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The non-market values for water-based activities in the west of Ireland Submitted by: Kieran O'Hanlon
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Attention of: Dr. Aidan Kane

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Abstract

The purpose of this paper is to highlight the economic benefits water based activities can have on rural communities. Coastal areas particularly in the west of Ireland can attract an enormous amount of tourists each year, whilst coastal areas can also provide amenity for the locals. Although, large urban areas such as Dublin can cater for most incoming tourists, it is also important coastal areas have adequate resources to attract tourists that are looking for something more alternative. Creating employment in small rural locations can be difficult as rural locations do not have the population or resources to attract large multinational organisations. However, growing tourism numbers can provide employment in coastal areas for people who are less educated or unwilling to migrate to large urban areas.

Market and non-market impacts are two distinct features that impact the economic well-being of coastal and marine based activities. Taxes, salaries and jobs associated with water based activities (WBA) are characteristics of market values. Non-market values are associated with the consumer surplus a resource provides. I will examine both the market and non-market values in this paper using a travel cost model (TCM). A TCM is a revealed preference method of the economic estimation used in cost benefit analysis. Aesthetic appeal regarding national parks, beaches and ecosystems cannot be obtained through market prices and a TCM will help estimate the cost benefit analysis. Moreover, I will use a recreationist study to gain insight into how the recent weather conditions have an effect on WBA in Lahinch, Co. Clare.

Contents

Introduction

Opportunities exist to develop clusters of marine leisure activities utilising and rejuvenating existing infrastructure in ports and harbour through waterfront developments. Specialist niche opportunities exist for salmon angling, 'fly to sail' holidays and water-sports linked to seaside resorts.

(Marine Institute)

Tourism is a major industry within Ireland because of the close proximity to the ocean. Tourists and locals are increasingly dependent on coastal areas for leisure activities because of the holistic benefits the ocean provides. It is difficult to determine the utility derived from visiting coastal areas. What is clear is the importance coastal areas can have on people's lives. Coastal areas can provide time to relax for locals, whilst tourism can generate income for small rural areas as well as providing employment. Furthermore, coastal areas are traditional hotspots for leisure activity, emphasising the importance to sustain these areas for future generations. In the past, there has been a direct correlation between economic development and environmental degradation. With tourism numbers growing year on year, coastal areas are becoming increasingly susceptible to degradation. It is important sustainable development meets the needs of the present, without compromising the ability of future generations to meet their own needs (Tietenberg, Lewis, 2009). During the course of this paper, I hope to find methods that can help the economy expand without having a negative impact on the natural environment.

Nature-related coastal activities, water sports, angling and scenic walkways provide a vast amount of recreational opportunities in Ireland. It is estimated 56% of Irish adults engage in some form of water and leisure based activity each year. One of the most frequently given reasons for WBA is social interaction (Curtis, 2003) which in turn leads to community well-being (Auld & Case, 1997). Moreover, WBA helps engage family participation, thus leading to positive impacts for family interaction, satisfaction and stability.

Market and non-market impacts are two distinctive types of economic impacts that relate to the coastal and marine economy. Market impacts refer to employment, salaries and taxes associated with the industry. Curtis (2003) refers to the non-market impact as a consumer surplus which the resource provides. This describes the holistic value WBA can have on a family or locality. I will use a TCM, which describes the commercial worth for non-market activities as non-market values are less clear when describing commercial WBA. A TCM is a

revealed preference method of the economic estimation used in cost benefit analysis. Aesthetic appeal regarding national parks, beaches and ecosystems cannot be obtained through market prices and a TCM will help estimate the cost benefit analysis.

An economic perspective to sustainable development

First used by the Organisation for Economic Co-operation and Development (OECD), the Driver Pressure State Impact Response (DPSIR) outline has proven to be instrumental regarding sustainable development issues in coastal areas. Tourism development, agricultural intensification and urbanisation are economic drivers at the heart of environmental change. Waste disposal in coastal areas, nutrient emissions and land conversion and reclamation will in turn create pressure on the environment. Furthermore, physical factors for example climate change will put increased pressure on the environment; variations in nutrient concentration as well as loss of habitat and species diversity. All these combined will have a direct impact on human welfare for example amenity value changes, health impacts and fishing productivity.

