# CHAPTER 1
# INTRODUCTION

## 1.1 Background of the Study

The terminology 'moonlighting' 'holding multiple jobs simultaneously' (Shyamsundar, 2014) dates back about half a century and is now becoming more widespread as economies get adopted fast towards more dynamic and flexible working conditions with globalization and privatization (Baines and Newell, 2004; Combos et al., 2007) in the contemporary world.

As the complexity of the modern economic world increases moonlighting becomes an important aspect, especially in terms of the performance and productivity of workers and thereby in the analysis of the labour market (Shyamsundar, 2014). Though the scholarship towards the concept was not of much concern at the beginning, it's distortional, as well as admiring effects on the labour market functions in modern economies, especially in the growing economies, has created demand for more research on the subject of moonlighting.

The main job of the worker is termed as prime or sunlighting job and the additional jobs are termed as secondary or moonlighting jobs (Shyamsundar, 2014). Except sunlightning, people moonlight due to many reasons. As in Kimmel and Conway(2001) workers hold moonlighting jobs because of complementarities with the first job. Further, the multiple-job holding is due to financial pressure that induces individuals to obtain a second job in order to maintain a level of income required to sustain the family (Panos et al., 2011)

All most all of the economies, as well as all of the sectors of an economy experience moonlighting at different levels. At the most end, doctors employed in public hospitals or in their own places, provide a good example of moonlighting in the health sector. Similarly, most of the formal school teachers undertake private tutoring classes after usual schooling hours, while some university/college professors obtain employment in consultation jobs, in addition to their teaching/research practices at

the university. Further, generally, musicians/artists and also politicians do moonlighting.

For whatever the reason for and in whatever the primary job, moonlighting has many dimensions on the positive and also negative side (Husain, 2014). As a benefit to the individual and also to the society, for some occupations moonlighting is greatly welcome; i.e. part time artist moonlights through the artistic job, the society will get benefit and it is a value addition (Casacuberta and Gandelman, 2006). At the same time, if moonlighting made moonlighters to get skilled, get practiced to improve or to get skill accumulation, it will benefit the economy as a whole (Dickey,Watson and Zangelidis (2009); Panos, Pouliakas and Zangelidis (2011)). However, when considered as a 'Bad', researchers have pointed out many black sides of the practice. For most cases, moonlighters frequently try to escape paying tax for their moonlighting income (Frey and Schneider, 2000; Schneider, 2010). Further, moonlighting may bear some distortional effects in the labour market in terms of performance and productivity (Biglaiser and Ma, 2007). These distortional effects may be critical in certain jobs such as formal school teaching, doctors in public hospitals as a nation's healthiness (physical and mental) depend on the efficiency and the productivity of these professions. Hence, research on the causes and also consequences of moonlighting has crucial policy implications.

### 1.2 Concepts and Practice of Moonlighting

The workers who acquire more than one job into their hand are called moonlighters (Shyamsundar, 2014).Moonlighting in second, third or even more jobs may be the American way, especially in tough economic times with increasing unemployment, declining benefits and shrinking work hours. But moonlighting is not an employee's protected legal right (Robinson and Wadsworth, 2006).

According to Banerjee (2012) moonlighting can be divided into four different moons: namely; (i) Blue moon : employees who are not satisfied with their increment; start looking for additional jobs for increased pay but they hardly get any

positive results out of their efforts , (ii) Quarter moon: when an employee is not satisfied with their current salary and search a part time job in which they work after their regular job for an additional income, (iii) Half moon: many employees imagine a luxurious life where they tend to spend more than what they earn. They also tend to save a sufficient amount of money for future, or to start a business. Such type of employee spends 50 percent of their time working in a part time job; their second job, rather than their regular job and (iv) Full moon: factors build mental pressure on the individual's mind about the differences in their earning capacity and they tend to look for an alternate source of income. Such pressure forces them to earn extra pay from a different source by starting their own business or a full time secondary job.

### 1.3 Moonlighting in Sri Lanka

Moonlighting is relatively a new phenomenon in the Sri Lankan labour market and this has an increasing trend in the last decade (Samaraweera, 2014). The SriLanka Labour Force Survey (LFS), conducted by the Department of Census and Statistics (DCS) revealed that about 8.4 million persons are employed in Sri Lanka during the year 2014 (refer Table 1.1) and it is illustrated that 8.6 percent (726,114) hold secondary jobs and 91.4 percent of employed population have been engaged in the main job only. Out of the secondary employed persons, 549,353 (75.7%) were males and 176,761 (24.3%) were females. Considering main and secondary employment together, about 9.2 million total numbers of jobs are estimated at the survey (DCS, 2014).

Considering the distribution of secondary employment by employment status, own account workersreport the highest contribution (62.3%), while the contribution of unpaid family workers is about 19 percent and the other two categories, employee and employer, report 15.3 and 3.44 percent respectively. Gender distribution over employment status shows that the female percentage among unpaid family workers is 63.4 percent (table 1.2), which is much higher compared to the contribution of male (36.6%) in the same category.

Table 1.1: Distribution of Employed Population in Sri Lanka

| | **Sri Lanka** | **Male** | **%** | **Female** | **%** |
|---|---|---|---|---|---|
| Employed Population | 8423994 | 5548131 | 65.9 | 2875862 | 34.1 |
| Total Jobs | 9150107 | 6097484 | 66.6 | 3052623 | 33.4 |
| Main Job Employed | 7697880 | 4998778 | 64.9 | 2699101 | 35.1 |
| Secondary Employed Population | 726114 | 549353 | 75.7 | 176761 | 24.3 |

Source: DCS (2014)

Table 1.2: Percentage Distribution of Secondary Employment by Employment Status and Gender

| **Employment Status** | **Sri Lanka** | **%** | **Male** | **%** | **Female** | **%** |
|---|---|---|---|---|---|---|
| Employee | 111155 | 15.3 | 92814.43 | 83.5 | 18340.58 | 16.5 |
| Employer | 25002 | 3.4 | 22876.83 | 91.5 | 2125.17 | 8.5 |
| Own Account Worker | 452208 | 62.3 | 383020.2 | 84.7 | 69187.82 | 15.3 |
| Unpaid Family Worker | 137749 | 19 | 50416.13 | 36.6 | 87332.87 | 63.4 |

Source: DCS (2014)

Table 1.3 shows the categorization of the secondary employed population by major occupation groups. The choice of multiple jobholding varies among different workers in different occupational groups. The LFS revealed that Skilled Agricultural, Forestry and Fishery workers, estimates the highest percentage (53.4%) among the occupation groups and Elementary occupations (17.1%) and Crafts and related workers (9.3%) reported second and third highest percentage. Armed Forces occupations and the undefined occupation group reported lower percentage (0.1) of moonlighting compared to other groups.

