GENDER AND CAREER ADVANCEMENT
IN THE SCIENCES: A THAI CASE STUDY

by

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ABSTRACT

This thesis is aimed to exploring a gender difference in scientific careers by presenting empirical evidence from Thailand, and also at evaluating the impact of different types of organisation: higher education and research institute sectors on gender and academic career progress. In order to understand gender dimensions in Thai academic careers, a multilevel analysis (Layder, 1993) is employed as a guide. With the pragmatic paradigm, the strength of this research has drawn both quantitative and qualitative approaches.

In comparison to the developed world, Thailand, a country with relatively low competency in science has progressive numeric indices of the status of women in science. However, the findings of this study highlight the existence of a gender gap in rewards. Particularly, female academics in Thai higher education were found worse than their counterparts in the research institute sector as a result of certain organisational characteristics.

This study reveals that Thai women in science remain under threat at different levels: constraints of the national scientific policy which focuses on engineering; Thai scientific organisational norms in favour of men; women's limitations in social connections; and gendered roles which compel women to put family before career. On top of that, though Thai women perceive gender inequality in academic careers, they tend to disregard it.

In order to eliminate gender disparities, Thai female academics need to raise their professional status through a range of activities: achieving privileged academic qualifications; joining each other through formal networks; adopting a male working style; deploying a conflict avoidance strategy; relying on rules and regulations; being single; and drawing on support from family and colleagues. However, it is noteworthy that some of these strategies seem to hinder women's success in science as well.

Overall, the findings support the argument that although Thai female academics may try to devise strategies to survive in their careers, the success of such attempts often depends on structural norms which generate opportunities for them.

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ABBREVIATIONS AND SYMBOLS

CVI	Content validity index
F	Female
GDP	Gross domestic product
IMD	The International Institute for Management Development
M	Male
MNL	Multinomial logistic model
MOST	The Ministry of Science and Technology (Thailand)
NCWA	The National Commission on Women's Affairs (Thailand)
NESDB	The National Economic and Social Development Board (Thailand)
NSO	The National Statistical Office (Thailand)
OCSC	The Office of the Civil Service Commission (Thailand)
RI	The Thai research institute
UK	The United Kingdom
UN	The United Nations
UV	The Thai university

GLOSSARY

Academic career	Careers in a job related to science and technology fields in Thai academic organisations
Academic career advancement	Salary increases and appointments to more senior positions in Thai academic organisations
Academic organisation	Thai public academic organisations related to science and technology fields including universities and research institutes
Academic staff	Academic personnel at Thai academic organisations (e.g. university and research institute), whose primary job is scientific research with a degree and training necessary for scientific work
Faculty staff	Academic staff in science and technology related faculties of a Thai university who undertake teaching, research, and administrative duties
Gender gap	Difference in terms of salary (gender pay gap) and grade position (gender grade gap) between men and women in Thai academic careers
Grade position	Positions of academic personnel in Thai academic organisations which are defined by the Office of Thai Civil Service Commission
Research institute	A Thai public research enterprise under the Ministry of Science and Technology, Thailand
Research staff	Academic staff of a Thai research institute in science and technology fields who perform research and technology functions, but are not required to do any teaching job
University	A Thai public university under the Office of the Higher Education Commission, the Ministry of Education, Thailand

PUBLICATION AND CONFERENCE

During the development of this thesis, a number of papers have been published.

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CHAPTER 1

INTRODUCTION

1.1   Background

Over recent decades, women in science have faced new opportunities as the impact of growing economy is creating new demands for personnel in science and technology (Organisation for Economic Co-Operation and Development, 2006). Consequently, there has been an increasing number of women joining the science and technology workforce. For example, in Europe, on average, the number of women in science fields has raised by 6.3 percent each year (European Commission Directorate-General for Research, 2009). Despite this dramatic rise, women are underrepresented in top levels in science careers - the proportion of female academics was found to be approximately one-fifth in professor and supervisory positions in European countries (European Commission Directorate-General for Research, 2009). This suggests that science remains a society in which gender inequality exists.

In order to investigate the reasons behind gender disparity in academic career advancement, some researchers have suggested that practices in organisations are a key factor in determining women's progression in academe. For example, Fox & Colatrella (2006), based on their research on the working experience of female academics within a technological university by focusing on promotion and career progression, revealed that formal and informal interactions among male counterparts apparently hindered women from reaching leader positions in science academe. However, the career experience of women is determined by not only practices in organisations, but also individual variables. For example, Stack (2004) found that female academics in sciences and engineering with dependent children are likely to have lower productivity than male counterparts, and thus seem women might be considered to be at a disadvantage in scientific careers.

Although some studies have previously attempted to investigate the reasons behind gender difference between men and women in academic career advancement (Fox

& Colatrella, 2006; Stack, 2004), it is still insufficient to fully understand the impact of gender in academic careers. That is because both social structure and individual endowments can together affect academic career advancement and may matter differently for men and women (Healy, Ozbilgin, & Aliefendioglu, 2005). For example, Stack (2004) aimed at investigating the status of women in academic sciences with an emphasis on the effects of individual variables (family burden and academic performance), yet paid little attention to the organisational environment as a barrier that could influence women's advancement as well. Similarly, Fox & Colatrella (2006) outlined the university environment as the principle to explain gender difference in higher education, but have little paid consideration to a range of individual factors such as demographic background that may also impact academic careers. This means that there is still a gap to fill in the research on academic careers in terms of career progression related to gender equality issues.

Moreover, it is noteworthy that most literature seems to focus on the importance of academic careers in the Western countries (Ceci & Williams, 2011; Connolly & Long, 2011) but the conceptualisation of gender varies from one country to another, depending on cultures, traditions and values (Cubillo & Brown, 2003, p. 285). In addition, characteristics of science academe in developing countries are often different from those of developed countries (Intarakumnerd, Chairatana, & Tangchitpiboon, 2002). Consequently, an empirical study of each society is required to demonstrate the effects of social and institutional environments on the existence of gender difference in academic careers, and thus Thailand presents an interesting case for several reasons.

The current research, focuses on Thai context, can contribute to the literature by presenting evidence of gender disparities in a non –Western context, where Western theoretical frameworks may not apply well (Olesen, 1998). Moreover, this research can illustrate evidence of a gender gap in scientific careers from a developing country which is relatively less successful in terms of scientific and technological development; thereby discovering any points of difference with that found in the developed world. Furthermore, half of the academics in Thailand are females (National Science Technology and Innovation Policy Office, 2007). This provides an interesting case for most European countries where the proportion of female researchers working in academic careers is lower, approximately 40 percent

(European Commission Directorate-General for Research, 2009). Also, recent international policy has paid more attention to gender issues in the workplace (Organisation for Economic Co-Operation and Development, 2006) so this study could offer an opportunity to make a step from research on gender towards career advancement.

1.2　The purpose of the study

The literature in relation to gender in advancement in the academic careers has ignored the interplay of a range of multi-level variables (social beliefs, organisational practices and individual variables), which makes gender research inconclusive and incomplete (Layder, 1993). Relatively few studies have employed multilevel perspectives as their research framework (Healy et al., 2005), even though managerial advancement is influenced by an interaction of multilevel factors (Ozbilgin & Tatli, 2005). Therefore, this research attempts to examine a range of variables, individual endowments and organisational practice that cause gender disparities in Thai academic careers. Based on a multi level analysis (Layder, 1993), the research could capture the transitions and interrelationships between personal and institutional powers.

This research aims to measure the gender gap in Thai academic career advancement that may offer some possibility of revealing the realities of gender disparities in Thai scientific careers. However, there is an ongoing debate among economists on the major cause of gender differentials in career advancement. Some advocate that differences of individual traits are important for the progress in careers (Stack, 2004), whereas others claim that discrimination presents the major source of gender disparity (Long & Fox, 1995; Sonnert, 1999). That is because, although men and women hold the same individual endowments, their status may be quite different, depending on the structure which creates the social opportunity for them (McNay, 1999). For example, if scientific and technological areas are based on a traditional male perspective which designates men as key persons, it is difficult for women to meet such particular needs (Fox & Colatrella, 2006). Therefore, the particular interest is whether differences in Thai academic career advancement result from characteristics associated with endowment traits such as

seniority, education, subject area, network, academic performance and family responsibilities, or discrimination.

In order to explore reasons behind the gender gap in academic career advancement, the individual elements that both enable and constrain individuals in a career field are investigated for understanding women's experience on science achievements in the Thai academic context. Apart from an examination on the existence of discrimination in career advancement between men and women in science, we look for supports or practices women employ so as to manage with such gender disparities. In doing so, we can develop a more accurate picture of gender in Thai academic careers. In other words, this study aims to seek the survival strategies drawn by women in academic careers within the particular endowment traits they own as well as the condition of gendered socialisation in the Thai academic context.

Based on individual capital along with gendered values in the society and academic organisation, the status of men and women are different in terms of who dominates the organisation (Hesse-Biber, Leavy, & Yaiser, 2004). Thus, in order to examine the actual status of women in the areas of science and technology in the Thai context, this research has drawn primarily on two traditional feminist approaches: liberal and radical feminisms as the framework for determining the gender equality in academic careers. Liberal feminism is employed to determine whether the rights of women to access academic progress are equal to those of men (Holmes, 2007). In this study, the gender ideology in Thai academic sciences is thus measured on the basis of equality of men and women in organisational hierarchies and rewards. However, examining gender equity by comparing a numerical measurement is inadequate in identifying the status of men and women in careers because gender discrimination is deeply rooted in the social structure (Stanley, 1990). Therefore, radical feminism, which places an emphasis on the gender biases in society (Beasley, 1999), is deployed in parallel in order to investigate whether or not the characteristics of male-predominant society oppresses women in Thai academic sciences.