Sustainability requires that the store of capital and the associated set opportunities available in the future is comparable to what is available at the present. Although environmental economics necessitates efficiency within the environment, efficiency does not guarantee sustainability. Coastal and ocean resources play a significant role in human welfare which invites the question: what aggregate level of human welfare does society want to preserve for the future. Policy makers will wish to know peoples value for coastal resources to answer that question. To aid policy makers sustainability has been broken down into two methods: weak sustainability and strong sustainability. Weak sustainability requires the total stock of capital whether it is man-made or natural is preserved whilst resting upon the assumption of substitutability. Basic economic theory suggests that by decreasing the supply of natural resources the prices will tend to rise, thus encouraging more sustainable use, substitution with other products or services as well as technological advancement. Due to physical limits, substitution will not always be possible because of the efficiency and availability of substitution opportunities. The interpretation of strong sustainability demands that the total stock of natural capital be non-declining. It is important that stocks of natural and man-made capital are maintained, so instead of being viewed as substitutes can be interpreted as complements.

Coastal resources and beach usage

Very few qualitative and quantitative studies have been dedicated towards coastal recreational conditions in Ireland. A number of studies have been conducted abroad to understand the public's view towards the coastline particularly beaches. There is much WBA that consumers wish to participate in, and it is argued that the utility derived from such activities is determined by the preferences visitors have for a particular area, for example, the type of scenery or activity at a particular area. Economic values allocated to coastal resources will help public agencies allocate better funding as well as improve planning and managing the resource. The more data collected will help planners know who is using the resources available, why they are visiting the area and how to augment consumer spend whether it is an entry fee or within the local economy. For example, the improvement of walking trails in coastal areas is likely to increase the need for Ireland's coastal resources. It is estimated 510,000 tourists visited Ireland in 2007 to engage in some kind of walking activity, whilst, in monetary terms; it is estimated these tourists were worth €340 million to the Irish economy.

A rare study was conducted by Macleod et al contrasting the value of beaches in Co. Donegal to that of Sines, Portugal. The study was compiled mostly on locals opposed to the visiting tourists. The study that was carried out found that the majority of Irish people valued the sense of space, the physical character of coastal regions, as well as cleanliness and the natural scenery. It was highlighted that less intensive use was preferred in Ireland as opposed to Portugal. The results have shown similar findings to research conducted in the UK, whereby there is a preference to preserve the natural beauty.

Moreover, Hanley et al developed a rating classification for beaches and coastal resources. The system was structured to take account of user preferences as well safety standards to market beaches, based on their relative strengths. This would help determine the people who use them. Whilst the rating classification has its advantages, no tiering system was implemented to support and promote the maintenance of undeveloped coastal resources in Ireland. According to previous studies the development of coastal resources was particularly relevant to the Irish. Beaches such as Salthill, Co. Galway where the coastal area is highly developed, a better emphasis should be placed on the development of local businesses and employment(Barry, van Rensburg, Hynes, 2011).

Walking trails can play a significant role in improving access to coastal resources such as beaches. Examples of these include the 20 kilometre coastal walkway on the edge of the

Cliffs of Moher from Liscannor to Doolin in County Clare. This walkway can provide much easier access to the coast but is also a valuable source of recreation to the public. Unfortunately, many of these lands are not state owned and can only be accessed through private farmland. Whilst the tourism and enterprise sector will gain from such initiatives, permission is required from the landowner. Landowners, on the other hand, have reason to be sceptical with issues such as insurance liability, potential interference with agronomic activities and trespassing. Those are just some of the explanations why landowners may not grant permission to their land for walking related activities. Policy makers are aware of these concerns and of the need to involve landowners in initiatives that help enable access in order to benefit the farmers and the wider community. Comhairle Na Tuaithe a countryside recreational council was initiated by the Minister for Community, Rural and Gaeltacht Affairs in 2004. The purpose of this council was to develop a "walkways management scheme" whilst it would help compensate the farmers for the development and maintenance of sanctioned, way-marked ways that permit visitors to walk through their land. In 2008, €4 million was granted for four existing trails that were selected for the pilot scheme.

