate consultation is undertaken. This consultation involves a process where Aboriginal culture and economic requirements are studied, reviewed and included in the negotiation process.

The labour method uses the Aboriginal peoples' allocation of time to different activities. This allocation is not only a minimization of costs but includes the Aboriginal customs and cultural structures. They make their decisions based upon their cultural rules which may include sharing, satiation, environmental rules and a spiritual relationship to the land. The Supreme Court insists on protecting their cultural rights and the time labour method supports this goal.

Finding a Method

In order to find a common link in values I had to go back in the history of thought to find a basic human value or comparison between cultures. The western valuation theory evolved from a labour or cost based system (Smith, 1970: 1776) to a system that could cope with scarcity and various land and resource ownership structures (Marshall, 1890). The idea of optimized marginal utility eclipsed the labour value theory. In western economics the labour theory is consistent with the utility theory and can be applied under certain circumstances, which are: no

resource or land ownership, little capital accumulation, and no absolute scarcities. In Aboriginal economics, the labour theory works as long as the economy is stable.

I also drew upon economic welfare theory and anthropological studies to derive a valuation system for subsistence economies. This helps explain the unspoken tradeoffs of which Aboriginal people are aware but do not regularly articulate. If subsistence harvesting permits the substitution of one good for another, the value is different than if no substitution was permitted. The isolation of the income effect from the substitution effect, the change in welfare when the economy is affected, is the goal of the valuation process. Also, anthropological studies provide information on the degree to which items are substituted and included in the diets of hunter-gatherers in subsistence economies. These anthropological studies provide information on behavioral characteristics that assist in establishing the method used to measure economic value to hunter-gatherers.

Other Methods

A new assessment method must be consistent with both Aboriginal views and western economic philosophy for it to meet my objectives. The replacement cost method does not account for all the aspects of Aboriginal economic activities, nor was it consistent with Aboriginal values and preferences. There were some encouraging ideas arising out of welfare economics' non-market based valuation methods. However, the field of welfare economics has evolved from the market based paradigm and even the so called non-market methods reflect the structure of a competitive market system. Hedonic wage models may be appropriate in circumstances when Aboriginal peoples have fewer rights and are based upon alternative wages earned in a market context.

Advantages of the Labour Time Method

The labour time method measures the preferences of the Aboriginal people within their traditional economy. Interviews with Fort McKay Elders demonstrated that these hunter-gatherers were aware of the different alternatives available to them. They made choices about which plants or animals they would pursue based upon what they wanted. Therefore we can draw some conclusions about their preferences based upon their choices to pursue different plants and animals and because they had expectations about the time costs of each product, we can draw conclusions about how they would allocate their limited time to obtaining each product.

This method proposes that the total time available to an Aboriginal family is like a budget constraint. They allocate their time to different products and activities thereby indicating their relative preference and therefore their valuation of those products and activities. This system appears to be consistent with their culture and traditions and at the same time is similar to classical valuation analysis.

Welfare economics identifies several measures of welfare change and some of these concepts can be applied to Aboriginal economies without imposing western cultural values. For example, some of the measures in welfare economics include substitution others do not. Some Aboriginal economies involve the substitution of one product for another, others may not. Two methods of measuring welfare that were appropriate to the Fort McKay situation were equivalent variation (EV) and compensating variation (CV). These measures arise from the classical budget constraint model that allows substitution between goods. Within a limited range of values, EV and CV provide valuable insights into the parameters of the valuation of Aboriginal economies.

For example, in subsistence hunting a moose may be more difficult to find because the industrial development of competitive hunting may have reduced the number available. The

hunter may spend more time looking for moose or he may look for caribou or deer to replace the moose he cannot find. The additional time hunting moose or additional time required to replace the moose with caribou is the amount he is willing to pay to avoid loosing the former level of moose meat and hides etc. Willingness to pay in this example (with an increase in price) is an EV measure. The extra time comes out of leisure time showing that there are important limits to the applicability of this method.

The legal rights of the Aboriginal people are very important in determining the appropriate valuation method. If the Aboriginal hunter or group must accept the industrial effects that have forced the loss of moose, the EV method or willingness to pay is an appropriate method. However, if the Aboriginal people have a right to the status quo and are not required to accept this loss, then the CV or willingness to accept method is appropriate. It is interesting to note that the CV method is higher with a price increase or decline in moose availability (Freeman, 1993). Although the CV (willingness to accept) method is difficult to measure without real examples (fair and equitable land claim settlements), it may be possible to use the EV values as a proxy for CV values given certain assumptions and provisos (Freeman, 1993; Hanemann, 2003).