Additionally, the specific context of academic sciences is provided. This study includes academic staff in science and technology disciplines in the context of

employment in university and research institute sectors because different types of institution may have different patterns of professional behaviours (Connolly & Long, 2011). Although previous studies related to career advancement of academics have been conducted, those studies tended to focus on occupational achievements of academics in a particular organisation (Fox & Colatrella, 2006; Xu, 2008). Few studies have examined gender effects by comparing the roles of organisation (Connolly & Long, 2011). Consequently, this study makes a further contribution by extending the literature on gender discrimination in academic careers by evaluating the impact of different types of institution, specifically by comparing the career profiles of academic personnel employed at university and research institute sectors. It is noteworthy that this study has focused on scientific employment in public science sectors, which make up a combination of 80 percent of the Thai scientific workforce in total (National Science Technology and Innovation Policy Office, 2007).

Finally, little is known of women in professional areas in less industrialised countries. As Yukongdi (2005) observed, there is a scarcity of empirical research examining women in developing countries, especially with respect to female professionals. Thailand, a developing country, was selected as a case study, provides an interesting phenomenon. As stated earlier, women in Thailand account for approximately half of those in scientific careers (National Science Technology and Innovation Policy Office, 2007), whereas women are a minority in science and technology in most other developed countries (European Commission Directorate-General for Research, 2009). In addition, Western feminist frameworks may not apply well in the context of non-Western countries (Olesen, 1998), and thus it is difficult to make generalisations about issues associated with gender in academic careers from the Western country context to the non-Western one.

1.3 Research question

This study aims at raising awareness and understanding of gender discrimination in terms of career progression in academic sciences, with Thailand as a case study. Specifically, the research questions of this study are as follows:

The first research question is to what extent a gender gap occurs in terms of pays and grade positions in academic careers in Thailand. In order to answer this, one main theme of this research is directed towards investigating whether or not a gender gap exists in Thai academic careers and revealing whether such a gap originates from the results of endowment variables or gender discrimination.

In order to answer the second research question asking what is behind the gender gap in academic career advancement, different endowments, organisational practices and social beliefs are investigated in order to pinpoint the influence of these factors on the status of women academics in Thailand. Then, the third research question asks what strategies women employ in order to respond to the gendered bias in academic careers and organisations.

Finally, with different individual capital and gendered attitude in society and organisations, the question, through the use of such traditional feminist approaches as liberal and radical, is expected to determine whether women belong to the dominant or subordinate group in Thai academic sciences.

As the gender behaviour in academic careers is the product of individual background, organisational context, as well social structure (Ozbilgin & Healy, 2004), this research utilises the multi-layered analysis (Layder, 1993) as a conceptual framework for explaining the process of negotiations between structure and agency, which is an understanding point for the behaviours of women in Thai academic careers. In other words, this framework enables the researcher to identify the gender difference and career achievements in Thai academic sciences.

1.4   Organisation of the study

This thesis consists of eight chapters. In this chapter, Chapter One, the topic, purposes, main research questions and structure of the study are introduced. Key results of this study are likely to contribute to the knowledge relevant to gender issues in academic science careers in the context of Thailand, to which Western concepts may not apply.

The literature review presented in Chapter Two explores the variety of gender approaches in association with the above research questions. These approaches are

pulled together to explain gender difference in the context of academic career advancement. The review of the literature illustrates that academic career advancement is determined not only by endowment factors, but also by societal values and organisational norms. The outcomes of these interactions among multilevel factors can complete the picture of gender phenomena in academic careers in terms of gender gaps, different kinds of individual practice and perceptions of gender equality in academe.

Chapter Three details the role of gendered socialisation towards the women's status in Thailand and the current situation of Thai women in science. This chapter specifically explores the situation of Thai women from cultural perspectives and national agenda. Followed by the characteristics of women's participation in Thai science and technology, the data on women in this field is presented to reflect the current status of women in Thai science academe.

Chapter Four outlines the research methodology upon which this study relies. It discusses the research methods and explains how the data was collected and analysed. The pragmatism paradigm is employed in this study in order to investigate gender difference in Thai academic career advancement because of its ability to examine a range of micro and macro phenomena in which women were supported or constrained in their academic careers. A cross-sectional survey of 420 Thai academic personnel was conducted in order to measure the gender gap in academic careers. Concurrently, the reasons behind the gender difference in academic career advancement were further explored with interviews with 33 academics, coupled with documentation. Multiple regressions analyses, the Oaxaca decomposition (1973) and multinomial logistic model were employed to measure the gender gap in Thai academic science advancement, while thematic analysis was used to analyse narrative data drawn from the interviews.

One of the purposes of this study is to compare career advancement between men and women, staff across two different types of Thai academic organisations: university and research institute in science and technology disciplines in the Thai context. Chapter Five and Six thus analyse the responses of Thai academics by providing details on the research results found in both the university and the research institute sectors. The chapters compare career advancements of female

with those of male academics through quantitative measurements, that is, the gender gaps in pay and grade in order to uncover the gender situation in Thai academic science careers. In order to explore the multilevel variables that may encourage or discourage success in Thai academic sciences, women's and men's career experiences in accordance with their sex, including the perceptions towards the women's status in Thai science academe, are qualitatively analysed and revealed.

Chapter Seven discusses similarities and differences in academic career advancement between Thai men and women in the university and the research institute sectors as reviewed in the two previous chapters in order to understand the patterns of gender disparities in Thai academics in the scientific disciplines. This chapter also addresses research contributions in terms of extending the knowledge about gender and organisation in a non-Western context through the gender analysis in the Thai academic organisation context.

Finally, Chapter Eight highlights key issues in order to provide answers to the research questions. The strength of this research is presented. Some limitations of the study are provided for further gender research in science. This chapter ends with a hope that the findings can offer some recommendations for gender policy as well as future research in order to improve women's status in Thailand.

CHAPTER 2

LITERATURE REVIEW

This chapter presents the conceptual frameworks which shape the analysis of gender difference in academic science careers. Research in a range of areas is reviewed in order to familiarise the researcher with gender theories and relevant studies and to confirm the appropriateness of the initial research questions. A number of studies related to gender difference in academic careers, academic career advancement, and women's experience in sciences were thoroughly searched through the Metalib database and Google Scholar.

The literature review begins with exploring whether or not a gender gap prevails in academic careers. Although previous studies found that such a gap does exist in science, relatively few studies have attempted to investigate whether it results from the outcomes of different endowments or discrimination. To fill the research gap, the current study employs quantitative techniques such as Oaxaca decomposition (1973) and multiple outcome models in order to measure the gender gap in Thai academic careers while further exploring whether this gap is a result of endowment variables or gender discrimination.

In order to discover the reasons behind the gender gap in science career advancement, a range of variables have been examined. The effect of social attitudes towards men and women in career advancement, coupled with possible impacts of endowment variables such as demographic background, were investigated. The literature review suggests that gender traits impact on the type of jobs for men and women differently, and that obstructs women from advancement in the workplace. The literature review also pointed out that individual endowments, created differently between men and women, are partly derived from gendered roles, which makes both genders experience differently in careers. However, a number of studies have focused on a few specific factors with no recognition of the comprehensive range of cultural and individual factors, even though managerial advancement is also influenced by an interaction of such factors (Ozbilgin & Tatli, 2005). To fill this gap, this study deploys the multi-level

analysis (Layder, 1993) as a conceptual framework in order to explore how social and individual levels are associated with women's advancement in Thai academic sciences.

Although the status of women in science seems to be addressed in terms of subordinate roles in academic organisations, relatively few studies mentioned practices of women in response to the female oppression as well as to move upward in the predominantly male scientific careers (Powell, Bagilhole, & Dainty, 2009). This chapter thus reviews the process of negotiations between the structure (social value) and the agency (individual capacity), which results in the behaviours of women in organisations so as to understand the strategies women operate to achieve in careers.

The chapter then discusses the two feminist approaches: liberal and radical ones to assess the status of women in academic sciences in terms of equality in career advancement. The literature reveals that some countries are likely to examine gender equity by drawing on liberal feminism which focuses on the rights of women with respect to the access to opportunity as equally as men do. Liberal feminism tends to urge the countries to search for legal and social rights, which place women in the same position as their male counterparts. However, we need to rely on radical feminism as well to investigate gender discrimination in Thai society because gender bias, deeply rooted in the social structure, is a main reason of women's underrepresentation.

Finally, based on the literature review, the researcher demonstrates the conceptual frameworks as a guide to explore gender disparity in academic sciences.

As far as the researcher is concerned, most studies have conducted gender comparisons with the use of samples from a single, rather than multiple, academic institution, even though the diversity of organisational cultures are worth exploring. In addition, academic careers in less-developed or non-Western countries have been ignored in previous studies as most gender research has been undertaken in industrialised or Western countries. To fill this gap, the current study attempts to examine gender difference in academic careers in Thailand as a case to draw some representation of developing countries in a non-Western context while presenting two types of academic organisation: a higher education and a research

institute so as to compare the similarities and differences in the diversity of organisational patterns.

2.1   Gender gap in academic career advancement

Although gender issues have been high on the national agendas of many countries (Organisation for Economic Co-Operation and Development, 2006), gender discrimination remains unchanged, especially in the workplace where men's careers were found more advanced than women's (Asian-Pacific Resource and Research Centre for Women, 2005). In the case of Thailand, although, in section 30 of the 1997 Constitution of the Kingdom of Thailand, equality is elaborated as: "All persons shall enjoy equal protection under the law. Men and women shall enjoy equal right" (Liamvarangkoon, 2002, p.1), Thai women seem to receive diminished employment opportunities. The statistics revealed that Thai women, as opposed to their male counterparts, are underrepresented in supervisory level. Approximately 75 percent of workers in management levels both in public and private sectors were men while only a quarter were women (National Statistical Office & Office of Women's Affairs and Family Development, 2008).