Table 1.3: Distribution of Secondary Employment by Major Occupation Group.

| Occupation group | Secondary employed population | |
|---|---|---|
| | Number | % |
| Managers, Senior Officials and Legislators | 9,282 | 1.3 |
| Professionals | 47,632 | 6.6 |
| Technicians and Associate Professionals | 11,174 | 1.5 |
| Clerks and Clerical Support workers | 1,520 | 0.2 |
| Services and Sales workers | 38,549 | 5.3 |
| Skilled Agricultural, Forestry and Fishery workers | 387,515 | 53.4 |
| Craft and Related Trade workers | 67,520 | 9.3 |
| Plant and Machine operators and Assemblers | 37,809 | 5.2 |
| Elementary occupations | 124,112 | 17.1 |
| Armed Forces Occupations and undefined occupations | 1,001 | 0.1 |
| Total | 726,114 | 100 |

Source: DCS (2014)

## 1.4 Significance of the Study

Moonlighting is an important strategy to increase people's living standards, as well as making distortions for the existing systems. Investigation of the factors that influence the moonlighting decision may be context or person specific but the outcome may impact on individual, as well as society. A worker engages in moonlight and the factors that influence moonlighting differs due to various factors. Identifying those factors will assist in having more efficient labour market policies that could raise the benefits and reduce the costs of moonlighting. It has also an assumed role of enhancement of the volume of parallel economy. The theoretical, as well as empirical knowledge of moonlighting helps to explore the consequences of moonlighting. Knowledge of the economics of moonlighting is essential for framing suitable anti moonlighting economic policies as well. Therefore, this study will provide a strong

base for effective labour market policy framing and the pointed voids could filled by future studies.

### 1.5 Objectives of the Study

Given the above context, the main objective of the study is to explore moonlighting in Sri Lanka in order to achieve the following specific objectives.

- To identify the moonlighting situation in Sri Lanka
- To investigate the factors that influence the choice of moonlighting (secondary occupation)
- To make possible policy recommendations

### 1.6 Organization of the Dissertation

This thesis comprises of six chapters, along with references. All six chapters are arranged in accordance with the chronological order under which the research thesis activities are performed.

Chapter 1: The initial chapter explains the background which led the researcher to conduct this research study and explain the significance and the objective of the study.

Chapter 2: The second chapter selectively and comprehensively reviewsthe previous literature on the concept and also the influencing factors of moonlighting.

Chapter 3: Details the entire research design of this study and provides a detailed overview of the methodology which is used for this study to achieve its stated objectives.

Chapter 4: This chapter discussed the results of the significance tests between moonlighting and explanatory variables.

Chapter 5: Results obtained from the estimated models were presented and discussed in this chapter.

Chapter 6: Includes the conclusion and recommendations for policy implications and endswith further research directions.

# CHAPTER 2
# LITERATURE REVIEW

## 2.1 Introduction

The reasons behind moonlighting are complex and a substantial amount of research has gone into understanding its determinants. The way individuals decide for moonlighting depends on their own circumstances, economic factors, socio-demographic and also the place/status where they are employed play important role as motivating factors of moonlighting. Researchers have examined these factors from different perspectives.Accordingly, this chapter selectively and thematically reviews the relevant literature. Followed by introduction, the first part of the chapter focuses on the factors that influence the moonlighting choice. The second section delineates the models and statistical methods used in the available literature.

## 2.2 Influencing Factors on Moonlighting

Several studies carried out by the persons have identified that various factors affect moonlighting. Some exogenous factors considered in their empirical work to estimate moonlighting are age, gender, marital status, education, region, family size, hours constrained in primary jobs, job heterogeneity, wage of the first job, income insecurity, unemployment rate of the household, having dependence etc. Some researches have identified and classified these factors into different groups such as demographic, social economic and labour related. According to the literature, following are the identified list of factors that may force a worker to decide for moonlighting.

*Age*:-Empirical research has identified that age is a major evaluated factor on moonlighting. Teenagers and aged 45 to 64 were more likely to engage in moonlighting (Sussman, 1998). Naderi (2000) has found that the probability of being a moonlighter increased with age at a decreasing rate. Dickey and Theodossiou

(2006)have clarified that age played no significant role in the decision to moonlight among the fishermen in Mallaig and Kyle of Lochalsh. Combos, McKay and Wright (2007)have explained that age is also likely to be a key determinant of multiple jobholding as the young on average are generally freer of family commitments and indicated that older persons are less likely to moonlight in the Magnesia Region of Greece. Young people in the UK were more likely to moonlight (Wu et al, 2008). Livanos and Zangelidis (2009) revived that middle aged individuals (between 35 and 44) are more likely to moonlight compared to young people. Age and marriage increases the probability of moonlighting among the Pakistani people (Hyder and Ahmed, 2011). Age has a significant positive relationship with moonlighting for workers representing both formal and informal sectors (Samaraweera and Ranasinghe, 2014). They further explained that moonlighting of workers in the formal sector increases with age at on a positive level first and decreases after the 40s, while moonlighting increases with age at an increasing rate for informal sector.

*Marital status*:- "Marital status" is also identified as an important factor on moonlighting. Foley (1997) has used marital status as a group variable in his study and concluded that married women and women with young children are less likely to moonlight. Single persons, particularly young people with no family obligations, aremore inclined to moonlight because they have both more time and less work experience than others (Sussman, 1998). Further, Sussman (1998) concluded that American married men were more likely to hold more than one job, while in Canada, single men were likely to do so. In both countries, women without a spouse were more likely to moonlight than married women. Kimmel and Powell (1999) illuminated that married women never moved to moonlight at a higher rate than married women and divorced women. Married male workers were more likely to moonlight (Naderi, 2000). British married women had a less probability to moonlight (Wu et al., 2008).Married individuals are more likely to moonlight in Greece (Livanos and Zangelidis, 2009).Marriage increases the probability of moonlighting among the Pakistani people (Hyder and Ahmed, 2011).

*Gender*: - `Gender'is also recognized as an important factor in moonlighting. A working wife may abandon the motivation to moonlight of a working urban male (Tansel, 1996). Foley (1997) has explained that gender difference in moonlighting rate has increased as transition stepped forward. According to him, male Russians men have experienced higher moonlighting rate than women and a major increase in the moonlighting growth rate was experienced by workers in male dominated occupations, e.g., Craft and Related Trades, Drivers and Mobile-Plant Operators. Moonlighting rate for both sexes have risen in Canada (Sussmen, 1998). He explained that among American men at age 35 to 44 had the highest multiple jobholding rate; among Canadian men 20 to 24 years old were most likely to moonlight. Further, in both the America and Canada, women between 20 to 24 displayed the highest rate of moonlighting. Males more likely than females to engage in multiple jobholding (Combos et al., 2007).Wu, Baimbridge and Zu (2008) concluded that male workers with more children have a greater probability of moonlighting, while female workers having more children negatively affect moonlighting. Working overtime influenced positively the moonlighting decision for German female and British male workers, (Heineck, 2009). Samaraweera and Ranasinghe (2014) indicated that being female decreases moonlighting of informal sector while that is insignificant for the formal sector workers. According to Samaraweera and Ranasinghe (2014),since secondary employments consist of evening or night work and physical hardship, females in the informal sector are not encouraged by moonlighting.

*Family size and no of dependent*:- `Family size' and dependence of the family also affectmoonlighting decisions. Shisko and Rostker (1976) have indicated that family size plays a positive role in determining moonlighting decision. According to them, increasing the family size lowers the shadow wage and increases the likelihood of moonlighting. Dependent members in the household exercise a positive effect on multiple jobholding and the ratio of dependent household members to the total household members also play a significant and negative role in determining multiple jobholding (Combos et al., 2007). Dependency is captured as a continuous variable

to analyze the effect of dependency on one's decision to moonlight (Nunoo et al., 2016).