Application of the Method

The labour time method was applied to the Fort McKay Community's traditional activities. Elders were interviewed about their activities during the 1960s before major industrial development began in the area. Twenty Elders from the community were asked about the amount of time it took to accomplish different traditional tasks. Although their memories were sometimes taxed by the questions, reasonable responses were obtained and checked by modeling their activities and asking similar questions in different ways. A complete cycle of their

economy was constructed and average time estimates were checked by fitting them into daily, monthly and seasonal activities.

I found that the value of most Aboriginal activities were higher when all the activities are included in the assessment. For example, a moose is used for meat, tools, hide, fat and other products. Bears are used for meat, grease, tools and hide and fur. Each of these products is associated with the time required to produce the products. Valuation based upon this system is more culturally appropriate and tends to produce a higher value than previous methods.

I found that the ethnographical information that was collected with respect to hunting organization, participation and technology was very important in being able to understand the total Aboriginal economy and to account for all of the processes associated with each product. All of their economic processes are relevant.

This valuation process estimated that the annual equivalent subsistence income of an Aboriginal extended family including 6.6 people was approximately $ 101,000.00 (1998$). This amount is approximately equal to the average amount earned by a four adult family in Canada (Statistics Canada, 1998). The choice of the per hour value of labour is very important in determining this value. However, the number of hours worked in gaining the subsistence livelihood established most of the value.

The labour time method was compared to three other methods. Two methods involved replacement costs. These methods returned values which consistently were less than ½ of the values estimated by the labour time method. A suggested explanation for these differences is that the labour cost method measures the amount of time allocated to all of their activities rather than limiting it to hunting for meat. It is important to note that the Aboriginal people have refined expectations about the amount of time it took to accomplish different tasks, therefore,

when they allocate their time, they do so knowing what they want and what they are likely to obtain. This is a true reflection of the relative value that they assign to different products.

Other methods are limited by their design. Country food estimates are based upon food only and the comparative price of meat in a grocery store. However, the revealed and stated preference models measure changes in hunting preference based upon forest harvest or environmental change scenarios. This method measures a relevant but limited part of the Aboriginal economy. Using the labour values, more detailed cost estimates may allow one to extend this analysis to measure substitution rates within the Aboriginal economy. With these rates one could measure the effects of an increase in price of the availability of one species or another. This could be a topic of further research.

The labour time method has several limitations associated with the assumptions that have been made. One important assumption is that one can use the willingness to pay to represent willingness to accept values. This may be true for a stable traditional economy, however, few traditional economies are now stable. Most are being replaced by industrial activities or at the very least are being limited in their scope. Because the current traditional activities are unstable, reliable data is difficult to obtain. Also, since the economies are unstable one must use a willingness to accept value, which would be obtained through other methods. The valuation system does not measure the loss of an entire culture or an entire traditional economy. It may assist in measuring the economic value of the economy in the context of an expropriation settlement where other values or categories of loss are also included.

Future Research Opportunities

This study has used the results of Traditional Land Use Studies to value aboriginal activities in a traditional aboriginal economy where it is assumed that the hunter gatherers

obtained an optimal allocation of time to different resources. The traditional land use study focused on a time period where the traditional economy was not significantly impacted by industrial development. Currently, many Aboriginal societies have lost or are loosing their traditional livelihoods due to loss of habitat or other external impacts. One interesting area of study would be to measure the degree to which an aboriginal hunter gatherer would substitute one important subsistence staple for another if and when an important staple become more scarce due to industrial activity within their traditional lands. The measurement of their ability or willingness to substitute would assist in the valuation of impacts due to industrial developments.

A second area of study that would provide very interesting results would be to look at the relationship between trapping and other traditional activities. It is possible that the market value of trapping could provide a missing link between the market system and the traditional economy.

A third area of investigation that might be fruitful would be to look at recent land claim settlements with a view to determining what the implicit value of Aboriginal traditional activities using a willingness to accept method. The goal of such a study would be: given that some opportunities for exercising their traditional activities is given up in these land settlements, what portion of the cash settlement could be considered payment for accepting the loss of those opportunities?

Conclusion

In conclusion, it appears that, although the method has its limitations, the labour time method is not only useful in determining the relative values of Aboriginal traditional activities and products but subject to certain provisos, it can be used as a base for establishing values for subsistence activities and for measuring the economic value of the subsistence economy to its participants. Economic values, of course, do not include spiritual, psychological, cultural and

other values, which need to be considered in an assessment of loss when the Aboriginal way of life is affected by industrial developments.