Even in academic careers, viewed as society with high ethical standards and democratic principles (Bronstein & Farnsworth, 1998), evidence of gender difference in career advancement is identified in both position and pay. For example, only a quarter of the executives in Thai academic institutions were women (National Statistical Office & Office of Women's Affairs and Family Development, 2008), although half of academic staff were women (National Science Technology and Innovation Policy Office, 2007). In addition, Thai female academics earned 15 percent less than men, compared with a national average gender pay gap of 5 percent (National Statistical Office, 2008). As Hakim (2004) argued academic careers are found to have a wider gender gap because white collar occupations are more likely to have a variety of rewards, as opposed to manual ones with more of a tendency of a single wage rate.

There is a current debate on the major cause of gender differentials in academic career advancement. Some advocate that individual trait differences could lead to the difference in progress between men and women in academic careers (Stack,

2004), while others believe that discrimination could greatly impact on gender differentials (Sonnert, 1999). As stated by Long & Fox (1995), the reward allocation in science can be divided into two categories: universalism and particularism. Universalism mentions that the allocation should be based solely on the endowments of a scientist, which can occur in the forms of academic outputs or demographic variables such as educational background or experience. In contrast, particularism relies on gender characteristics for the allocation of rewards and resources. If women receive lower rewards because they produce lower academic publications, this would be a universalistic process. On the other hand, if women receive lower rewards than men even with the equal number of publications, this is a result of particularistic process. If there is no gender difference in rewards for the same qualification, this means that there is no discrimination.

In order to classify the allocation of gender pay differentials whether it originates from the effect of endowment traits or discrimination in terms of numeric measurements, empirical work has applied the Blinder-Oaxaca decomposition approach (1973). In this approach, the wage equations are estimated separately for both groups (i.e. male and female) in order to allow a comparison between the mean differences of the log wage equations. This method decomposes the average log wage differentials in terms of the effect of difference in endowments and that of treatment (i.e. discrimination). Kittisuwan (2003), assessing the gender wage gap after the eruption of the economic crisis in Thailand, has applied the Blinder-Oaxaca decomposition (1973) to the data of a Labour Force Survey conducted by the Thai National Statistics Office and revealed that Thai male workers received a 24 percent higher wage than their female counterparts. The majority of total wage differences between men and women in Thailand were largely due to gender discrimination, accounting for 85 percent of the total wage differentials, while only 15 percent of the income gap generated from the difference in characteristic endowments.

In addition to examining the gender gap in terms of pay, the difference in academic career advancement was also measured by positions in the hierarchy (Connolly & Long, 2011). Connolly & Long (2011), employing multiple outcome models to estimate the probability of belonging to any given grade in academic careers of science and technology within the higher education and the research institute in the

United Kingdom, revealed that there was a different probability of attaining the highest grades between men and women. Female academics were more likely to be in junior posts and less likely to be in senior ones, suggesting that career progress is more difficult for females. Further, there was evidence that the grade gap is much wider at top levels in higher education while women in the research institute face a greater disadvantage at bottom levels, presenting evidence of a glass ceiling in higher education and a sticky floor in research institutes. Given the importance of hierarchical positions in determining the gender gap in academic careers, the current research thus concerns gender grade gap in Thai science academe by employing multiple outcome models so as to assess whether or not the probability of belonging to junior or senior grades varies by gender.

Even though the gender gap in academic sciences can originate from either discrimination or characteristics related to endowment traits, there are relatively few empirical studies dealing with the components of gender gap in terms of numeric measurements (Connolly & Long, 2011). Therefore, in order to fill the research gap in academic sciences and answer the first research question asking whether or not there is a gender difference in academic career advancement as previously stated in Chapter One, the Blinder Oaxaca (1973) decomposition is applied in this study to examine the gender pay gap, along with the analysis of career progress with multiple outcome models to estimate the probability of being in differently ranked positions. One main theme of this research is directed towards investigating the existence of the gender gap in academic careers and identifying whether such a gap originates from endowment variables or discrimination.

2.2   What is behind the gender gap in academe: multi-level analysis

In this section, the multi-level variables (Layder, 1993) related to difference in career advancement between men and women are reviewed as a conceptual framework for understanding the gender phenomena in academic sciences. Structural issues underlying the disadvantaged position of women at macro level are presented. Then, the diversity of individual background is explored in terms of their impact on academic advancement.

2.2.1 Social attitudes towards gender and career advancement

There are some broad theories capturing the differentiation between men and women to explain why women are oppressed and cannot be equal to men in the workplace. Traditionally, the gender difference in labour force generated from a belief that biological differences are criteria to separate women's work from men's. Women are considered physically weaker than men, female bodies and characters in general are thus unsuitable for working as hard as men's (Holmes, 2007). According to Hakim (2004, p. 4), differences in male physiology make men generally "more self-assertive, aggressive, dominant and competitive", and that earns them a higher social status than women.

Typically different traits between genders impact on the difference in the job division of women and men in the workplace. Men are supposed to show their physically strong and competitive character while women are taught to express their soft emotions and orderly character (Hakim, 2004). The division of labour, derived from these traditional characteristics, has made employers prefer men over women and vice versa for a particular kind of work. According to Ashcraft (2006), such gender difference has thus caused unequal rewards in the workplace. Suriyasarn & Resurreccion (2003) stated that the gender segregation in the Thai labour market is explained by men's work which requires physical strength or technical skills, whereas women's work needs the ability to concentrate on domestic skills. Regarding the gender difference, Thai women are often restricted to work in social sciences or humanities while men are likely to get a job in engineering fields, which tend to receive better reward (National Statistical Office, 2009).

As gender is not only shaped by individual physiology but also by the structure of social institutions (Wood, 2006), which perceive the female role as passive instead of active, this also obstructs women from taking leading roles. The impact of social attitudes towards differences between Thai men and women in career advancement was observed by Pongsapich (2007), who revealed that the stereotypical attitudes have been transferred to the Thai organisational culture in which promotion criteria for leadership positions depend on gender rather than ability. Furthermore,

although more Thai women are participating in leadership positions than previously, they are not powerful in comparison to men.

Although the social structure determines the lower status of women both in society and workplace, it is still insufficient for explaining the complexity of the gender segregation in careers where individual endowment is viewed as a key element for advancement in the modern workplace (Corsun & Costen, 2001). Therefore, the next section reviews individual variables as an important component for supporting or restricting women in advancement in academic careers.

2.2.2 Endowment variables and academic career advancement

Research on women in management suggests that endowment variables present a key factor in determining women's success at work (Metz & Tharenou, 2001). Women with appropriate endowments were found to have a greater opportunity to move upward in their workplace because individual endowment determines the skills and resources one can bring to institutions (Kabeer, 1999), and thus define an individual's power in the workplace (Sayce, 2006). In this regard, a variety of endowment variables are investigated in this study in order to understand the power of women in academic career achievements.

However, individual endowments are defined through a mixture of social and cultural values which later determines the pattern of their lives (Layder, 1993). In particular, since men and women are given a different gendered role, differently shaped by traditional values in society to which they belong, the endowments of both genders are created differently (Wood, 2006). Further, individual endowments of women and men contain different forms which either support and limit them both to behave differently in careers (Iellatchitch, Mayrhofer, & Meyer, 2003).

Because of this, a number of studies have demonstrated causes of women's underrepresentation in academic careers by focusing on a range of characteristics such as personal endowments including seniority, educational qualification, subject area, social networks, academic performance and family responsibilities.

Seniority can refer to the amount of time which can increase the degree of power in the cultural capital such as knowledge and experience (Bourdieu, 1986). In

academic sciences, however, while years of experience is a key to career advancement for both women and men (Levin & Stephan, 1998), the effect of seniority on gender discrimination is noticeable. Based on a survey with 556 staff within higher education in the United States, Bronstein & Farnsworth (1998) observed younger female experience of unfair behaviours such as pressure to take on extra activities and exclusion from social events. Among newly appointed faculty members, the feeling of exclusion was a problem often reported by women (33 percent) rather than by men (19 percent).

These results of gender disparity could be explained by a father-daughter model introduced by Reskin (1978), which demonstrates the relationship between senior male scientists and junior female scientists in terms of respect and obedience. A long-term father-daughter relationship can lead to the lower status of women and hinder them from scientific growth and independence. Conversely, Reskin (1978) argued that the relationship between junior male scientists and their senior colleagues or a father-son model is different. That is because young male scientists attempt to attain a status of their own as they are expected to be of the same status as the senior ones. On the other hand, the relationship between senior female scientists and young male scientists, called a mother-son model, are less likely to occur because few women have a high status enough to attract young male scientists.

As for Thai culture, people have been traditionally taught to hold unconditional respect for seniority because their senior colleagues have more experience at work and also a higher status. Therefore, compared with their junior colleagues, the senior have more opportunities in career advancement (Bhanthumnavin, 2003).

However, rather than focusing on seniority, some studies put a greater emphasis on educational qualification towards career advancement. As noted by Leung (2004), highly educated employees have more human capital and this gives them access to better rewards and higher ranks. Based on an examination of personal profiles of 128 managers and interviews with ten senior managers in one of the largest public companies in Thailand, Wailerdsak & Suehiro (2004) indicate that it is difficult for employees with a lower level of education to reach the supervisory level. This

suggests that educational attainment is a key condition to promote individuals for their career advancement.

On one hand, according to Bourdieu (1986), academic qualification can guarantee values with respect to competence and can demonstrate an individual difference in terms of social class. For Thai people, an educational degree is regarded as a privilege. As higher education is considered a prestige in Thai society, people with good education can earn a high-paid job, which is one of the major criteria to determine the social status (Tantiwiramanond, 2007).

According to Payne & Nassa (2002), education can promote women's rights to life choices, especially in developing countries. That is, education can be considered as a key factor in supporting women with power in deciding what they want to do in their life with no restriction imposed by social discrimination and traditional values. That is why Thai women with education opportunities have more power in extending their roles to the wider public. Based on a questionnaire with female civil servants in Thailand, Liamvarangkoon (2002) identified education in terms of the highest degree earned as the most powerful factor for promoting women to the top ranks. Congruently, as observed by Yukongdi (2005), education provides an important resource for Thai woman in career progress.