Amenity Beach Management

"Relates to the qualities, characteristics and attributes people value about a place and which contribute to their quality of life."

(Department of Environment, Climate Change, and Water, 2008)

Historically beach management protection has focused on the need to prevent coastal erosion and flooding, whilst, beach management guidance organisations have focused very little on the amenity value of beaches. This is a type of policy that needs to be addressed as the primary importance of the beach to a local community is amenity as well as providing economic benefits from tourists. Amenity can have a different meaning or perception depending on who uses the beaches. Families that use beaches for recreational purposes will view beaches that are popular for surfing as unsafe. Eco-tourists, on the other hand, will want to conserve the natural beauty of the coastal region. All markets though share the same characteristic that beaches should be free of beach litter whilst emphasising more of an aesthetic appeal for visitors.

For policy makers to gain a better understanding of beach users preferences, questionnaires and surveys have to be conducted which may take up to several years. Video monitoring can

also be used which will provide information over a longer period of time. Video monitoring can identify how, when and where the beach is used. This method was undertaken at Crane Beach, Massachusetts, United States over a ten year period. This study has helped understand visitor behaviour and beach use including reasons why people visit the beach, for example, the natural scenery, cleanliness and the facilities provided.

According to Williams and Micallef (2006) the character or scenery is one of the five most important features in determining a successful beach holiday. The character of the beach is highly dependent on the surrounding hinterland as rural beaches are quite different to urban beaches. This can be reflected in the number of services available at a rural beach. Moreover, an urban beach will attract different users, whilst, more people are likely to visit an urban beach also. Beach carrying capacity is also an important factor especially with areas of high tourism activity. This identifies the number of available beach area per beach user. Overcrowding will eventually lead to a decline in the quality of the recreational experience. It is estimated the threshold carrying capacity in an urban beach is between 3 m^2 and 6 m^2 (Williams and Micallef, 2004). If the area-to-user ratio is less than this, it will lead to a perceived reduction in the value of the beach as a recreational resource.

The Market & Non-Market Value of Water Based Activities in Ireland

Market Value

> In terms of economic value, water-based leisure activities in Ireland make a major contribution to overall domestic tourism revenue. The report indicated that the high level of adult participation in 2003 contributed €434 million in expenditure and accounted for almost 45% of our total domestic tourism revenue during that same year.

> (Ann Wilkinson, Marine Institute, 2005)

The Irish coastline reaches 3,172 kilometres which supports a varied marine economy. In 2012, 970,000 overseas tourists visited Ireland and participated in WBA. This was worth approximately €61m to the Irish economy. Furthermore, according to the Economic and Social Research institute (ERSI), 1.5 million adults in Ireland take part in some form of water based leisure activity each year. The expenditure accumulated by Irish residents generated €434 million in 2003, which supported 5,100 jobs. A further study indicated that the domestic tourism market and water-based tourism domestic market further highlights the value of this

sector. Water-based tourism accounted for 22 percent of the domestic tourism market and accumulated 45 percent of domestic tourism revenue. As illustrated in table one seaside and resort trips generated €278 million in revenue as well as employing 3,200 people in 2003. A similar study was conducted in 1996 with no substantial change in each industry except for seaside and resort trips. In 1996, 353,000 people participated in this activity which rose to 538,800 participants in 2003. Moreover, in a study conducted by the marine institute environmental concerns regarding pollution was cited by one-third of beach users and 19 percent of swimmers. Lack of facilities was cited as the most negative issue and was reflected across all participants engaging in WBA. 37,000 swimmers and almost 71,000 beach users stated that they would increase their support if facilities are improved. WBA are distinguished into five groups as highlighted in table one. This is the most update data available as there is very little empirical data on WBA at present.