*Education:*-Moonlighting is widespread among salaried persons of all levels of education and probability of moonlighting in urban male employed persons in Turkey increases with education (Tansel, 1996). Foley (1997) found that the probability of moonlighting doubled due to increase in the level of education and furthermore, higher educated Russians have experienced the highest secondary employment rates. Kimmel and Powell (1999) provided a cross-country comparison between Canada and the United States and found that university graduates in both countries have the highest moonlighting rates. Higher educated Iranian was more likely to moonlight (Naderi, 2000). Considering the empirical studies education plays a positive role in determining moonlighting decision (Dickey and Theodossiou, 2004; Wu et al., 2008). Higher educated persons bear a high probability of being a moonlighter and males with a tertiary education is more likely to moonlight than females with tertiary education (Combos et al., 2007). The effect of education on the probability of moonlighting is not only insignificant, but also very small in magnitude (Hyderand Ahmed, 2011).

*Family income*:-Tansel (1996) found evidence that moonlighters generally belong to low income group. Similarly he explained that probability of moonlighting increases as income from primary job decreases and probability of moonlighting decreases with an increase in the number of earning members of the households. The workers with higher non-labour income are less likely to be a moonlighter (Naderi, 2000).

*Occupation*:-Jamal and Crawford (1981) have debated against the general popular opinion that moonlighters have less involvement in their primary occupation. Foley (1997) determined that 87 percent of Russian moonlighters choose to moonlight through additional jobs which were not in the same occupation as their main job. They specified that medical and teaching professionals, salespersons, and extraction workers were most likely to moonlight through occupations belonging to the same field of the main activities. According to Sussman (1998), medicine and health, and

social sciences had the highest incidence of moonlighting. He clarified that the highest rate of multiple job holding in the United States were workers whose main job in the educational services or health and social services, and moreover in Canada, this was true of those working in health and social services, education or the primary industries. Kimmel and Powell (1999) have examined a rise in the rate of moonlighting among self-employed persons and moonlighting rate increased among managerial, service, and primary occupations. Self-employed and agricultural laborers are more likely and the farmers employing waged workers are less likely to moonlight (Combos et al., 2007). Livanos and Zangelidis (2009)have specified that full time employees exhibit a lower rate of moonlighting, similarly individuals working in family businesses and self-employment are more likely and moonlighting is higher among employed people in the public sector compared to the private sector. Dickey, Watson and Zangelidis (2009) have shown that workers like to maintain a flexible work schedule and probability of moonlighting increases for a primary job associated with a high risk of injury.

*Residence Area*:- Variations in the distribution of employment by industry and occupation, as well as in self-employment, part time and unemployment rates may all play a role in provincial moonlighting rates (Sussman, 1998). Naderi (2000) has confirmed that the rural Iranian people are more likely to moonlight. Combos, McKay and Wright (2007) indicated that the probability of being a moonlighter is higher for urban citizens while living in an urban area to be positively related to multiple jobholding because workers may find it easier to obtain additional work in cities than in rural areas. Livanos and Zangelidis (2009) indicated that areas with developed primary sector, like Crete, Eastern Macedonia, Thessaly, and the Peloponnese are more prone to moonlighting in Greece.

*Hours constrain*:-Under the labour related factors on moonlighting `hours constrained' is the major evaluated aspect. Shisko and Rostker (1976) have recognized that the hour's constraint plays an important determinant of moonlighting behavior of workers. Krishnan (1990) said that the husband is less like to moonlight if the hours on the second job increase. Foley (1997) illuminated that monthly hours

worked at formal moonlighting jobs were considerably higher than monthly hours worked at informal second jobs and the absence of formal sector benefits at informal jobs compelled the Russians to work for both formal primary and moonlighting jobs. US women mostly choose to moonlight due to hour's constraint job motive (Kimmel and Powell 1999).Naderi (2000) explained that hours worked in the primary job lowered the probability of moonlighting and hour's constraint played a major determinant of Iranian moonlighting. Those who work more hours in their first job are less likely to hold a second job; an additional hour in the first job reduces the probability of holding a second job (Böheim and Taylor, 2004). Further, hours constraint played an important role in shaping moonlighting decision (Boheim and Tailor, 2004; Dickey et al., 2009). Robinson and Wadsworth (2006) have explained that hours constraint on the main job plays a significant role in shaping moonlighting, while work hour in a moonlighting job reduced and work hour in the main job increased since the introduction of national minimum wage (NMW). Heineck (2009) has specified that male workers in Germany are not hours constrained, whereas British males, as well as female workers are less prone to moonlighting with increasing working hours. Hyder and Ahmed (2011) have confirmed that the hours constraint is one of the main determinant of moonlighting in Pakistan. According to him, any worker will work a maximum of 16 hours in 24 hours, and after that the worker would start preferring leisure over work even at a very high wage rate.

*Primary job wage*: -Shisko and Rostker (1976) have demonstrated that increase in the moonlighting wage rate results in decreasing the labour supply to primary job and increase in the wage rate of the primary job results in decreasing the labour supply to moonlighting job. Krishnan (1990) said that the husband is less like to moonlight if the income on the first job increases. Foley (1997) indicated that moonlighting jobs yielded a much higher wage rate on average than primary jobs and most second jobs in Russia were attached to a greater wage rate than the primary job. Kimmel and Powell (1999) concluded that Canadian women decided to moonlight because of wage constraint. Combos, McKay and Wright (2007) illuminated that payment of compulsory job contributions negatively affects the probability of

moonlighting. Heineck (2009) exposed that the moonlighting wage rate did not influence the moonlighting decision of German male workers, but influenced negatively on the moonlighting decision in the UK. Hyder and Ahmed (2011) have found no strong evidence of the influence of wage rate in the incidence of moonlighting. Furthermore, Nunoo, Darfor, Koomson and Arthur (2016) used the monthly earning in the main job (in normal terms) to measure the logs to examine whether financial constraints also serve as a reason for moonlighting.

### 2.3 Statistical Analysisused in Previous Studies

According to the empirical studies on factors influencing moonlighting, different models are used by the researches. Naderi (2000), has studied the causes of moonlighting in Iranian labour market by estimating a logistic regression model using two sets of data, which were annual survey of Employment and Unemployment Characteristics of Household (cross section of 2000) and the Family Panel Survey (2001) conducted by the statistic center in Iran. Moreover, Combos, McKay and Wright (2007) have utilized a logistic model to ascertain the factors affecting the probability of moonlighting in the Magnesia region of Greece on the basis of their survey carried out in 1994.

Heineck (2009)has used the panel data drawn from the German and the British Household Panel Survey (BHPS) to do the comparative study of the moonlighting patterns and the determinants of moonlighting behavior for males and females using the technique of logistic regression. Dickey, Watson and Zangelidis (2009) have studied the working conditions and moonlighting behavior of individuals who are employed in the UK North sea oil and gas industry using the logistic regression model. Livanos and Zangelidis (2009) determined regional aspects and cyclicality of moonlighting among male workers over the business cycle in Greece using logistic regression analysis from micro data of LFS for the years 2000-2004. Nunoo, Darfor, Koomson and Arthur (2016) used the logistic regression as the main analytical tool

for their analysis on “Employment security and workers moonlighting behavior” in Ghana.