In addition to the highest degree earned, the possession of a foreign degree affects women's career advancement. Asian countries, in particular, overseas education means a new opportunity and thus contributes to advancement in work society because of a better quality of education and demands for global training. As stated by Park (2007), Korean female scientists holding a foreign degree were likely to increase potential and career advancement. This is because earning a foreign degree is perceived as a guarantee of a learning capacity and a familiarity with various aspects of knowledge in the international arena. A study of 111 female and 118 male biochemists of the Korea Research Foundation's database revealed that a positive effect of foreign degrees earned was more significant for female scientists than their male colleagues in terms of a chance for career advancement ($\beta_{female} = 0.67$ and $\beta_{male} = 0.51$). Similarly, in Thailand, foreign training was found positively related to women's career advancement as females with overseas

training were promoted to top positions in Thai civil service (Liamvarangkoon, (2002).

It is noteworthy that a gender dimension has brought about a subject-based segregation. Much attention has been devoted to why women and men have different experience in subject areas in science. Some advocate that higher education does not rely on the principle of equal opportunity but sets a gender-based quota. For example, Thailand had a quota which specifically set a larger number of male students in some subjects such as marine science, agro-industry and forestry (Yukongdi, 2005). The restricted quota system has discouraged many Thai women from these fields and reinforced the perceptions of gender difference.

Although the quota system was criticised as institutional sexual discrimination and thus abolished by the end of the 1990s (Praparpun, 2009), Thai female students continue to be underrepresented in hard sciences (e.g. engineering) (National Statistical Office & Office of Women's Affairs and Family Development, 2008). The cluster of women in these academic fields suggests that there are other factors than educational opportunity for a subject-based segregation. As Yukongdi (2005) noted, gender stereotypes have influenced decisions about education choice. For example, the female stereotypes have continued to impact women on selecting study fields that are socially viewed as suitable for their nurturing roles; thereby segregating female choices into soft sciences (e.g. chemistry) while turning them away from hard sciences.

A key point for explaining gender discrimination resulting from the subject segregation in science-related field is a pay difference that varies from one subject to another. Thai National Statistical Office (2009), surveying an average wage of employees in each field, found that graduates in hard sciences (e.g. engineering) earn salaries that are 20 percent higher than those of soft sciences (e.g. chemistry). This suggests that subject areas have a great impact on earnings and hence explains gender difference in academic career advancement.

However, human capital theory has been criticised for ignoring the effect of social networks (Becker, 1975). As Metz & Tharenou (2001) noted, while human capital reflects the level of individual ability, social relationship refers to the degree of

unity in membership among social networks. Employment advancement, thus, is not determined solely by educational qualification, other factors such as social relations also influence career advancement.

A review of the related literature indicates that the rewards for individuals in the workplace are strengthened or weakened by the surrounding social networks. According to McDonald & Hite (1999), a network relationship can be positively related to career advancement. Similarly, Bhanthumnavin (2000) also argued that social support has been found to be associated positively with job effectiveness in the Thai public sector. This means that people with a network are likely to experience a greater degree of career success (Timberlake, 2005). In academic sciences, Rothwell (2002) also stated that connections may help researchers gain knowledge with respect to publishing opportunities and provide them with professional advancement, in addition to academic gains. Moreover, researchers who seek networks may receive some professional backup in academic performance more than those who do not. As a result, men and women may enter an organisation with similar levels of individual endowment (e.g. education, skills and experience), but the return on their performance may be different, depending on the surrounding social networks.

Access to networks is not only through formal channels such as exchanges at a meeting, but also through informal networks of organisations. As Reskin (1978) elaborated, scientists use informal modes of communication to obtain practical information that are unavailable in the formal source data. Information on career advancement such as tips about career opportunities (e.g. funding, data sources, and etc.) can also be found in informal networks. In addition, Maneerat, Hale, & Singhal (2005) commented that failure to achieve membership in an informal network prohibits an individual from the organisational society.

Timberlake (2005) found that women are not allowed to join the male social networks because men feel more comfortable with their male fellows because of similar styles and behaviours. Also, Hakim (2004) noticed that male managers were likely to select male applicants because they preferred to work with the fellow males. Accordingly, women were treated as outsiders and excluded from the male social networks. As female exclusion from male-prevalent connections, this

reduces women's access to connection, thereby being denied when asking for co-operation and being often invisible within the organisation (Sonnert, 1995/1996).

Although, women are unlikely to join their male counterparts but they may choose to build their own networks in organisations by incorporating other women into this networks, rather than depending on the male networks. Based on a focus group of 27 female managers of the United States in a range of industries such as hospital, national insurance, manufacturing and defence, McDonald & Hite (1999) found that building relationships, networking and developing connections among females were factors supporting women for success.

In addition, since scientific personnel is primarily responsible for research and development, academic performance have become a key endowment for them, signifying a guarantee for scientific prestige (Long & Fox, 1995). Previous research has identified academic outputs as the most effective measure of academic advancement in terms of research capability. This argument is consistent with the faculty promotion system in Taiwan which has been designed to reward on the basis of faculty research productivity (Tien, 2007).

There is relatively little evidence that the rewards of academic performance are affected by gender. Levin & Stephan (1998) used a longitudinal data set of doctoral scientific staff in order to examine whether or not the rewards of science publications were determined by gender. The regression result demonstrated that, for each additional article published, gender difference did not appear to receive any different reward from publications ($\beta = 0.0098$, p-value < 0.05). This suggests that the rewards of publications do not impact either men or women differently.

However, some research has found the interactions between gender, academic outcomes and family responsibilities. Stack (2004), based on the survey investigation on the effect of gender and children on research productivity among 11,231 academics in sciences and engineering, revealed that productivity was relatively lower for women with young children ($\beta_{\text{female with young children}} = -0.043$, p − values < 0.05). That is, family responsibilities were more likely to impact on women's work than men's. Key resources such as time that women spend on child rearing can reduce the research productivity of female academic staff. As Becker

(1975) pointed out, men and women have different choices in resource investments in the spheres of work and family. Women were more likely to invest their resources more in the family and less in careers, which results in less productivity in academic work.

On the other hand, Fox (2005) found that a family-related variable such as having dependent children had no effect on research productivity. Fox (2005), using a survey with 1,215 academic staff in science, found that the productivity was relatively higher for women with pre-school children (β female academics with pre-school children $= 0.657$, p – values < 0.05). The results suggest that marriage and young children are not associated with diminished publication productivity among women in academic sciences. However, Fox (2005) collected the data derived from women holding tenured positions who have survived the process of selection and evaluation in science so they may have developed skills necessary to manage their limited time.

However, previous studies on careers found that family matters are more likely to interfere with women's careers. Van der Velde et al. (2005) observed that domestic responsibilities may obstruct women's career advancement more than men's. A survey conducted with 178 employees of a Dutch company, revealed that male candidates were more willing to accept overseas assignments than females because they were not expected to hold family responsibilities, which in turn became a barrier to overseas work for women. Lewis & Humbert (2010) explained that women were more likely to face social expectations about family responsibilities, that is, men can focus on their career goals while women often face social expectations about marriage and family care which may present a barrier to their career success. In the Thai context, social attitudes that women should stay home may cause discrimination against women in the workplace, where employers tend to believe that women lack time devotion for their work commitments and are more likely to put their family over work (Yukongdi, 2005).

Family responsibilities have a particularly negative impact on the time devoted to work in science. Blackwell & Glover (2008) admitted that the nature of scientific employment requires the work model of long hours and is considered as non-family-friendly. Time devoted to work is an important factor for scientific

disciplines because scientists need to spend long hours in the laboratory to develop their expertise and ultimately secure a permanent position (Rothwell, 2002). Female scientists with limited time tend to either have a small chance of promotion or finally give up their careers. This view is confirmed by a survey study with 93 female employees in science, engineering and technology in the United Kingdom conducted by Wynarczyk & Renner (2006). The results revealed that 38 percent of female participants reiterated that having dependent children would limit their time, and thus prevent them from furthering their careers.

Therefore, one way to avoid these difficulties balancing between paid work and motherhood is to delay their marriage and become child-free. Wynarczyk & Renner (2006) revealed that women did not wish to start a family as this would prevent them from making career progress. Blackwell & Glover (2008) identified that women staying in the scientific field had children later than other occupations and their rates of motherhood were lower. Only two-fifths in science, engineering and technology were mothers, compared to four-fifths of women in health-related occupations.

In summary, this section has identified a range of personal and demographic variables at individual level including seniority, educational qualification, subject areas, networks and academic performance, and tested the impact of these variables, along with the effect of family responsibilities on career advancement. It is noteworthy that many studies have attempted to investigate the reasons behind gender difference between men and women in career advancement, but most of them have focused on a single level which may be insufficient to fully understand the phenomena of gender difference in academic sciences (Blackwell & Glover, 2008; Fox, 2005).

As the likelihood of career success may not be relevant to the power of individual endowment alone, it also relates to the social structure (Layder, 1993), as stated in the earlier section, so the researcher attempts to contribute to the previous research by revealing the hidden reality on gender issues on the grounds of a multi-level analysis (Layder, 1993), which captures the transitions and interrelationships between personal and social powers. The next section thus aims to address the issues in terms of males and females seeking to gain and maintain power through

organisational practice in academic organisations by providing a link between the individual and the structural levels (Ozbilgin & Tatli, 2005).

2.3 Organisational practice and academic career advancement

Cubillo & Brown (2003) argued that academic organisations are gender-biased, which means that the issues of career progress in academic organisations are affected by the gender identity as men play a dominant role and women take a subordinate one. Drawn on organisational data related to gender and interviews on working experience with 30 academic staff in the higher education sector in the United Kingdom, Guth and Wright (2008) found that top-ranked positions were male-dominant, while women were obstructed from attaining top positions. That is why the institution state gender-neutral has been criticised, by feminism, for accepting masculine characteristics as norms and standards for success (Acker, 2006).