Non-Market Value

The economic value of non-market goods and services such as clean air is similarly defined as the amount a consumer would pay for an orange, if payment were possible. As there is no market value, values must be established through empirical research. Wilson et al describes humans as welfare-maximising agents. Wilson points out those human beings attach positive economic values to non-market goods and services which coastal areas provide. Recreational activities such as walking can play a pivotal role in increasing economic growth to rural areas through tourism, thus supporting rural diversification, innovation and regional development (Barry, van Rensburg, Hynes, 2011).

The length of a walking trail near the beach can contribute positively to a person's utility. Natural beach features with swimming and walking are perceived to be a key activity in the reasoning to visit beaches. In some of the studies described in table two, there are a number of non-market reasons on why people visit beaches. Cutter et al (1979) describes social interaction as an important determinant for beach usage whilst, Breton et al (1996) describes beach location and character as important reasons.

A study conducted by Raheem et al, (2012) describes how coastal policy decisions in California helped foster improvements in non-market goods and services. California's tidal coastline is 3,427 miles long, whilst 76 percent (27.2 million) of the population live on the coast. Although these numbers cannot be compared to Ireland, there is a template that Irish policy makers can try to replicate. The California Ocean Protection Council (OPC) was

created under the California Ocean Protection Act 2004. The purpose of OPC is to ensure that ''California maintains healthy, resilient, and productive ocean and coastal ecosystems for the benefit of current and future generations.'' The purpose of the OPC was to incorporate non-market values into legislative proposals. Non-market features the OPC sought to improve are marine protected areas, offshore aquaculture, different fishing methods and restoration of wild salmon populations.

Data and Site Description

John Lloyd said of County Clare in 1780, "From its agreeable situation, the climate is remarkably wholesome, the air clear and temperate, and the prospect pure and delightful."

The data I will use is secondary data gathered in a previous study conducted in Lahinch Co. Clare by Dr. Stephen Hynes. Lahinch is seen as a traditional hot spot for WBA because the beaches attract an enormous amount of surfers each year as well as many divers who are attracted to the rich biodiversity hidden deep under water. County Clare has a coastline of 360 kilometres and in 2013; six beaches were awarded the blue flag status. This accolade is awarded because of high standards in water quality, environment information and education as well as environmental management and safety services. Although, tourism numbers have stagnated over the past two decades, niche tourism sectors such as ecotourism have helped raise the profile of the tourism industry in the county in recent years. Initiatives such as Burren Connect, Burren Beo and Shannon Trails have helped this industry grow. However, with the recent weather conditions causing havoc on our coastal defences it is imperative that we get an economic value on coastal regions. The more data collected will help policy maker's better plan for our coastal defences for the future.

The most economically effective way to gather data is through face-to-face surveying. The participants that have been surveyed will be over the age of 18, who have participated in a WBA at a particular site. The study used in this paper will comprise of three sections: Section one will contain personal information and socioeconomic information, for example, age, income and occupation. Section two will distinguish how many trips each participant had undertaken in the past twelve months. Moreover, the survey will determine the average journey time to each WBA, as well the amount of years they had participated in WBA and free days during the year they could engage in water and leisure activities. Section three will

consist of travel cost questions which will estimate local (within 25km of the destination) and non-local expenditure.

Methodology

I will use a travel cost model (TCM) to calculate demand for commercially based WBA in County Galway. The travel cost method looks at actual human behaviour to try to define the significance people place on something intangible. The basic idea of the TCM is that the time and travel cost expenses that people incur to visit a site represent the "price" of access to the site. The price people are willing to pay can be estimated on the number of trips that they make at different travel costs. This comparison is to determine consumer's willingness to pay (WTP) for a marketed good based on the quantity demanded at different amounts. The TCM model will estimate demand function for the number of trips to each area per annum, the travel cost and partakers features. An important determinant, when undertaking a TCM, is the assumption of a negative relationship between the cost of travel to a WBA and the number of trips taken to the location (Hynes & Hanley, 2006).