## 2.4 Summary of Chapter 2

Reviewed literature at international level, as well as in the local context, provided a sound theoretical and empirical foundation for the present study. It was noted that much of the studies are from other countries, while there was a lack of studies related to moonlighting in Sri Lanka. However, the above exploration of the literature was helpful in identifying the factors influencing moonlighting and carry out the analysis of this study. The review also helped in identifying the research models that have been used in similar researches.

# CHAPTER 3
# MATERIALS AND METHODS

This chapter provides a comprehensive knowledge on the study design, sample and research methodology which is developed in order to achieve the stated objective of the study.

## 3.1 Data and the Variables

### 3.1.1 Data Source

The main data source for the present study was Labour Force Survey (LFS), conducted by the Department of Census and Statistics (DCS) in the year 2014. LFS was designed on a quarterly basis to measure the levels and trends of employment, unemployment and labour force in Sri Lanka on a continuous basis since the first quarter in 1990. In the past, information on labour force characteristics, employment, and unemployment, etc. were collected through the labour force and socioeconomic surveys conducted at five year intervals. Since 1990, DCS has been able to continue this survey quarterly throughout the island.

### 3.1.2 Methodology of the Labour Force Survey

LFS survey was conducted from January to December in 2014 and all the DCS field staff attached to the Divisional Secretariats (DS) were involved in the data collection part. Two stage stratified sampling procedure was adopted to select a sample of 25,000 housing units to be enumerated covering the entire country.

### 3.1.3 Sample Size

Sample for the current study comprises a total of 81,376 individual records in the LFS data file in 2014. From them, total number of job holders are 30,415 and 2,525 are employed in two jobs. Therefore, for the analysis those who worked only one job (27,890) are considered as non-moonlighters and that those who did secondary jobs (2,525) are considered as moonlighters.

## 3.2 Variables

### 3.2.1 Dependent Variable:

Decision to moonlight is a qualitative dichotomous dependent (response) variable. If an individual supplies, labour time at least one additional (moonlighting) job, the individual will be assigned the value 1, and those who are not engaged in moonlighting coded is denoted by 0.

### 3.2.2 Independent Variables

The explanatory variables that are considered in the study predict the response variables that are listed (Table 3.1). The variables age, size of the household and dependents below 15 years old are taken as continuous variables. The variables such as gender, marital status, residential sector, education, occupation, first job income and hours working on the first job are considered as categorical variables and for the analysis dummy variables are created for each of the categorical variables.

## 3.3 Statistical Techniques

Bivariate analysis was done using the Chi square test to identify significant variables of the model and the binary logistic model is used to quantify the determinants of moonlighting. All statistical analysis was done by using SPSS (Statistical Package for Social Scientists) IBM -2013 version 21.0 software.

### 3.3.1 Pearson Chi-square Test

Pearson Chi-Square test is used to identify relationship between each variable.

$$\text{Pearson's Chi-Square Test(exact)} = \chi 2 = \Sigma \frac{(Observed - Expected)^2}{Expected}$$

Hypotheses

Null: There is no association between the two variables.

Alternate: There is an association between the two variables.

### 3.1 Variables List

| Variable | Variable Type | Category of the variable | Dummy variables |
|---|---|---|---|
| Age (age) | Continuous | | |
| Gender (G) | Categorical | 1.Male<br>0.Otherwise | Male = $G_{11}$=1, otherwise = $G_{11}$=0 |
| House hold size (Hs) | Continuous | | |
| Marital status (Ms) | Categorical | 1.Married<br>0.Otherwise | Married = $Ms_{11}$=1 , Otherwise = $Ms_{11}$ =0 |
| Dependents below 15 years(Dp) | Continuous | | |
| Residential sector (S) | Categorical | 1.Urban<br>0.Otherwise | Urban = $S_{11=}$1,Otherwise =$S_{11}$ = 0 |
| Education (Edu) | Categorical | 1.up to grade 9<br>2.O/L<br>3.A/L and above | D1Edu=up to grade 9=$Edu_{11}$=1, other= $Edu_{11}$ = 0<br>D2Edu= O/L =$Edu_{12}$ = 1, other = $Edu_{12=}$ 0 |
| Occupation (Op) | Categorical | 1.White collar jobs<br>2.Blue collar jobs<br>3.Pink collar jobs | D1Op=White collar jobs= $Op_{11}$=1,other= $Op_{11}$ = 0<br>D2Op=Blue collar jobs = $Op_{12}$=1,other = $Op_{12}$=0 |
| First Job Income (Fi) | Categorical | 1.Income below Rs. 20,000<br>0.Income more than Rs. 20,000 | below Rs. 20,000= $Fi_{11=}$ 1, other = $Fi_{11=}$ 0 |
| Hours working at first job (Hw) | Categorical | 1.Below 40 hours per week<br>0.More than 40 hours per week | below 40 hours= $Hw_{11}$= 1, other= $Hw_{11}$= 0 |

### 3.3.2 Binary Logistic Regression

Logistic regression analysis extends the techniques of multiple regression analysis to research situations in which the outcome variable is categorical. Generally, the response variable is binary. Further, it is a statistical technique that examines the influence of various factors on a dichotomous outcome by estimating the probability of the event's occurrence. It describes the relationship between a dichotomous response variable and a set of explanatory variables. The binary logistic model is used to estimate the probability of a binary response based on one or more predictor (or independent) variables. It allows one to say that the presence of a risk factor increases the probability of a given outcome by a specific percentage.

Accordingly, the dichotomous dependent variable in the present study, takes the value 1 if a person as moonlighting or 0 otherwise (non-moonlighting). If p(x) is the probability of the occurrence of interest in the response variable for an observation with factor x having two levels, a logistic model can be written as,

$$\text{logit } p(x) = \ln\left(\frac{P_x}{1-P_x}\right) = \beta_0 + \beta_1 X_{i1} \dots\dots\dots + \beta_k X_{ik} + \varepsilon \dots \quad (1)$$

Where $\ln\left(\frac{P_x}{1-P_x}\right)$ is the natural log of the odds are considered as a moonlighter whereas $\beta_0$ is the intercept and $\beta_1$ is effect of level one (say) of the factor x.

From (1) $p(x) = \frac{\exp(\beta_0 + \beta_{1X_i} \dots\dots\dots + \beta_k X_{ik})}{1+\exp(\beta_0 + \beta_{1X_i} \dots + \beta_k X_{ik})}$ ..... (2)

The full model for factor influence on moonlighting is as follows:-

$$\ln\left(\frac{P_x}{1-P_x}\right) = \beta_0 + \beta_1 \text{age} + \beta_2 G_{11} + \beta_3 \text{Hs} + \beta_4 \text{Ms}_{11} + \beta_5 \text{Dp} + \beta_6 S_{11} + \beta_7 \text{D1Edu}_{11} + \beta_8 \text{D2Edu}_{12} + \beta_9 \text{D1Op}_{11} + \beta_{10} \text{D2Op}_{12} + \beta_{11} \text{Fi}_{11} + \beta_{12} \text{Hw}_{11} + \varepsilon$$

Binary logistic regression does not have as many assumptions as linear regression. However the following assumptions are important:

- Cases and errors should be independent
- A linear relationship exists between the continuous independent variables and the logit transformation of the dependent (outcome) variable
- No multi-collinearity
- No significant outliers or influential points
- Categories are mutually exclusive and exhaustive

### 3.3.3 Model Validation

Sample size: Sample size for the logistic model was checked for adequacy under standard criteria suggested by Hosmer and Lemeshow (2000). Accordingly the rule of "events per parameter" was applied. Under this rule a minimum number of ten events per parameter are needed to avoid problems of overestimation / underestimation of Wald statistics.