The patterns of organisational behaviour are more likely to favour the characteristics of masculinity in organisations. For example, the top manager is always strong and rational, often defined through the characteristics of masculinity (Reskin & Roos, 1990). Therefore, the masculine model is considered a professional one and applied to the code of practice in organisations (Hakim, 2004). Conversely, women do not generally meet these criteria because women are often criticised, by men, for a lack of skills and thus omitted from professional fields (Somswasdi, 2007). As a result, power lies in the hands of men because the gendered characteristics of men fit in the rules of male-dominant organisations, while bias and discrimination are experienced by female workers.

In sciences, Kamerade (2007, p. 170) stated that gender is a multifaceted problem because the difference does not originate only in gender difference in social beliefs, but also in barriers created by academic organisational practice. Gender discrimination in academe, examined by Bronstein & Farnsworth (1998) with a survey of 556 faculty members of the higher education in the United States, was reported that women were 60 percent more likely than men to experience negative reactions towards their work or potential, such as questioning of their qualification or undervaluing of their accomplishments. In such a case, the dominant group in

the scientific field, often men, seek to create boundaries by setting rules or standards required for success in the game of work.

As argued by Reskin (1978), the gender roles in organisation may affect a job division and also the credit shared between men and women in sciences. Corley & Gaughan (2005) found, based on a survey with 916 female and 853 male respondents in higher education in the United States, that women were less likely to hold tenured positions or full professors (35 percent women versus 59 percent men). The major difference is due to the difference in job responsibilities. Women taught more undergraduate students than their male colleagues, while men were more likely to take advantage of industries and consulting opportunities. Further, as stated by Zuckerman (2001), women in science are less likely to be assigned to jobs that support research and are more likely to stay in less prestigious work that cannot create productivity. The lower productivity of women therefore makes it more difficult for them to obtain the resources for further advancement and thus has reinforced disadvantage and discrimination for women. In other words, these different assignments promoted men to the higher status while preventing women from contributing to more creative outcomes.

In the Thai context, Somswasdi (2007, p. 7) also conveyed that the Thai academic organisation is "hegemonic patriarchy", defined as the sociological and political condition where men have supreme authority within institutions. That is because the employment practice of Thai women in academic organisations has been controlled by male-predominant groups with an unfair advantage for men. In this situation, although women have an opportunity to enter the professional field, their capital may insufficient to make themselves visible in the organisation because the social pressure and organisational structure limits the degree to which the women's capital performs (Bourdieu, 1990).

As a result, individuals with different types of power require different practices in order to continue their careers (Iellatchitch et al., 2003). Women, as outsiders, need to learn how to operate suitable strategies to standout in male dominant organisations (Corsun & Costen, 2001). Strategies operated by women depend on their assessment of the situation and ability to interpret difficult situations in accordance with a particular form of capital they own (Holmes, 2007).

According to Iellatchitch et al. (2003), agents have various practices to survive in the career fields as the process opens up possibilities for individuals to use their own capital in different ways. Firstly, some people with capital that fit in the fields are likely to accept the existing rules, play and control the game, and thus have a higher chance of success. For example, in science, men are likely to be in top positions because the masculine style is widely accepted as an ideal (Long & Fox, 1995). Secondly, some people, in order to be accepted in the field, choose to agree to the rules although their capital does not fit in. That is why some studies argued that in order to survive in male-dominated careers, it is advisable for women to act like a man (Powell et al., 2009). Thirdly, some people without capital that fit in choose to reject the rules and attempt to survive with an alternative strategy. For example, some women in science decide to deploy female leadership style such as care and concerns for other people as a strategy to control their subordinates or avoid conflict in the workplace (Sonnert, 1995/1996).

In summary, this section has illustrated that even when men and women receive the same capital, the status and actions of men and women in organisations may be different as a result of the structural condition. The researcher, therefore, draws primarily on a conceptual framework of multilevel research to overcome the dualities between the structure and the agency as well as macro and micro phenomena (Ozbilgin & Tatli, 2005). According to Iellatchitch et al.(2003), this concept is associated with the individual levels (e.g. education and academic background) and the structural levels (e.g. social beliefs and organisational culture) and thus explains an interaction among multi-level factors which are behind social discrimination in careers.

2.4   Gender ideology in academic careers

As the sociological conditions in society provide men and women with different opportunities, men and women advance differently in careers even with similar qualifications (Reskin & Roos, 1990). In this section, the research reviews a range of feminist approaches, including liberal and radical feminisms, in order to identify the status of women in academic sciences.

Gender ideology in academic sciences, in this study, are measured in terms of the equality of men and women in organisational hierarchies and wage differentials that are in line with the liberal feminist approach. The liberal feminist approach principally focuses on the notion of rights, citizenship and equality (Holmes, 2007). Based on such a concept, it highlights the equal rights of women in terms of the equal access to opportunity as men do. The liberal feminist approach is the principle underlying gender equality in the workplace in many countries because it is derived from gender difference in numerical representations in organisational hierarchies and wage differential measurements. For example, Pongsapich (2007) noted that the dominant strand within Thai feminism has been liberal, whose agenda emphasises equal rights for Thai women in legal, occupational and educational spheres.

However, even equality offers a free opening to everyone in applying for a job, discrimination against women as a minority persists (Praparpun, 2009). Therefore, the liberal feminist approach which aims at eliminating discrimination in employment by ensuring equal terms and conditions of employment for both women and men without acknowledging any difference in their social status is insufficient to conclude that men and women receiving the same rewards are free from gender bias because the equal access does not guarantee gender equality.

While the liberal feminist approach seeks a fair representation in employment without a notion of structural inequality, the radical feminist approach places an emphasis on gender bias in society and institutions as the cause of women's underrepresentation (Beasley, 1999). The radical feminist approach claims that a social belief that males are superior to females, which divides men and women into the dominant group and the subordinate one, is the key factor oppressing women in society (Holmes, 2007). For example, in Thailand, men are regarded as those with a higher social status and supreme authority, while women belong to the lower ranks in society; thereby being expected to support and depend on men (Tantiwiramanond, 2007). This belief reinforces that Thai women should act passively and hinders them from taking leading roles in the workplace. According to Hakim (2004, p. 206), if women regard themselves as a secondary earner, they are unlikely to get the same average earnings as men do. Therefore, if women

perceive themselves as a minority, the gender pay gap is wider, which makes it difficult for women to gain equality at work.

Because gender discrimination is deeply rooted in the social structure and women's mind-set, an examination of gender equity by drawing on the equal opportunity in the organisational hierarchy or rewards is inadequate to identify the status of men and women in academic sciences. Therefore, in order to assess the current status of Thai women in science and technology, this research has relied primarily on both radical and liberal feminist approaches as a framework.

Overall, the literature review provides the frameworks for assessing female status in academic sciences. However, it is noteworthy that different types of institution may cause different patterns of professional behaviours and that relatively few studies have explored gender effects by focusing upon organisational roles (Connolly & Long, 2011). Consequently, this study makes a further contribution in extending the literature on gender discrimination in academic careers by evaluating the impact of different types of academic organisation, specifically by comparing the career profiles of academic personnel employed in the higher education and research institute sectors.

Additionally, previous studies have overlooked academic careers in developing or non-Western countries as most gender research has been conducted in developed or Western counterparts; therefore, Thailand are chosen as a case study. Whereas women are a minority in science and technology in most countries, the share of female professionals in Thailand, while a developing country with less technological advancements, made up a half of the academic workforce (National Science Technology and Innovation Policy Office, 2007). Also, Maneerat et al. (2005) stated that the work – related values in Thai organisations that partly reflect Thai culture may generate a distinctive character from those found in the Western organisational context. Accordingly, Thailand can present an interesting case in this aspect.

In an attempt to explain the gender difference in Thai academic careers, the researcher has developed a number of themes as guides, to be described in the next section.

2.5   Conceptual framework

Careers are a multi-level phenomenon which cuts across individual, organisational and societal levels (Iellatchitch et al., 2003). Societal and organisational cultures create the opportunity for an individual's actions, at the same time, each individual's performance depends upon their own endowment variables. In this study, the researcher attempts to contribute to previous research in several ways in order to introduce an approach that can offer some possibility of revealing the hidden reality on gender issues in Thai academic careers. The researcher employs the conceptual frameworks as shown in Table 2-1 in order to explore the difference in career advancement between men and women in Thai academic sciences.

The review of the literature illustrates that the disparity in male-female earnings can be addressed in terms of individual characteristics and gender discrimination in the social structure. In order to answer the first research question asking whether or not a gender gap in Thai academic career advancement exists, the researcher measures the gender gap in Thai academic careers and further explores whether such a gap originates from the results of endowment variables or gender discrimination. This study proposes the Blinder - Oaxaca Decomposition (1973) and multiple outcome models (Borooah, 2002; Field, 2009; Tarling, 2009) to analyse the gender gap in Thai academic career advancement in terms of pay and position in academic levels.

In order to answer the second research question asking what is behind the gender gap in academic career advancement, the multi-level analysis (Layder, 1993) is employed as conceptual frameworks for exploring what makes the career advancement of men and women different in accordance with their sex. Based on such approaches, the social structure (social norms, organisational cultures and national policies in Thailand) and the different endowment variables (seniority, educational qualification, subject area, networks, academic performance and family responsibilities) are examined with respect to their influence on Thai women's advancement in academic careers.

In order to answer the third research question asking what practices or supports women employ in order to react to the gender bias in Thai academic organisations,

the survival strategies that Thai women operate in academic science careers are revealed. Attention is drawn to the working experience of women in order to understand a range of individual practices in Thai academic organisations, where a gender hierarchy persists.

Finally, based on the liberal and radical feminist approaches (Beasley, 1999; Holmes, 2007), the researcher can answer the fourth research question of whether women belong to the dominant or subordinate group in Thai academic careers, with respect to the individual capital and practice in academic organisations.