A TCM for commercial WBA maybe be specified as:

$$TRIP_i = f(TTC_i, EXPERIENCE_i, DAYS_i, SUBS_i, SE_i, \beta o, \beta k, \varepsilon i)$$

$TRIP_i$ is the dependent variable where the number of trips to a WBA is calculated which determines the total travel cost, personal experience and leisure time as well as socio-economic characteristics to visit the area. TTC_i is the main explanatory variable for participating in the WBA. $Experience_i$ is determined whereby the number of years the participant is involved in WBA, whilst $DAYS_i$ is the number of free days the participant can engross themselves in WBA per annum. $SUBS_i$ determines the distance between a substitute site, and SE_i determines the set of socio-economic variables and demographic variables for each participant (Morrissey, Moran, 2011).

Recreational activities are time consuming while participants are restricted that try to maximise utility are constrained to income and cost. The TCM, I will use will include all the marginal costs of making a visit to a WBA, comprising 'out-of-pocket' costs, for example, fuel costs and the cost of time spent travelling which will include the opportunity cost of time not spent working. I will combine actual travel costs and the value of travel time as research has found that the consumer surplus estimate may help minimise omitted variable bias (OMB) (Morrissey, Moran, 2011). OMB occurs when a model is created which erroneously

omits one or more important causal factors. The model can compensate the missing bias for the missing factor by over or underestimating the effect of one of the other factors. The total travel cost TTC_i, of a trip may be defined as;

$$TTC_i = TC_i + TIMECOST_i$$

The Automobile Association (AA) of Ireland estimate the marginal costs of a motor car of average size would cost €.28 per kilometre. This estimate will calculate the TC_i out-of-pocket expenses that are incurred by the participant from their point of origin to the WBA. Several studies have indicated the inclusion of time costs in travel cost studies has been the subject of much debate (Morrissey, Moran 2011). According to Zawacki and Bowker, 2000 to estimate a true travel cost fraction, a fraction of the wage rate should be used to estimate the opportunity cost of time, in addition to time/travel cost., I will calculate the cost of travelling time $TIMECOST_i$ as;

$$TIMECOST_i = HWAGE_i \; x \; 33\% \; x \; TRAVELTIME_i$$

It is assumed that changes in costs of access to the recreational site ($^c_2$) will have the same effect as a change in price. In other words, the number of visits to a site diminishes as the cost per visit grows. The demand function assumes that that visits to a recreational site is $x_2 = {}^f({}^c2)$. This is estimated using the number of yearly visits as long as it is possible to detect different costs per visit. A weak complimentary is assumed to complete a TCM under the condition that trips are a non-decreasing function of the quality of the location, and the individual does without trips to the recreational site when the quality is not at its best. Figure 8, illustrates the expected relationship between the number of visits and cost per visit to the site, with other variables, describing the number of visits decreases as the cost increases per visit. If for example, each respondent has the same income and preferences, the amount of visits is a function of the cost per visit:

$X_2 = G({}^c_2)$

Non-homogenous sub samples can be estimated as part of a demand function such as independent variables for example income and socio-economic variables which represent individual characteristics. In other words, if an individual incurs c_2^e per visit, he or she chooses to do x_2^e visits per annum and if the cost per visit increases to c_2^p the number of visits per annum will decrease to x_2^p. The choke price (cp), is the cost per visit that results in zero

visits. The per annum user surplus is acquired by integrating the demand function from zero to the current number of annual visits, and subtracting the total expenditures on visits.

Results

The results taken via the on-site survey presents a summary of results taken from table 3. The questions on the survey included questions on demography, socio-economic status as well as frequency of participation in WBA. Moreover, respondents were asked how many trips per year they undertook at this particular coastal region as well as substitute trips to other coastal areas. I have calculated the average cost at €70.05 per respondent that undertook some form of WBA. This figure does not include the amount spent on overnight stays which would include accommodation, food and drinks and any other expenses that would have been incurred. To get to this average I calculated the distance travelled in kilometres multiplied by €.28 which is the marginal cost of an average motor vehicle per kilometre travelled. Furthermore, I calculated the average time travelled to the destination multiplied by the average hourly wage (need to double check that).