The Overall significance of the model; Omnibus test: The Omnibus test can be interpreted as a test of the capability of all predictors in the model jointly to predict the response (dependent) variable. It tests whether the explained variance in a set of data is significantly greater than the unexplained variance, overall.

Category prediction: Binary logistic regression estimates the probability of an event (in this case, having moonlighting) occurring. If the estimated probability of the event occurring is greater than or equal to 0.5 (better than even chance), and if the probability is less than 0.5, statistics classifies the event as not occurring (non moonlighting). It is very common to use binary logistic regression to predict whether cases can be correctly classified (i.e., predicted) from the independent variables. The

classification table provides much important information about binary logistic regression.

Variance explained: In order to recognize how much variation in the dependent variable can be explained by the model (the equivalent of $R^2$ in multiple regression), the "Model Summary" can be consulted. Cox & Snell and Nagelkerke Pseudo-$R^2$an adapted version of the $R^2$ (coefficient of determination) can be used in logistic regression. It approximates the proportion of the total variance in the data that the model accounts ranging from 0 to 1.

Hosmer-Lemeshow goodness of fit test**:** The Hosmer and Lemeshow test is basically a way of ascertaining how well the data fits the model. It tests the null hypothesis that the model is a good enough fit to the data. Reject the null hypothesis if p <.05.Hosmer and Lemeshow recommend partitioning the observations into 10 equal sized groups according to their predicted probabilities.

Significance of individual coefficient; The Wald test, (also called the Wald Chi-squared test) is a way to find out if explanatory variables in a model are significant. The test can be used for a multitude of different models, including those with binary variables or continuous variables. If the Wald test shows that the parameters for certain explanatory variables are zero, can remove the variables from the model and if the test shows the parameters are not zero, should include the variables in the model.The test consists of dividing the value of the coefficient by standard error.

Odds ratio: The odds are simply the ratio of the proportions for the two possible outcomes. If p is the proportion for the one outcome then, (1-p) is the proportion for the second outcome. It is calculated by using the exp (exponent) of the regression coefficient of the predictor.

$$\text{OR= Odds of and event} = \frac{\text{P (event occurs )}}{P(event\ does\ not\ occurs)} = \frac{\text{P}}{(1-\text{P})}$$

# CHAPTER 4
# IDENTIFICATION OF SIGNIFICANCE VARIABLES ON MOONLIGHTING

This chapter of the research study discusses the results of the significance tests between moonlighting and explanatory variables. This was done using chi-square test between each explanatory variable with the dichotomous response variable (moonlighting). The results of all independent variables with moonlighting, cross tabulation are depicted in Tables 4.1– 4.10.

## 4.1: Association between Moonlighting and Age

The selected group of the study is the employers are greater than 15 years old. The Table 4.1 shows the chi squire test of the moonlighting with the above mentioned age group. Results indicate that there is a statistically significant association between the age group and moonlighting since the *p*-value of the chi square statistic (113.286) is less than 5 percent (*p*=.000). It can be concluded that the age of the employed persons depend on moonlighting.

## 4.2: Association between Moonlighting and Gender

Table 4.2 shows cross tabulation of the moonlighters with their gender. The percentage of persons who engage in a secondary occupation among male (9.6%) is significantly higher than that of females (5.7%). Considering the chi squire between gender and moonlighting, it indicates a statistically significant association as the *p*-value of the chi square statistic (134.665) is less than 5 percent (*p*=0.000). It was found that the moonlighting of the persons depends on their gender.

Table 4.1: Cross Tabulation of Moonlighting and Age Group

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Age group | 15-39 | Count | 12670 | 875 | 13545 |
| | | % within age group | 93.5% | 6.5% | 100.0% |
| | 40-59 | Count | 12124 | 1348 | 13472 |
| | | % within age group | 90.0% | 10.0% | 100.0% |
| | 60 and above | Count | 3096 | 302 | 3398 |
| | | % within age group | 91.1% | 8.9% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within age group | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics - $\chi^2_2 = 113.286$ ($p < 0.05$)

Table 4.2: Cross Tabulation of Moonlighting and Gender

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Sex | Male | Count | 18251 | 1940 | 20191 |
| | | % within sex | 90.4% | 9.6% | 100.0% |
| | Female | Count | 9639 | 585 | 10224 |
| | | % within sex | 94.3% | 5.7% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within sex | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi 2=134.665$ ($p < 0.05$)

### 4.3: Association between Moonlighting and Household Size

The total numbers of the members in a typical household are considered here. Table 4.3 shows the results of chi squire statistics between moonlighting and household size. It is indicate that association between household size and moonlighting is significant ($p$=0.000). It signifies that 4-6 household size group reported the highest family member group.

Table 4.3 Cross Tabulation of Moonlighting and Household Size

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Household size | 1-3 | Count | 8704 | 854 | 9558 |
| | | % within Household size | 91.1% | 8.9% | 100.0% |
| | 4-6 | Count | 16918 | 1555 | 18473 |
| | | % within Household size | 91.6% | 8.4% | 100.0% |
| | 7 and above | Count | 2268 | 116 | 2384 |
| | | % within Household size | 95.1% | 4.9% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within Household size | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2_2 = 42.332$ ($p < 0.05$)

### 4.4: Association between Moonlighting and Marital Status

When considering the marital status never married, divorced and separated represent the single. In this data set most of the employed persons are married. There is a statistically significant association between the moonlighting and the marital status of the person as the p-value of the chi square statistic (191.355) is less than 5 percent ($p = .000$).

Table 4.4: The Cross Tabulation of Moonlighting and Marital Status

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Marital Status | Single | Count | 6888 | 315 | 7203 |
| | | % within Marital S | 95.6% | 4.4% | 100.0% |
| | Married | Count | 21002 | 2210 | 23212 |
| | | % within Marital S | 90.5% | 9.5% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within Marital S | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2 = 191.355$ ($p < 0.05$)

### 4.5: Association between Moonlighting and Dependents

For this study, below 15 years of age family members are taken as the dependents, because still they depend on their parents. There is a statistically significant association between dependent under 15 years and moonlighting as the *p*-value of the chi square statistic (35.543) is less than 5 percent ($p$= 0.00) Table 4.5.

Table 4.5: Cross Tabulation of Moonlighting and Number of Dependents

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| No of dependents | No dependents | Count | 11864 | 932 | 12796 |
| | | % within dependents | 92.7% | 7.3% | 100.0% |
| | 1-2 | Count | 15582 | 1561 | 17143 |
| | | % within dependents | 90.9% | 9.1% | 100.0% |
| | 3 and above | Count | 444 | 32 | 476 |
| | | % within dependents | 93.3% | 6.7% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % withindependents | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2_2 = 35.543$ ($p< 0.05$)

### 4.6: Association between Moonlighting and Residential Sector

According to the gathered data from the survey sample, 90 percent of the moonlighters are represented from the rural sector. It indicates a statistically significant association between the sector and the moonlighting as the *p*-value of the chi square statistics (219.613) is less than 5 percent ($p$= 0.000).