Table 2-1 Conceptual framework

Gender difference and academic career advancement: Multi-level analysis (Layder, 1993)		
Research question	Expected results	Conceptual framework
Research question I: Is there a gender gap in terms of pay and grade position in Thai science academic career advancement?	• Gender gap in academic careers in terms of pay and grade • Explores whether such a gap originates from the results of endowment variables or gender discrimination	• The Blinder - Oaxaca Decomposition (1973) • Multiple outcome models (Borooah, 2002; Field, 2009; Tarling, 2009)
Research question II: What is the determinant of the gender gap in Thai science academe?	• Social structure (social norms, organisational cultures and national policy) • Different endowments (seniority, educational qualification, subject area, networks, academic performance and family responsibilities)	• Multi-level analysis (Layder, 1993)
Research question III: What strategies women draw on in response to the gender bias in the Thai science academe?	Strategies that women operate to survive in academic sciences	
Research question IV: What the current status women belong to in Thai science academe?	The status of Thai women in academic sciences	• Liberal feminist approach • Radical feminist approach (Beasley, 1999; Holmes, 2007)

2.6   Conclusion

The literature review explored a variety of gender approaches in association with the research questions, previously stated in Chapter One, including the multi-level analysis (Layder, 1993) and the traditional feminist approaches including liberal and radical feminism (Beasley, 1999; Holmes, 2007). These approaches are drawn together to investigate any gender gap in Thai academic sciences. The literature review presented in this chapter illustrates that academic career advancement is determined, not only by the endowment variables which are gendered, but also by social attitudes towards men and women both in society and academic organisations.

The next chapter reviews the literature on Thai culture and the status of Thai women in order to provide a gender phenomenon in the broader Thai context. National policies and Thai women's development agenda are also discussed. Then, information on the background and the situation of Thai women in the academic sciences is detailed so as to grasp the gender reality in Thai academic careers.

CHAPTER 3

THE STATUS OF WOMEN IN THAILAND

In order to understand what differentiates men's status from that of women in Thai academic sciences, this chapter focuses on a background of Thai society and its traditional values as well as an account of the country's transition to modernity. Both of these factors have played a key role in shaping the way Thai women lead their lives.

This chapter begins with an introduction to the influence of Thai traditional values on the status of Thai women. Next, the researcher examines the transition of Thailand to a modern country, including changes in public policy, a booming educational opportunity and a greater demand for skilled workers in the labour market. These issues are examined with respect to their impact on the situation of Thai women. The opposition between gender socialisation and modernity is highlighted in order to assess the current status of Thai women in the public sphere. Finally, data from the science and technology sector are presented so that we may reflect upon the situation of Thai women in this field. In particular, the secondary data including official statistics and related articles constitute the main source for this part of the research.

The literature review reveals that hierarchy in Thai culture exercises its influence on society to a greater extent than that of modern values which advocate for the female opportunities. Although Thailand seems to gain success in initiating public policy on gender equality, the country failed to raise the impact of social structure and cultural values. Although modernity provides Thai females with better access to the public sphere, discrimination against women continues to prevail, in practice. As a result, the notions of male dominance and gender segregation remain unchanged in both Thai society and Thai science academe.

The issues in this chapter are introduced in order to provide a background or context for the empirical data for the university and research institute sectors as research settings presented in Chapters Five and Six.

3.1 The status of Thai women

Thailand is a country in Southeast Asia with an area of 513,115 km^2 (International Institute for Management Development, 2008). Though generally seen as a tourist destination, the country is grouped economically as one of the newly industrialised countries, with gross domestic product (GDP) per capita of approximately US$ 7,258 in 2010 (World Economic Forum, 2010).

In 2010, the Thai population was 67.39 million and women made up half of that figure (World Economic Forum, 2010). The number of Thai females outnumbered men for the first time since the 1970 census as medical progress has reduced the risks associated with pregnancy and birth delivery (National Statistical Office & Office of Women's Affairs and Family Development, 2008). In terms of employment, Thai employees consisted of 16.3 million and women's share of employment was approximately a half of the total workforce (National Statistical Office, 2008).

This section assesses the position of women in Thailand by providing various social contexts: Thai traditional social values; changes in national policy; the influence of international agenda; educational opportunity; and greater demand for workers in labour market in order to understand their impact on gender socialisation which may influence the status of Thai women.

3.1.1 Traditional values and the status of Thai women

A social hierarchy is embedded in Thai culture where inequality is generally seen as a societal practice (Chompookum & Derr, 2004). Based on the social attitude towards the individual background, Thai people are given to social positions with different ranks and that assigns them an unequal status in society (Maneerat et al., 2005). For example, people with a privileged educational degree barely find difficulties moving upward in the Thai social hierarchy. With a privileged educational degree as a guarantee for competence, those people are accepted to earn a high social status (Tantiwiramanond, 2007). Moreover, people with such careers as medicine and engineering are likely to be admitted to the privileged class in Thai society because such occupations require specific training and thus earn more money (Praparpun, 2009). In addition, the more junior are less likely to

be accepted as leaders due to their less accumulated experience. On the other hand, the more senior, with more experience, are considered candidates for managing positions (Bhanthumnavin, 2003). With respect to gender, even with the same qualifications, men, are considered stronger than women, they take leadership roles whereas women are expected to assume domestic responsibilities. Therefore, women are less advanced in the hierarchy (Suriyasarn & Resurreccion, 2003). In other words, Thai society is of structural and cultural inequality in which individuals are classified into different positions on the grounds of the social attitude towards their individual background.

Thai women were perceived to be inferior to men as a result of the Buddhist practices and traditional social values. Given that majority of the Thai population is Buddhist, the principle of Buddhism is thus a major factor underpinning Thai culture and guides the lives of the majority of Thai people (Elliott & Gray, 2000). The morality of Buddhism tends to favour men over women on the basis of the right to become a monk, which is the best way for Buddhists to gain merit and bring the best rewards to themselves in the next life (Mills, 1999). Buddhist law does not allow women to enter the priesthood, therefore, in order to gain merits, women need to depend on men such as their sons to enter the priesthood (Praparpun, 2009). In other words, males are the only merit generators and females must depend on men in order to receive such merits. Such a religious belief creates an unequal status between men and women.

According to Vichit-Vadakan (1997), the belief that a son can generate special merits for his parents by becoming a monk has resulted in different parental attitudes towards their sons and daughters in Thai context, which in turn creates difference in the treatment of boys and girls within a Thai family. The son tends to be treated with more consideration, since he is expected to accrue the supreme merits to his parents once he is ordained. On the contrary, the daughter is taught to serve her brothers in order to support Buddhist virtues. In other words, Buddhist law has promoted male dominance over women, endorsing the notion of men holding supreme power while women will never be accepted as leaders and must support men unquestioningly.

In addition to the effects of Buddhist principles, social beliefs and customs relating to Thai men and women have reinforced the subordinate status of Thai women. Historically, between the 13th and the 17th centuries, there was an argument about the subordinate status of women in Thailand which claimed that Thai women were primarily considered to be a family asset and that they belonged to their fathers and husbands (Tantiwiramanond & Pandey, 1997). This suggests that Thai women are taught to follow, depend upon, and respect men.

Although there were significant changes in terms of Thai women's rights in Thai society, for example, H.M. King Mongkut (King Rama IV) abolished a husband's right to sell his wife in 1874, women have always been discriminated and considered inferior to men as a product of ancient social customs (Pongsapich, 1997). Female access to the public sphere was denied by Thai society, which structurally excluded them. For example, Thai women established themselves as Members of Parliament the first time in 1949, which was 17 years after they were granted the right to vote and to stand for an election in 1932 (Praparpun, 2009). This suggests that power in decision making in public matters and the authority to deal with the Thai community lie with men.

Thai men today still hold the attitude that a woman's position should be supporting their back and cannot be equal to them in status, while Thai women themselves accept this state of affairs and recognise male superiority (Elliott & Gray, 2000). A daughter thus needs to commit to domestic responsibilities from early childhood in order to prepare for being a wife and supporting her husband, while a son is not required to do any of that (Vichit-Vadakan, 1997). As a result, female work is concentrated mainly on domestic responsibilities: raising her children, serving her husband, and taking care of her parents.

However, the roles of husband and wives have considerably changed in recent times. According to Suriyasarn & Resurreccion (2003), at this point in time, the division of male and female spheres is becoming altered due to economic pressures which have forced both Thai men and women to enter the labour force. Both a husband and wife earn wages for the family which means both of them must leave the house to do outside work. Thus, family and economic responsibilities are more likely to be shared, with the upshot that women now generate income while men

are more involved in household duties such as childcare (Chompookum & Derr, 2004). However, it would be inaccurate to draw a conclusion that Thai men and women enjoy an equal status in the domestic sphere.

Although the role of Thai women has changed from being an asset to their families to that of the independent individual with educational and work opportunities, women are still dictated by society to be domestic workers. Patana (2004) argued that Thai female students are trained at school to be good wives, mothers and workers. The objective of Thai women's education is not to teach them to compete in professional careers, but to produce a perfect housewife who is also a mother, and worker in the contemporary labour market. Accordingly, the Thai curriculum for girls' education has been based on domestic sciences as much as academic subjects.

Thai women are thus born with a double obligation. They are expected to be in charge of family and household duties alongside a career. They have to allocate time to many duties, which often results in less time for their own learning and self-improvement, as compared with men. The average number of hours per day spent on household work was 3.5 hours for Thai women and 1.9 hours for Thai men, while the number of hours per day spent on work and study was 8.1 hours for women and 8.6 hours for men (National Statistical Office & Office of Women's Affairs and Family Development, 2008). More Thai women have become heads of households (an increase from 26.8 percent in 2003 to 31.0 in 2007), which means that they have to take extra responsibilities (National Statistical Office & Office of Women's Affairs and Family Development, 2008).

3.1.2 Women issues in the Thai national development policy

This section aims to describing policies and activities related to Thai women's development. It is noteworthy that most of them may be labeled as liberal feminist because they are likely to involve promoting women to have equality in terms of basic rights with men, rather than asking for moderation in social structural (Holmes, 2007).