The variance reported was 3320, which was a strong indicator that the dependent variable (trips_0) is over dispersed. The average age per respondent was 39.5 years, 69 percent had a third level degree or equivalent, whilst 60 percent are married. As the dependent variable was over dispersed two econometric stipulations were used to estimate a commercial WBA demand model. The stipulations included a Poisson regression model and a negative binomial regression model. Implicit in estimating the results of a TCM is the supposition of a negative relationship between between the cost of travelling to a site and the number of trips taken to the site. In both models this estimation is proven statistically significant.

In econometrics, a Poisson regression is a type of regression analysis used to model count data in which observations can only take the non-negative integer values for example 0, 1, 2, 3. Moreover, the Poisson regression is also used to model contingency table which is type of table in a matrix format that displays the frequency distribution of the variables. Also, this assumes the response variable Y has a Poisson distribution which adopts the logarithm of its expected value can be modelled by a linear variation of unknown parameters. The Poisson distribution can also be used for the number of events in specified intervals for example distance, area or volume.

If $X \in R^n$ is a vector of independent variables then the model takes the form:

$Log\ (E(Y \mid X)) = \alpha + \beta' X$

When the Poisson regression is over dispersed, for example, in the model I am using the negative binomial distribution can be used as an alternative to the Poisson regression. The negative binomial distribution is very helpful when the discrete data over a limitless positive range, whose sample variance surpasses the sample average. In other words, the observations are over dispersed in regard to the Poisson distribution, for which the average is equal to the variance. This is the reason the Poisson model is not appropriate for this sample. With the negative binomial distribution having one more parameter than the Poisson model, the second parameter is used to adjust the variance independently of the average.

When there is a series of independent Bernoulli trials, whereby each trial has two potential outcomes called success and failure. For each trial the probability of success is *p* and failure is *1-p*. We will observe this series until a predefined number *r* of failures has transpired. The random numbers of successes we have seen, *X*, will have the negative binomial distribution and will take the form: *X ~ NB (r;p)*

The negative binomial distribution model indicates that the explanatory variable travel cost (tc2) is statistically significant with the P-value at 0 percent hence the reason I will reject the null hypothesis. The null hypothesis refers to a default position in which there is no relationship between two measured variables. The coefficient is showing a negative sign at -.0153233. This would indicate the more trips undertaken by the respondent the higher the cost. In the original model the dummy variables married (IMARRIED1) and kids (MAIN_KIDS1) was showing multicollinearity. This is where two or more predictor variables in a regression model are highly correlated. The socio-demographic variables such as gender, married, student and retired are consistent with the model. Gender has a P-value of over 5 percent which proves the sex (male or female) of the respondent is statistically insignificant. The variable student has a negative coefficient which would indicate a student has less money than a person who is retired as well as not having a car. Both P-values are below the 5 percent level which proves their coefficient sign is statistically significant.

The average respondent from the summary analysis spent €80.62 which is worth €56,837 to the local economy of Lahinch.

Table 3 shows the truncation and the over dispersion and the reason why I used a negative binomial model. The truncation arises in this model because each respondent was interviewed

on site meaning they visited the site at least once. If a door-to-door or telephone survey was conducted on a national scale, most of the respondents would not have visited Lahinch, meaning the survey would not have been biased.

$$R^2 = 1 - \frac{\sum (Yi - Yi')^2}{\sum (Yi - \overline{Y})^2}$$

(Need to double check R^2)

Conclusion

International studies have found WBA participants and companies have a positive impact on local economies. Although, there is very little empirical data on WBA at the moment, Morrissey and Moran (2011) found that using a TCM on non-market values proves there is economic benefits from the research I will conduct. Furthermore, tourism helps enhance the reputation of rural areas as well as being a major market in the Irish economy. Small rural and coastal areas benefit enormously each year from domestic and foreign tourists. A study conducted by the Marine Institute in 2003 indicated that €124 million was spent on day trips to the seaside, inland waterways, rivers and lakes. Furthermore, the marine tourism industry was worth €453 million in gross value added to the Irish economy 2007. Consumers who participate in WBA place a high value on non-market services that the coast can provide. A study carried out by Raheem et al (2012) emphasises this need and demonstrates how policy makers in Ireland can adopt these improvements.