### 4.7: Association between Moonlighting and Level of Education.

Though the LFS has categorized education into several groups, for this analysis it has been divided into three groups, considering the general idea got from the data. Under the three education categories, Table 4.7 has given the relationship between the

moonlighting and the level of education. The chi- square statistics (48.867) is significant ($p$=0.000) between moonlighting and level of education. Therefore, it can be concluded that there is a significant association between the persons having a second job and their level of education. The result shows that percentage of persons pass the grade 9 or less education are doing a second job than that of persons has higher education qualifications.

Table 4.6: The Cross Tabulation of Moonlighting and Residential Sector

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Sector | Urban | Count | 4483 | 127 | 4610 |
| | | % within sector | 97.2% | 2.8% | 100.0% |
| | Rural | Count | 23407 | 2398 | 25805 |
| | | % within sector | 90.7% | 9.3% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within sector | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2$ = 219.613($p$< 0.05)

Table 4.7: Cross Tabulation of Moonlighting and Level of Education

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Level of Education | Grade 9 or less | Count | 10324 | 1102 | 11426 |
| | | % within Education | 90.4% | 9.6% | 100.0% |
| | Pass O/L | Count | 10702 | 914 | 11616 |
| | | % within Education | 92.1% | 7.9% | 100.0% |
| | A/L and above | Count | 6864 | 509 | 7373 |
| | | % within Education | 93.1% | 6.9% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within Education | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2_2$ = 48.867($p$< 0.05)

### 4.8: Association between Moonlighting and Occupation

The LFS has taken the occupation information into 10 categories. Based on the literature, this study considered the occupation into three groups. The choice of multiple job holding varies among different workers in different occupational groups. The results of the chi square statistics indicate a statistically significant association between the occupation of the person and moonlighting. The *p*-value of the chi square statistics (112.957) is less than 5 percent ($p$= 0.000). Table 4.8 illustrates that the people in blue collar occupation group more prefer to do a second job.

Table 4.8: The Cross Tabulation of Moonlighting and Occupation

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| Occupation | White collar | Count | 4238 | 334 | 4572 |
| | | % within Occupation | 92.7% | 7.3% | 100.0% |
| | Blue collar | Count | 14010 | 1542 | 15552 |
| | | % within Occupation | 90.1% | 9.9% | 100.0% |
| | Pink collar | Count | 9642 | 649 | 10291 |
| | | % within Occupation | 93.7% | 6.3% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within Occupation | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2_2 = 112.957 (p < 0.05)$

### 4.9: Association between Moonlighting and Income of the First Job

According to the LFS data file, the person's first job income variance is high. Because of that this study has taken the first job income into two categories. Table 4.9 illustrates that the people having below Rs. 20,000 as their monthly income, more prefer to do a second job. Considering the chi squire statistics between first job and the moonlighting, it indicates a statistically significant association between the first job and moonlighting, as the *p*-value of the chi square statistics (53.572) is less than 5 percent ($p$=0.000).

Table 4.9: The Cross Tabulation of Moonlighting and Income of the First Job

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| First job income | Below Rs. 20,000 | Count | 19422 | 1934 | 21356 |
| | | % within First job income | 90.9% | 9.1% | 100.0% |
| | Above Rs. 20,000 | Count | 8468 | 591 | 9059 |
| | | % within First job income | 93.5% | 6.5% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within First job income | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2 = 53.572 (p < 0.05)$

### 4.10: Association between Moonlighting and Hours Working on the First Job

Generally, the total working hours per week is about 40 hours in Sri Lanka. Considering that working hours in the first job is divided into two groups; as working less than 40 hours per week and more than 40 hours per week. Table 4.10 demonstrates the relationship between the hours working on the first job with moonlighting. There is a statistically significant association between the hours spend for a first job and moonlighting as the *p*-value of the chi square statistic (559.976) is less than 5 percent ($p = 0.000$). Therefore, it can be concluded that the moonlighting of the persons depend on the hours work on their first job.

Table 4.10: The Cross Tabulation of Moonlighting and Hours Working on the First Job

| | | | Moonlighting | | |
|---|---|---|---|---|---|
| | | | No | Yes | Total |
| hours working on first job | Below 40 hours | Count | 14003 | 1888 | 15891 |
| | | % within hours working | 88.1% | 11.9% | 100.0% |
| | More than 40 hours | Count | 13887 | 637 | 14524 |
| | | % within hours working | 95.6% | 4.4% | 100.0% |
| Total | | Count | 27890 | 2525 | 30415 |
| | | % within hours working | 91.7% | 8.3% | 100.0% |

Pearson Chi-squire Statistics- $\chi^2 = 559.976 (p < 0.05$

### 4.11 Summary of the Chapter 4

Chi-Square analysis for each independent variable with response variable revealed that all the variables have a significant ($p$=0.000) impact on moonlighting. The identified significant factors are age, gender, size of the household, dependents below 15 years, marital status, sector, education, occupation, hours working on the first job and first job income.

# CHAPTER 5
# MODELLING MOONLIGHTING USING BINARY LOGISTIC MODEL

The significant variables identified in chapter four were input to develop a binary logistic model to identify the factors influence on moonlighting. For the analysis age, number of dependent in the family and family size are taken as continuous variables and others taken as categorical variables. This chapter discusses the important results given by the SPSS for the binary logistic regression.

## 5.1: Modeling the Moonlighting

The results of the omnibus test show whether all of the variables provide a good prediction or not. In this study, the value of the chi square test indicates that the model is a good fit for the data. According to Table 5.1, when all variables are added to the model change in 1385.279 and degrees of freedom are 12, it is statistically significant at the 5 percent level of significance.

Table 5.1: Omnibus Tests of Model Coefficients

| | | Chi-square | Df | Sig. |
|---|---|---|---|---|
| Step 1 | Step | 1385.279 | 12 | .000 |
| | Block | 1385.279 | 12 | .000 |
| | Model | 1385.279 | 12 | .000 |

The p –value associated with the chi square provided for the step, block and for the model in Table 5.1 and the p –value associated with the -2LLis the Hosmer and Lemenshow given in Table 5.2 (HL is not statistically significant $p$ = .163) indicate that the model is good fit and all the predictors (overall)have a significant effect over the dependent variable.

Table 5.2: Hosmer and Lemeshow Test

| Step | Chi-square | df | Sig. |
|---|---|---|---|
| 1 | 11.746 | 8 | .163 |

The model summary given in Table 5.3 indicates how much variation in the response variable can be explained by the model. ReportedpseudoR$^2$: Cox& Snell R$^2$and Nagelkerke R$^2$ values are .045 and .102 respectively. Therefore, the explained variation in the response variable for the model with all the predictors ranges from 4.5percent to 10.2percent giving reasonably acceptable level explanatory level in the logistic setting.