One other important aspect of using methods that are based upon Aboriginal values and culture is that it helps the negotiation process by forcing the negotiators to consider the characteristics of the Aboriginal culture. This is part of the requirements of the Supreme Court in their demand that infringements can not be justified without proper consultation with the affected Aboriginal peoples. In order to determine the degree of the infringement, the developer must first determine the preferred way in which the Aboriginal people used their lands. A labour time analysis outlining Aboriginal preferences can provide the basis of this type of analysis.

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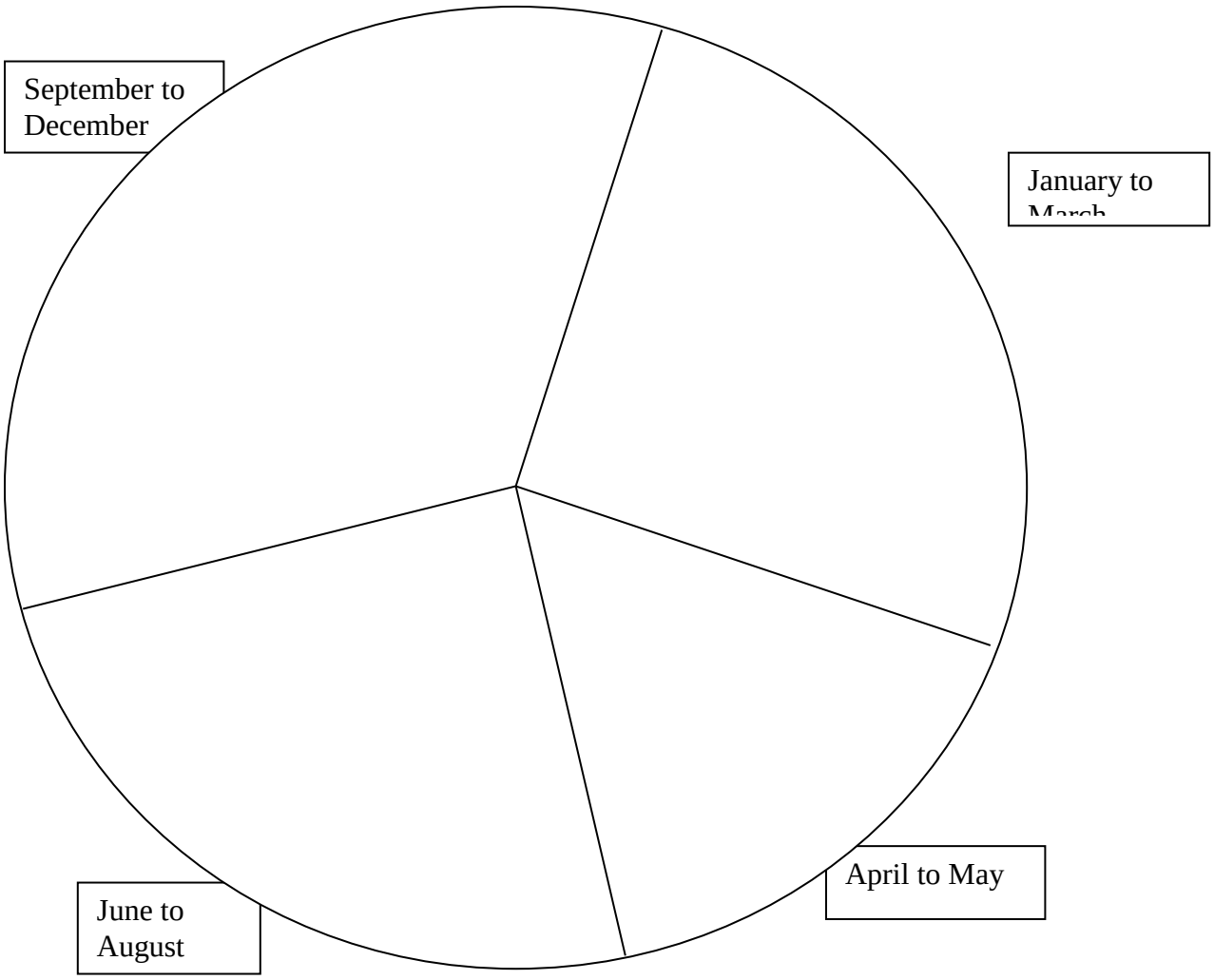
Appendix A
Resource Harvesting Interview Record