Protecting our water-based natural resources has become increasingly important for many people because it gives rise to the opportunity of enjoying these resources through leisure activity. Unfortunately, the value of these resources is unknown which in turn will lead to these areas not getting enough protection that they have merited. According to Curtis (2002), it is imperative that non-market amenity resources are frequently valued so that resource use decisions are fully notified.

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Table 1: The economic value of water-based activities in Ireland 2003

Industry	Internal revenue (€m)	Employed
Seaside/Resort trips	278	3,200
Angling	59	733
Coastal & Inland boating	50	661
Water Sports	35	520
Nature-related Coastal activities	12.3	291

(Marine Institute, 2003)

Table 2: Demographic and Socio-Economic Characteristics of WBA Participants

	Average/Majority	Percentage of respondents
Gender	Female	56%
Age	39.5	
Marital Status	Married	60%
Education	Third level	69%
Employed	Full-time	56.5%
Income	50,000-59,999	13.1%
Trips in the past 12 months	24.7	
Days free to engage in WBA P/A	25	
Specific reason to visit	10	40.4%
Transport	Own Vehicle	95%
Travel K/M	100.2	---
Length of journey	1 hour 17 minutes	---
Day visit	Yes	69.3%

Stay overnight	Yes	31.7%
Nights in Area	3.4	---

Table 3

Table 4: Negative Binomial Regression

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Negative binomial regression                 Number of obs   =       226
                                              LR chi2(13)     =     58.86
Dispersion    = mean                          Prob > chi2     =    0.0000
Log likelihood = -815.55407                   Pseudo R2       =    0.0348
```
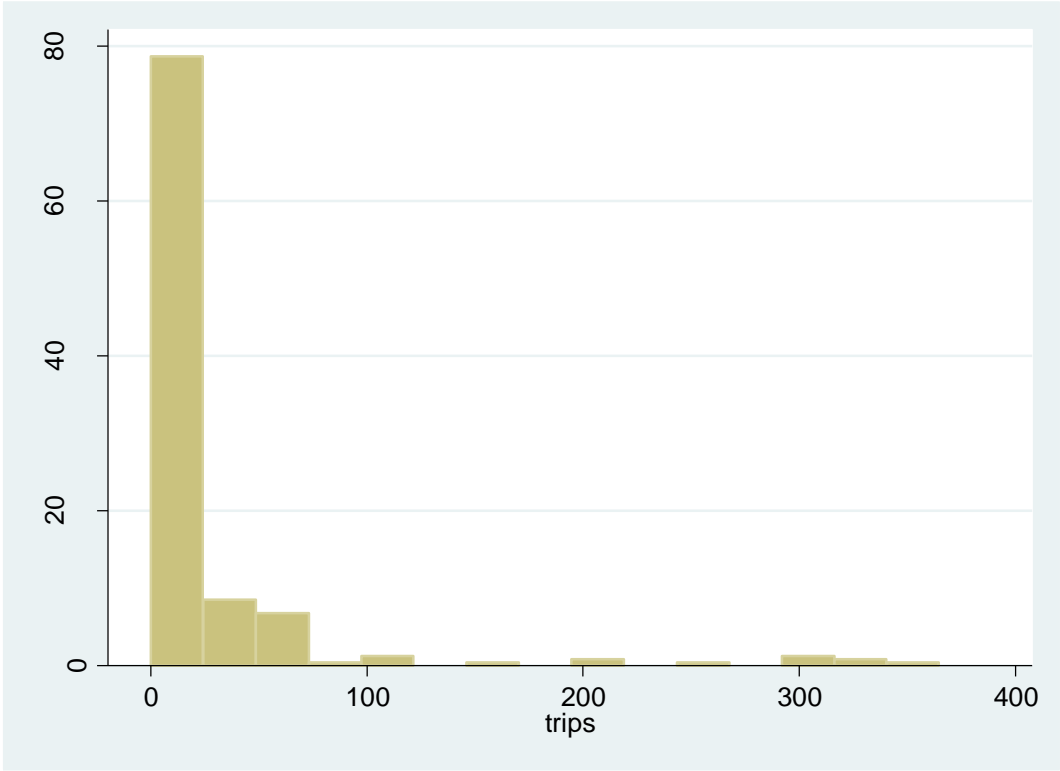
trips	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
tc2	-.0153233	.0030739	-4.98	0.000	-.0213481	-.0092986
income1000	.0106735	.0036936	2.89	0.004	.0034342	.0179128
_Igender_1	.1351628	.2054925	0.66	0.511	-.2675952	.5379207
age1	.1034238	.0640318	1.62	0.106	-.0220762	.2289238
age2	-.0012249	.0008146	-1.50	0.133	-.0028215	.0003716
_Imarried_1	-.4774456	.2627525	-1.82	0.069	-.9924311	.0375399
_Istudent_1	-.3390812	.445835	-0.76	0.447	-1.212902	.5347393
_Iretired_1	.6271603	.645552	0.97	0.331	-.6380984	1.892419
_Ifull_time_1	-.1118273	.230696	-0.48	0.628	-.5639832	.3403286
_Ithird_lev_1	.0082604	.2236562	0.04	0.971	-.4300976	.4466185
_Id_walking_1	.1069707	.2463109	0.43	0.664	-.3757897	.5897312
_Imain_surf_1	-.1591943	.3349616	-0.48	0.635	-.815707	.4973184
_Imain_kids_1	0	(omitted)				
_Imain_swim_1	.7112888	.303001	2.35	0.019	.1174178	1.30516
_cons	.6498851	1.234702	0.53	0.599	-1.770086	3.069856
/lnalpha	.4853145	.0865505			.3156787	.6549503
alpha	1.624686	.1406173			1.37119	1.925047

Likelihood-ratio test of alpha=0: chibar2(01) = 5581.71 Prob>=chibar2 = 0.000

Table 5

stats	triphat	trips
mean	16.85873	24.78865
variance	144.1832	3320.903

Table 6: Poisson Regression