Table 5.3: Model Summary

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 16016.955[a] | .045 | .102 |

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

The observed and predicted classifications are presented in the classification Table.(Table 5.4).In this study, logistic regression estimates the probability of an event occurring holding a secondary occupation (moonlighting). If the estimated that the probability of the event occurring is greater than or equal to .5 (better than even chance), the event is classified as occurring (moonlighting). It is common to use logistic regression to predict whether cases can be correctly classified (predicted) from the independent variables. Therefore, it becomes necessary to have a method to assess the effectiveness of the predicted classification against the actual classification.

The subscript in the Table 5.4 states that the ‘cut value is .500. This means that if the probability of a case being classified into the ‘moonlighting - yes’ category is greater than .5, then the case is classified into the ‘moonlighting’. Otherwise, the case is classified to the ‘moonlighting - no’ category ‘non-moonlighting’.

Table 5.4: Classification Summary

| Observed | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Moonlighting | | Percentage Correct |
| | | | No | Yes | |
| Step 0 | Moonlighting | No | 27890 | 0 | 100.0 |
| | | Yes | 2525 | 0 | 0.0 |
| | Overall Percentage | | | | 91.7 |

a. Constant is included in the model. b. The cut value is .500

The classification Table 5.4 above, indicated that 8.3percent of cases overall could be correctly classified by the model. When the independent variables are added, the model correctly classifies 91.7percent of cases overall. That is, the addition of the explanatory variables improves the overall prediction of cases into their observed categories of the response variable. Hence, the percentage accuracy in classification (PAC) of the model has been improved to 91.7 percent.

Table 5.5 shows the explanatory variables and their statistical significance of the model. Furthermore, it includes the odds ratios of each explanatory variable in Exp (B) column along with their confidence intervals [95% C.I. for Exp (B) column]. The interpretation of the odds ratio is as follows:

- Holding other variables constant, age, household size and number of dependents below 15 the odds of having moonlighting increase by 1.007 times, 0.915 times and 1.156 times respectively.

Holding the other variables constant, being a male, the odds of moonlighting increase by 2.152 times than a female, while being a married person increases the odds of moonlighting by 0.527 times than single person.

Table 5.5 Variables in the Equation

| | B | S.E. | Wald | Df | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Age | .007 | .002 | 12.908 | 1 | .000 | 1.007 | 1.003 | 1.010 |
| Male ($G_{11}$) | .766 | .052 | 220.027 | 1 | .000 | 2.152 | 1.945 | 2.381 |
| Household size (Hs) | -.089 | .017 | 26.912 | 1 | .000 | .915 | .885 | .946 |
| Married ($Ms_{11}$) | -.640 | .068 | 88.684 | 1 | .000 | .527 | .462 | .602 |
| Dependents (Dp) | .145 | .027 | 29.381 | 1 | .000 | 1.156 | 1.097 | 1.218 |
| Urban ($S_{11}$) | -1.134 | .094 | 144.475 | 1 | .000 | .322 | .267 | .387 |
| Grade 9 or less ($Edu_{11}$) | -.021 | .070 | .093 | 1 | .760 | .979 | .854 | 1.123 |
| O/L pass ($Edu_{12}$) | -.008 | .067 | .013 | 1 | .909 | .992 | .871 | 1.131 |
| White collar jobs ($Op_{11}$) | .441 | .082 | 28.607 | 1 | .000 | 1.554 | 1.322 | 1.826 |
| Blue collarjobs ($Op_{12}$) | .361 | .050 | 51.926 | 1 | .000 | 1.435 | 1.301 | 1.584 |
| First job income below 20000m($Fi_{11}$) | -.325 | .057 | 32.784 | 1 | .000 | .723 | .647 | .808 |
| Below 40 hours per week ($Hw_{11}$) | 1.068 | .049 | 472.133 | 1 | .000 | 2.909 | 2.642 | 3.203 |
| Constant | -3.628 | .136 | 715.438 | 1 | .000 | .027 | | |

- When considering the residential factor, which is sector significant for moonlighting. The odds of moonlighting of a person in the urban sector decrease by a 0.322 times compared to a person in the rural sector.

- The explanatory variable “occupation” is an important and significant factor among the selected variables for moonlighting model. The result revealed that the occupation category and the moonlighting show a positive relationship. The person holding a white collar or blue collar job increases the odds of moonlighting by 1.554 times and 1.435 times respectively.

- Holding an other variables constant, the odds of a person involved in secondary occupation, working below 40 hours per week increase by a factor 2.909 times compared to person working more than 40 hours per week.

- Holding an other variables constant, the odds of a moonlighting increase by a factor 0.723times for the first job income of the persons below Rs. 20,000 per month compared to the person earning more than 20,000 income from their first job.

Based on Table 5.5, the logistic regression model is as follows:-

$$\ln\left(\frac{P_x}{1-P_x}\right) = -3.628 + 0.007\text{Age} + 0.766G_{11} - 0.089\text{Hs} - 0.640\ \text{Ms}_{11} + 0.1454\text{Dp} - 1.134S_{11} + 0.021\text{Edu}_{11} - 0.008\text{Edu}_{12} + 0.441\text{Op}_{11} + 0.361\text{Op}_{12} - 0.325\ \text{Fi}_{11} + 1.068\text{Hw}_{11} + \varepsilon$$

where$P_x$ is the probability of having moonlighting

Because of all the variables on the above model were not significant, it is needed to run a new model for further the improvement. Hence, dropping the education variable, the model was run and the results were as below.

The *p*_value associated with the chi square provided for the step, block and for the model in Table 5.6 and the *p*_value associated with the -2LL is the Hosmer and Lemenshow given in Table 5.7(HL is not statistically significant $p = .122$) indicate that the model is good fit and all the predictors (overall)have a significant effect over the dependent variable.

Table 5.6: Omnibus Tests of Model Coefficients

| | | Chi-square | df | Sig. |
|---|---|---|---|---|
| Step 1 | Step | 1385.161 | 10 | .000 |
| | Block | 1385.161 | 10 | .000 |
| | Model | 1385.161 | 10 | .000 |

Table 5.7: Hosmer and Lemeshow Test

| Step | Chi-square | Df | Sig. |
|---|---|---|---|
| 1 | 12.707 | 8 | .122 |

Model summary given in Table 5.8 indicates how much variation in the response variable can be explained by the model. ReportedpseudoR$^2$: Cox& Snell R$^2$and Nagelkerke R$^2$ values are .045 and .102 respectively. Therefore, the explained variation in the response variable for the model with all the predictors ranges from 4.5 percent to 10.2 percent giving reasonably acceptable level explanatory level in the logistic setting.

Table 5.8: Model Summary

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 16017.073[a] | .045 | .102 |

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

The classification Table 5.9, indicated that 8.3 percent of cases overall could be correctly classified by the model. When the independent variables added, the model correctly classifies 91.7 percent of cases overall. Therefore, the addition of the explanatory variables improves the overall prediction of cases into their observed categories of the response variable. Hence, the percentage accuracy in classification (PAC) of the model has been improved to 91.7 percent.

Table 5.9: Classification Summary

| Observed | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Moonlighting | | Percentage Correct |
| | | | No | Yes | |
| Step 1 | Moonlighting | No | 27890 | 0 | 100.0 |
| | | Yes | 2525 | 0 | 0.0 |
| | Overall Percentage | | | | 91.7 |

a. The cut value is .500

The "variables in the equation", Table 5.10 shows the contribution of each independent variable to the model and its statistical significance.