Harvesting Period (early 1960s or late 1990s) _____

Interview # _____ Date (dd/mm/yyy): _____

Male or Female _____ Present age code: _____
1=21-30, 2=31 – 40, 3=41 – 50, 4=51 – 60, 5= 61- 70, 6= 71 – 80, 7= 81- 90, 8=> 90

Seasonal Activities



Hunting and Gathering Activity Records:
Season: _____

Activities	Done in this Season (Yes/no)	Time in Days or hours	# of People: Participating
Big Game Hunting	_____	_____	_____
Meat Cutting/Smoke/Drying	_____	_____	_____
Fat Extraction	_____	_____	_____
Hide Preparation	_____	_____	_____
Hide Products	_____	_____	_____
Making special Tools	_____	_____	_____
Other	_____	_____	_____
Trapping	_____	_____	_____
Collect beaver castors	_____	_____	_____
Skunk juice mix	_____	_____	_____
Fur hat	_____	_____	_____
Skin/ flesh / stretch hides	_____	_____	_____
Other	_____	_____	_____
Gathering Fire Wood	_____	_____	_____
Hauling Water	_____	_____	_____
Repairing Cabins	_____	_____	_____
Fishing	_____	_____	_____
Dry / smoke /prepare fish	_____	_____	_____
Dog Food	_____	_____	_____
Make fish net	_____	_____	_____
Make fish trap	_____	_____	_____
Make fish hook	_____	_____	_____
Make fish snare	_____	_____	_____
Other	_____	_____	_____

Birds	_____	_____	_____
Pluck duck	_____	_____	_____
Collect feathers	_____	_____	_____
Collect feathers	_____	_____	_____
Loon storage bag	_____	_____	_____
Pelican pouch	_____	_____	_____
Other	_____	_____	_____

Activities	Done in this Season (Yes/no)	Time	# of People:
Gathering Berries	_____	_____	_____
String and dry berries to last season	_____	_____	_____
Can enough berries to last season	_____	_____	_____
Other	_____	_____	_____

_____

_____

_____

Tree products	_____	_____	_____
Make enough tree sinew thread	_____	_____	_____
Collect ashes	_____	_____	_____
Make snowshoes	_____	_____	_____
Collect bark	_____	_____	_____
Make meat cashe	_____	_____	_____
Canoe	_____	_____	_____

_____

Gathering Medicines	_____	_____	_____
Preparing mint	_____	_____	_____
Collecting tree sap	_____	_____	_____
Collecting tree balsam	_____	_____	_____
Collect willow fungus	_____	_____	_____
Other	_____	_____	_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Equipment and Tools:

Page ____

Interviewee number _____

Date of interview (day/month/year**)_____**

Traps (how many): #1_____#11/2_____# 2_____#3_____#4_____

Snare wire: (what kind/how many rolls of each)

_____

_____

Guns: (what kind and number of each)

_____

_____

_____

Mode of transportation:

Dogs (how many?) _____

Breed? _____

Harness (factory made or traditionally made?)

_____

_____

Dog leases (type/length/size?)

_____

_____

Sleigh (traditionally or factory made?)

_____

_____

Sleigh wrapper (traditionally or factory made?)

_____

_____

Dog whip (made of what?) _____

_____

Pack sack (made of what?)

_____

_____

Dog packs (made of what?)

_____

Tools: (circle ones on interviewee's list)

1) Fleshing knife	**2) Butcher knife**	**3) Jack knife**
4) Skinning knife	5) File	6) Awl
7)Gunny sacks	8) Swede saw	9) Leather/canvass repair kits
10) Perfume	11) Leather needles (glovers) & thread	
12) Domestic needles & thread	13) Clean cotton for bandaging (old pillow cases)	
14) Flashlight	15) Batteries	16)Hammer
17) Flash light bulbs	18) Assortment of nails	19)Rope
20) Stove wire	21) Wooden matches	22) Snow shoes
23)Candles	24) Coal oil lamp	25)Coal oil

26) Dog booties 27) Tarps 28) Axe

Line cabins:

Number of cabins on total trapline? _____

What were the cabins made of ? (type of wood) _____

_____

How long did it take to build (1) cabin? (days/hours) _____

_____

How many people did it take to build (1) cabin? _____

_____

Cabin Maintenance:

How much time did it take (days/hours) to repair (fix up) the cabin from year to year?
_____

_____

Fishing Equipment:

Net (size of mesh / length) _____

Boats (size/kind) _____

Paddles (how many/kind) _____

Any other fishing equipment used: _____

<u>Maintenance and Preparation:</u>

How much time did it take (hours/days) to fix up or repair the equipment mentioned above each year? _____