Pongsapich (1997) observed that promoting women in Thailand seems to restrict women from fighting against the patriarchy (male dominance) system in society.

During 1920s, although the promotion of women's development stated that women should be better educated, it must be done without allowing women to argue and compete with men. For example, Satriniphon, a feminist magazine with the aim to protest against the unfair treatment towards women, was closed down in 1932 (eight years after the first publication in 1924) due to its political and social conflicts (Pongsapich, 1997). Until the present time, several obstacles to feminist movements still exist. As Somswasdi (2007) put, the fields of women's studies, for instance, were viewed by some academic administrators as problematic and could do harm on social integration. This suggests that, in the Thai context, gender equality has been controversial and mitigating gender bias is thus difficult to happen (Connors, 2007).

As a consequence, Thai policy makers are likely to address the women's opportunity on the grounds of liberal equality with an emphasis on the equal access to opportunity as men do, as well as the equal rights in terms of numeric measurement. A range of national policies related to women development in Thailand thus tends to focus on legal changes with the objectives and outcomes set to improve the female access to the rights as equals to men (Pongsapich, 1997).

Nevertheless, the Thai female population was left out of the national development policy. Tantiwiramanond & Pandey (1997, p. 110) reported that, women's issues were not specifically addressed by the first three National Economic Development Plans (1963-1976). The first two National Economic Development Plans (1963-1971) were largely concerned with increasing the macro-economic growth rate without paying any awareness to women. The third plan (1972-1976) saw women as receivers of programmes related to family planning and population control. Thai women were included in public health development to improve maternal and child care. The only effect of such policies on women was that the female population has outnumbered the male one.

As pointed out by Tantiwiramanond & Pandey (1997), gender issues in Thailand were seriously considered in the national agenda after 14 October 1973, the day when a political demonstration mushroomed into a main democratisation movement in Thailand. At that time, the women's movement dramatically changed while the public was focusing more on democracy. A significant effect of the

movement was a gender equality clause in the 1974 Constitution of Thailand (Yukongdi, 2005), which arrived at the same time of the amendment of Sex Discrimination Act 1975 (SDA) and Equal Pay Act 1970 (EPA) in the United Kingdom (Guth, 2008).

The 1974 Thai Constitution precipitated some significant legislation. Pongsapich (1997) observed, several gender issues have been further addressed by this legislation: the civil-commercial code of 1976 has freed women from requiring their husbands' consent for disposing of their property or travelling abroad; and anti-prostitution laws that impose harsher sentences for owners and managers of sexual enterprises has imposed.

According to Tantiwiramanond & Pandey (1997), the Thai government began to target women as beneficiaries of education, vocational training, and healthcare in the fifth National Economic Development Plan (1982-1986). In addition, a Sub Committee on the Economic and Social Development Board was organised to devise a long-term Thai women's development plan (1982-2001). The content of this plan has addressed gender issues and designed policies in order to develop the welfare of Thai women. This has become the first long-term female development plan in Thailand.

A number of measures were proposed such as extending the opportunities of education and training, and improving the law and its enforcement to improve gender equality in the workplace. The Thai government attempted to provide better benefits for Thai women by introducing legal measures to improve their professional welfare in the seventh National Economic Development Plan (1992-1996). For example, pay discrimination is illegal as Section 26 of the 1997 Thai National Constitution states that whenever the job is of the same type, quality and quantity, the basis of pay including working hours, overtime and holidays, must be equal regardless of the genders of the staff (Liamvarangkoon, 2002). Moreover, a woman who has been employed for 180 days or more is allowed a maternity leave with pay for the whole period of ninety days, extended from sixty days. The employer is responsible for paying her current wage rate for 45 days and the Thai Social Security Office for the remaining 45 days (Yukongdi, 2005). Also, women are protected from types of work considered to be too dangerous for them. For

example, the law specifies the maximum weight that women are allowed to carry and single women under eighteen years of age are not allowed to work in places where liquor is sold (Yukongdi, 2005).

As for women's organisations, the National Commission on Women's Affairs (NCWA) was established in March 1989, with the objectives of providing advice and recommendations to the Prime Minister on the needs for further legislation to promote Thai women's development; of acting as a central coordinating agency between governmental and non-governmental sectors; and developing policies in female-related matters (Office of the National Commission on Women's Affairs, 1995). In addition to this governmental women's organisation, Pongsapich (1997) revealed that women's non-government organisations has been recognised in this period in order to engage in activities for advancing the status of Thai women such as the Foundation for Women (FFW) and the Gender and Development Research Institute.

According to Yingchoncharoen (2007), gender issues were placed on the policy agenda with a proper budget directly allocated to the implementation of the Thai women's development programmes for the first time in the eighth National Economic Development Plan (1997-2001). At this time, the government reviewed and reformulated the former long term Women's Development Plan (1992-2011) in the areas of health, education, employment, public administration, politics and law. At present, according to the National Economic and Social Development Board (2008), the women's development plan is included in the tenth National Economic Development Plan (2007-2011), which is the first time that the national agenda mentions a strategy to tackle negative attitudes to women. This strategy aims to enhance Thai women's participation in political and administrative decisions as well as economic activities.

Although many national policies target Thai women for further development, they have been criticised for ineffective outcomes. For instance, Yukongdi (2005) observed that the Thai laws and policies related to gender equality in the workplace treat women as the weaker or dependent sex, and thus mean that they are paid less or prevented from doing a range of jobs, especially those considered typical male jobs. In addition, Tantiwiramanond & Pandey (1997) contended that cooperation

among women's institutions is not strong enough to upgrade the status of Thai women. Such organisations are constrained by problems such as a lack of staff, budget, and other resources. Non-governmental organisations are also reported to be vulnerable in terms of funding and long-term sustainability.

In other words, instead of introducing a change in social values, policies related to women development in Thailand tend to focus on the equal access to opportunity between men and women (Pongsapich, 1997). Such gender policies tend to focus upon implementation through legal mechanisms with specific outcomes indicating female access to rights as equals to men. This approach helps improve the gender situation in Thailand while reflecting a liberal feminist stance in the national development policy.

3.1.3 The influence of international agenda on Thai women development

In addition to the influence of the national policy, the status of Thai women has changed as a result of the international agenda and is in the same league with other developing countries (Asian-Pacific Resource and Research Centre for Women, 2005). This implicitly pushes Thailand to address gender issues in order to make a transition to modernity.

Tantiwiramanond & Pandey (1997) argued that, previously, women's issues were overlooked in the development process and thus were not integrated in the national plan in most developing countries, including Thailand, because their countries placed economic growth as the core of their national policies. Later, as women have become part of the market system, an initiative to include female issues in the development agenda has been introduced worldwide so that the economy could grow more dynamically. The United Nations (UN) eventually declared 1975 as the International Year of Women.

The declaration of the United Nations Action Plan for the Decade for Women (1975-1985) has led the Thai government to take action for the improved status of women and include female issues in the national policy (Pongsapich, (1997). As a result of the activities generated from the UN agenda, a policy for Thai women's

development thus appeared as part of the national plan for the first time in the fourth National Economic Development Plan (1977-1981) (Pongsapich, 1997).

After that, there seemed to be an increasing coordination between the Thai government and the UN to upgrade the Thai women's status, especially to support women in access to the labour market. For example, according to Suriyasarn & Resurreccion (2003), the Thai Ministry of Labour coordinated with the International Labour Organization (ILO) to conduct a research project in identifying problems and barriers women have in gaining access to vocational training and employment in Thailand. The outcomes of this research have provided policies and practices on promoting women for the access to skill training and enabled them to generate incomes such as adding occupational skills that are considered appropriate to women (i.e., child and elderly care, commercial cooking, and traditional Thai massage) to the existing list of skill training curriculum.

The attention from the international agenda to women's issues also helped promote national data collection related to women's participation in various areas. For example, the United Nations Development Program (UNDP) supports the Thai Ministry of Social Development and Human Security's Office of Women's Affairs and Family Development to launch a Thailand's "Gender-Disaggregated Data and Database Project". The project establishes a database, disaggregated by gender, with useful information in planning and implementing gender policy (Office of Women's Affairs and Family Development, 2008).

This suggests that the international agenda has urged Thai policy makers to seriously consider gender issues in Thailand, and motivated the relevant agencies to take more initiatives in the promotion of gender equality.

3.1.4 Thai women and educational opportunity

According to Tantiwiramanond & Pandey (1997, p. 90), the educational system of Thailand began to change in the mid-19th century due to the British colonial pressure. In 1857, Thailand signed the Bowring Treaty for trade liberalisation in order to preserve its independence. A new monetary and export economy replaced the King's monopoly. Hence, the nation's economy was opened up to the world

market. The economy slowly shifted from subsistence to commercial level, and peasants were transferred to farmer-owners and the ruling class was reformed.

Western influences have helped move education from the temple to the school. Before that, Buddhism dictated public education in Thailand and Buddhist monks served as teachers who educated young men with the basic knowledge needed for economic and political activities (Sittirug, 1997). Since education was solely administered by monasteries and Thai women did not have the privilege of becoming ordained, they were automatically deprived of education. Also Tantiwiramanond (2007) argued that Thai women were typically trained at home by mothers or grandmothers to be good housewives.

Due to the influence of the West, Thailand responded to a growing demand for women's educational opportunities so as to better equip women for their new social roles. Costa (1997) stated that in 1921, during the reign of H.M. King Vajiravudh (1910-1925), primary education in Thailand was declared compulsory for all children, regardless of gender, meaning that since the early 1920s girls have had access to education.

Since the 1960s, the Thai government had developed the education system by establishing new schools nationwide to develop human capital to prepare for the coming modernity. Thousands of primary schools were built in rural areas and most boys and girls completed the mandatory four years of education (Costa, 1997). As a result of the expansion of basic education, literacy rate was high for both women and men. In 2010, literacy rate of Thai women was 92 percent, slightly lower than for men, 96 percent (World Economic Forum, 2010).