The Table 5.10 contains the odds ratios of each explanatory variable in the Exp (B) column along with their confidence intervals [95% C.I. for Exp (B) column]. The interpretation of the odds ratio is as follows:

- Holding other variables constant, age, household size and number of dependents below 15, the odds of having moonlighting by 1.007 times, 0.915 times and 1.155 times respectively.

- Holding the other variables constant, being a male, increases the odds of moonlighting by 2.147 times than a female, being a married person increases the odds of the moonlighting by 0.527 times than being a single.

Table 5.10: Variables in the Equation

| | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I.for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower | Upper |
| Age | .007 | .002 | 13.149 | 1 | .000 | 1.007 | 1.003 | 1.010 |
| Male ($G_{11}$) | .764 | .051 | 223.227 | 1 | .000 | 2.147 | 1.942 | 2.374 |
| Household size (Hs) | -.088 | .017 | 26.841 | 1 | .000 | .915 | .885 | .947 |
| Married ($Ms_{11}$) | -.640 | .068 | 88.696 | 1 | .000 | .527 | .462 | .602 |
| Dependents (Dp) | .144 | .027 | 29.288 | 1 | .000 | 1.155 | 1.097 | 1.217 |
| Urban ($S_{11}$) | -1.132 | .094 | 144.437 | 1 | .000 | .322 | .268 | .388 |
| White collar jobs ($Op_{11}$) | .449 | .077 | 34.425 | 1 | .000 | 1.567 | 1.348 | 1.820 |
| Blue collar jobs ($Op_{12}$) | .363 | .050 | 53.020 | 1 | .000 | 1.438 | 1.304 | 1.586 |
| First job income below 20000 ($Fi_{11}$) | -.320 | .054 | 34.527 | 1 | .000 | .726 | .653 | .808 |
| Below 40 hours per week ($Hw_{11}$ ) | 1.068 | .049 | 474.451 | 1 | .000 | 2.908 | 2.642 | 3.202 |
| Constant | -3.634 | .127 | 823.510 | 1 | .000 | .026 | | |

- The odds of moonlighting of a person in urban sector decrease by a 0.322 times compared to a person in rural sector.

- The person holding a white collar and blue collar job increases the odds of moonlighting by 1.567 times and 1.438 times respectively.

- Holding other variables constant, the odds of a person involved in secondary occupation, working below 40 hours per week increase by a factor 2.908 times compared to person working more than 40 hours per week.

- Holding a other variables constant, the odds of moonlighting increase by a factor 0.721 times for the first job income of the persons below Rs.20,000 per month compared to the person earning more than 20,000 income from his/her first job.

Based on Table 5.10, the logistic regression model is as follows:-

$$\ln\left(\frac{P_x}{1-P_x}\right) = -3.634 + 0.007\text{Age} + 0.764G_{11} - 0.088\text{Hs} - 0.640\ Ms_{11} + 0.144\text{Dp} - 1.132S_{11} + 0.449Op_{11} + 0.363Op_{12} - 0.320\ Fi_{11} + 1.068Hw_{11} + \varepsilon$$

where$P_x$ is the probability of having moonlighting.

## 5.2: Model Selection and Validation

A measure of goodness-of-fit often used to evaluate the fit of a logistic regression model is based on the simultaneous measurement of sensitivity (true positive) and specificity (true negative) for all possible cutoff points. Receiver Operating Characteristic (ROC) curve is a useful way to interpret sensitivity and specificity levels and to determine related cut scores. Standard error and confidence interval option will provide the area under the ROC curve with inference statistics about the curve. The area under the ROC curve ranges from 0.5 and 1.0 with larger values indicative of better fit.

According to the survey results Table 5.11 shows the ROC curve. The area under the curve is .716 with 95 percent confidence interval (.706, 726). Also, the area under the curve is significantly different from 0.5 since p-value is .000 and a lower standard error, the developed binary logistic regression model is best fitted for the data.

Table 5.11: Area under the ROC Curve

| Area | Std. Error[a] | Asymptotic Sig.[b] | Asymptotic 95% Confidence Interval | |
|---|---|---|---|---|
| | | | Lower Bound | Upper Bound |
| .716 | .005 | .000 | .706 | .726 |

The test result variable(s): Predicted probability has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Both the models result in the same ROC curve areas. However, the model that does not take education as a variable is considered the best model.

Hence, the final model equation is:

$$\ln\left(\frac{P_x}{1-P_x}\right) = -3.634 + 0.007\text{age} + 0.764G_{11} - 0.088\text{Hs} - 0.640\ \text{Ms}_{11} + 0.144\text{Dp} - 1.132S_{11} + 0.449\text{Op}_{11} + 0.363\text{Op}_{12} - 0.320\ \text{Fi}_{11} + 1.068\text{Hw}_{11} + \varepsilon$$

where$P_x$ is the probability of having moonlighting.

# CHAPTER 6
# CONCLUSIONS AND RECOMMENDATIONS

## 6.1 Conclusions

Researchers have developed various models on moonlighting for their research based on several variables in different ways. However, most researchers have used a limited number of variables to develop their models. This study has used a higher number of independent variables that are related to moonlighting in Sri Lanka.

According to the model developed by logistic regression, it was found that the significant variables are age, gender, size of the household, dependents below 15 years, marital status, residential sector, occupation, hours working on the first job and income of the first job.

It was shown that moonlighting keeps increasing with aging, while males are more likely to do additional jobs. If a household has more number of dependents, there is an increasing tendency to do moonlighting. It was further found that rural sector workers are mostly multiple jobholder's compared to the urban sector. Once the occupational status is considered, white collar workers are the people who have greater tendency to do multiple jobs. This category specifically includes professionals like doctors, lawyers, lecturers etc. Though it is contradictory with the existing work norms (40 hours per week), people who work less than 40 hours had the greatest effect on moonlighting.

The insignificancy of the education variable can be identified in practice on redundancy of the variable. It is a common situation that both high and low educators are engaged in moonlighting in the country. Especially it can be identified that the people with less education i.e. working in agriculture sector and other labour sectors are more likely to be engaged in moonlighting. Moreover, people with high level of education such as lawyers, doctors, teachers and university lectures are engaged moonlighting using their skills as a tool.

## 6.2 Recommendations for Future Research

Sri Lanka Labour Force Survey collects information from citizens on their primary and secondary jobs only. However, other countries collect information on multiple jobs (third and fourth jobs). If we have data from the 3rd and 4th jobs can identify effect from doing multiple jobs on social life.

Moonlighting is an important aspect of economic development in a country. On the other hand, moonlighting can affect a person's ability to do their primary job conscientiously. It can also increase a person's stress level and affect family dynamics. This study was not able to identify the socio-economic problems moonlighters faced. Therefore, it is important to conduct another study which will identify a moonlighter's problems and difficulties.

It was seen that there is a dearth of studies in relation to moonlighting in Sri Lanka.The variables influencing moonlighting should be studied in depth to understand the causes of moonlighting. Scholars who are interested, as well as information providers for policy makers should further research this area.

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