```
Poisson regression                              Number of obs   =        226
                                                LR chi2(13)     =    3141.51
                                                Prob > chi2     =     0.0000
Log likelihood = -3606.4071                     Pseudo R2       =     0.3034
```

trips	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
tc2	-.0306822	.001078	-28.46	0.000	-.032795	-.0285693
income1000	.0078396	.0004462	17.57	0.000	.0069651	.0087141
_Igender_1	.0150989	.035091	0.43	0.667	-.0536781	.0838759
age1	.1181798	.0121647	9.72	0.000	.0943375	.1420221
age2	-.0012065	.0001481	-8.15	0.000	-.0014967	-.0009163
_Imarried_1	-.6700349	.0403913	-16.59	0.000	-.7492003	-.5908695
_Istudent_1	-.4029613	.0976264	-4.13	0.000	-.5943055	-.2116171
_Iretired_1	.2416365	.107529	2.25	0.025	.0308834	.4523895
_Ifull_time_1	-.1875583	.0376911	-4.98	0.000	-.2614315	-.1136852
_Ithird_lev_1	.2161972	.0376228	5.75	0.000	.1424578	.2899365
_Imain_surf_1	-.0106124	.0815169	-0.13	0.896	-.1703825	.1491577
_Imain_kids_1	.5299305	.0504557	10.50	0.000	.4310391	.628822
_Imain_swim_1	1.196485	.0470728	25.42	0.000	1.104224	1.288746
_cons	.2640239	.244729	1.08	0.281	-.2156362	.743684

Table 7: Summary Statistics of Variables used in the recreation demand model

	Mean	Standard Deviation	Minimum	Maximum
Number of trips in the past 12 months	24.7	57.5	0	365
Total travel cost	116.70	1561.209	0	41482.66
Distance KLM	100.2	87.3	.5	432
Substitute trips	10.5	31.9	0	300
Spending	80.62	121.4	0	1350
Income	5.47	3.1	0	18

Table 8: Demand Function