Annual Harvest Volumes

Number caught in each type of year

Big game	Poor year	Average year	Good Year
Moose			
Deer			
Caribou			

Grouse			

Hares			

Waterfowl			
Ducks			
Geese			
Cranes			

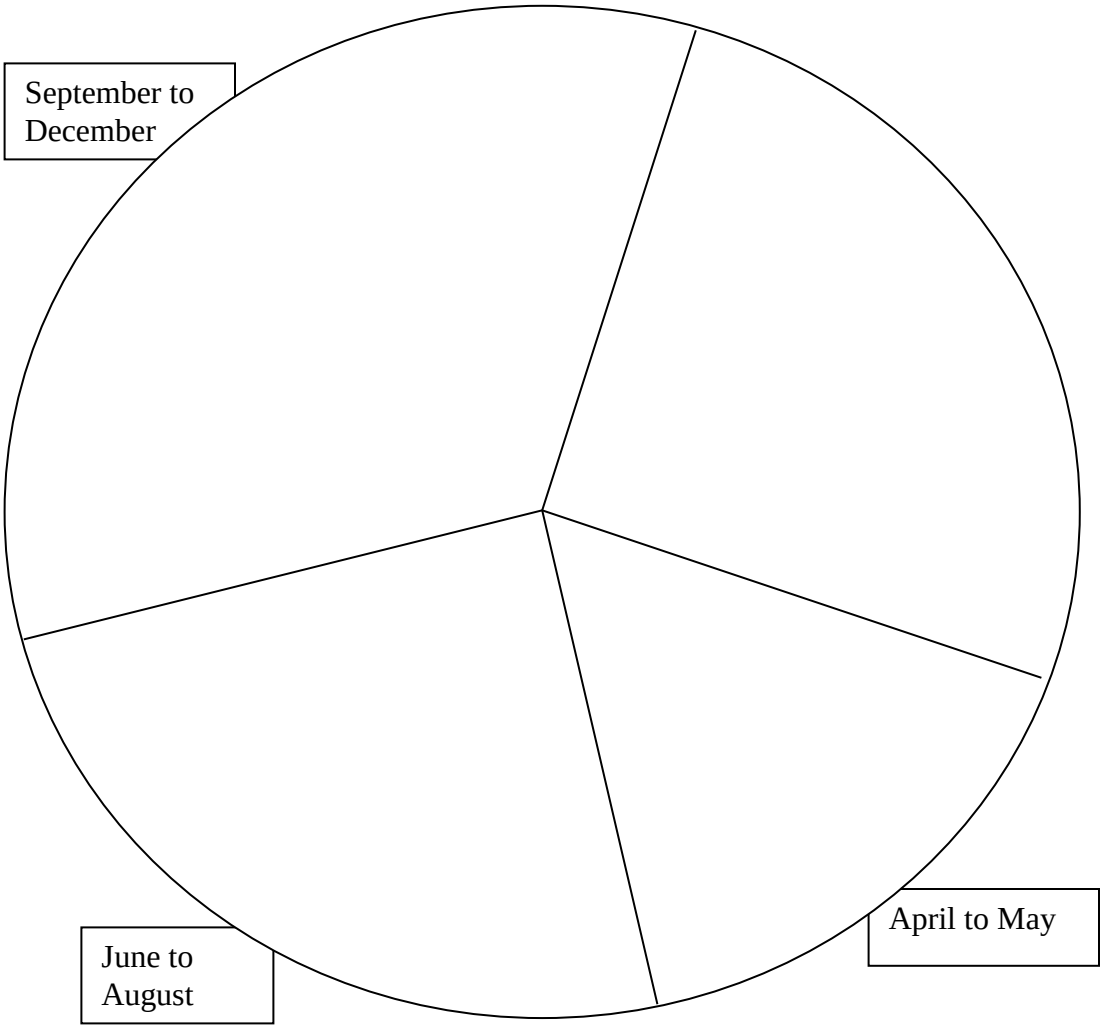
Fur bearers			
Beaver			
Muskrats			
Lynx			
Marten			
Fisher			
Ermine			
Squirrel			
Wolf			
Fox			

Fish			
White fish			
Pike			
Walleye			
Burbot			

Plants and berries

	Amount gathered in each type of year		
	Poor year	Average year	Good Year
Berries (gallons)			
Medicinal plants (pounds)			
Tree Products			

Space for additional information:


September to December
April to May
June to August