With a growing emphasis on educational distribution in Thailand, Ramkhamhaeng University, the first open university was established in Thailand in 1971. Such advances have prepared Thai students for higher education. Unlike the previous public universities, open universities do not require applicants to take an entrance examination while not limiting the age or gender of the applicants either. Later, with the proliferation of open universities, coupled with high investments in college education, women's access and rights to education have been much further improved (Tantiwiramanond & Pandey, 1997). During the 1970s and 1990s, the percentage of Thai men with the university education rose from 0.6 percent to 5.0,

also the percentage of Thai women with educational attainment at university level surged from 0.3 percent to 4.9 (Suriyasarn & Resurreccion, 2003).

Apart from the national agenda, a possible explanation for the high enrolment rate of Thai girls at school may be a change in social attitudes. Becker (1975) pointed to a relatively low return on earnings derived from female education as a reason why parents would be sensible to invest less in their daughter's schooling than in their son's. This is because daughters tend to work for fewer years than sons. Yet, such an argument may not apply to the Thai context. In the Thai family, Costa (1997) was of the view that, the daughters rather than the sons, must take care of domestic affairs and elderly parents, thus education can bring a daughter a good job that pays a regular salary and this money can guarantee a stable economic environment for the parents in their latter years. Additionally, in Southeast Asian communities, Devasahayam (2009) argued that rapid socio-economic changes have forced parents to pay more attention to educating their daughters than in the past. Parents have shifted their values so that they no longer want to confine their daughters in the domestic area. Instead, parents these days want to encourage their daughters to enter higher education.

Also, some researchers argue that Thai women, as opposed to men, participate in higher education because Thai men tend to quit school and enter the job market earlier than women. This phenomenon has kept more girls in school and thus their enrolment rate high. During the Asian financial crisis in 1997, according to Suriyasarn & Resurreccion (2003), this phenomenon became more evident. Since many businesses closed down and the employment rate dropped in Thailand, companies started to hire high-skilled employees and thus men were favoured on the basis of their expertise in specific areas such as engineering and science. Thai women were not offered jobs so readily and remained in school to continue their studies.

For these reasons, over the past two decades, the higher education rate for Thai women has improved. Thai women have achieved the greater rate of educational participation than men have. As recent as 2010, the tertiary gross enrollment was 49 percent for women and 40 percent for men (World Economic Forum, 2010).

3.1.5 Thai women and greater demand for workers in labour market

As Jacobs (1996) put it, the country's development may have helped remove social constraints from women. Changing Thailand into a modern country does not only require a policy for women entering the public sphere and supporting them in the educational access, a greater demand has occurred for women in the labour force as a result of the rapid growth of economy (Devasahayam, 2009). The prosperous economy promoted Thai women to participate in employment as rapid industrialisation tends to be based on labour-intensive production (Suriyasarn & Resurreccion, 2003).

In terms of economic participation, Thai women appeared to gain a high success when compared to their counterparts in other countries. Thailand attained a high rate of female participation in the workforce. Thai females constituted 57 percent of the total labour force, a rate higher than that in other Asian countries such as Japan (41 percent) and Malaysia (33 percent) (International Institute for Management Development, 2008). As for senior positions, the proportion of Thai female legislators, senior officials and managers was 29 percent, representing a higher proportion than that in Japan (10 percent) and Malaysia (23 percent) (International Institute for Management Development, 2008).

Because the rapid transition to modernity in Thailand has led to a great demand for Thai women in the labour market, gender issues were seen as less important as Thai women gained further opportunities in the public sphere (Tantiwiramanond & Pandey, 1997). However, this would not be correct to draw the conclusion that the status of women is better according to such a numeric measurement alone. For example, according to Suriyasarn & Resurreccion (2003), in the manufacturing sector, firms employ female labour because they want to increase profits by paying female workers less. As a consequence, more women (59 percent) are employed than men (41 percent) in the Thai manufacturing sector.

Hence, in order to identify the real status of Thai women in society, it is necessary to understand the effect of modernity in parallel with gender socialisation. In other words, as stated by Yukongdi (2005), Thai female advancement is torn between

the traditional values of hegemonic patriarchy in the social structure and the new values of employment in a modern society.

Thai traditional values still do not allow women to gain equal status to men in the workplace. As Patana (2004) argued, Thai men's role is still seen as that of a decision-maker, while Thai women are expected to be good followers; hence, power and rights have been accrued to men while being used to discriminate against women. For example, women make up a half in the total labour force, but they accounted for only a third of executive posts (International Institute for Management Development, 2008). In addition, although rapid national growth has resulted in Thai women's higher participation in the labour market, a gender wage gap still exists. Even though both Thai men and women, by law, are supposed to be paid at the same rate for the same job, women, by national average, still receive 5 percent less than men (National Statistical Office, 2008).

Thai women are still restricted in terms of job opportunity. For example, Patana (2004) noted that despite the existence of a policy for eliminating discrimination against women in employment, a government regulation states that ministers have the right to consider which position is suitable for each officer on the basis of an individual's physical qualities. Consequently, Thai women are deemed inappropriate in certain sectors; for example, they are not admitted to a prestigious military academy (Tantiwiramanond & Pandey, 1997). As for job applications, discrimination against married women still exists. For example, some job advertisements for such positions as secretary and support services specify that 'single women are preferred' (Yukongdi, 2005). That is why it is relatively difficult for women to get a job if they have young children.

This section has reached the conclusion that while there is support derived from modernisation in the forms of national policy, educational opportunity, and greater worker demand in labour market, Thai women have not been able to stamp out gender discrimination entirely because they have been placed in an inferior position by the cultural customs of Thai society.

3.2 The status of Thai women in academic sciences

This section describes the background of Thai women in academic science by using the data from a range of literature in order to investigate the participation of Thai women in science academe and gender segregation in Thai scientific fields. The evidence indicates that the increased number of Thai women in science, along with gender segregation, has been fairly consistent, and that gender discrimination in Thai science society still exists.

3.2.1 The participation of Thai women in Thai science academe

Although the Thai government has realised that science and technology is a key factor in the country's development, the capacity of Thai science is not at the same pace as many other countries. In 2007, the World Economic Forum (WEF)'s Global Competitiveness Report ranked Thailand's innovation and sophistication competitiveness at 35th out of 125 countries while other Asian nations such as Singapore, Japan, Korea and Malaysia have been ranked 5th, 7th, 24th, and 26th (National Science Technology and Innovation Policy Office, 2007). Concurrently, the 2006 World Competitiveness Yearbook of the International Institute for Management Development ranked Thailand's scientific infrastructure at 49th out of 55 countries and its technological infrastructure 48th. However, the Thai government has implemented a range of policies in order to promote science and technology by reinforcing knowledge in society as a whole and encouraging innovation in support of economic growth.

With respect to gender, although some people assert that such fields as science and technology usually belong to men (Long & Fox, 1995), Thai women's enrolment in science at present has continued to rise and match that of men. As illustrated in Figure 3-1, Thai women are equally represented with men in doctoral degrees in science and technology (National Research Council of Thailand, 2007) and the proportion of females within Thai academic science has been equal to males (National Science Technology and Innovation Policy Office, 2007).

Figure 3-1 Percentage of Thai doctoral graduates and academics in science by gender in 2007
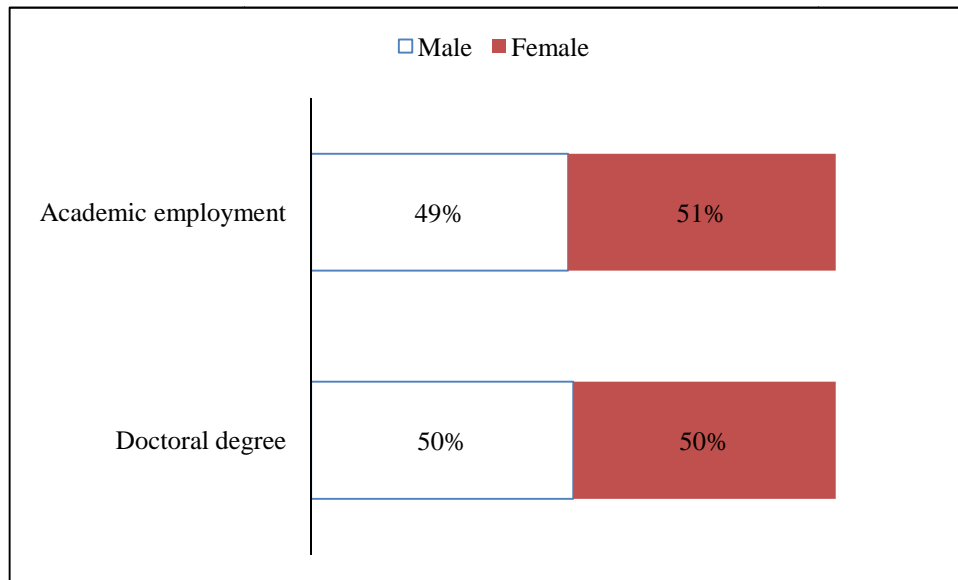
Source: (1) Proportion of Thai academics in science by gender
          Source: National Science Technology and Innovation Policy Office, 2007
          (2) Proportion of Thai scientific doctoral graduates by gender
          Source: National Research Council of Thailand, 2007

There are several reasons why more Thai women enter academic sciences. Firstly, in the effort to upgrade its science and technology, the Thai government places human resource development as the top priority in its science and technology agenda. The Thai government has created a roadmap for science and technology personnel development to assure a sufficient supply for future demand (National Innovation Agency, 2007). The 10th National Economic and Social Development Plan for 2007-2011 aims at increasing the number of science and technology personnel from 5.9 to 10 in every 10,000 of the population (Office of the National Economic and Social Development Board, 2008). Thus, the need for qualified scientific personnel in Thailand has posed a challenge to women's education as well as employment in the field of science and technology in order to be part of productive workforce.

Moreover, as Layder (1993) argued, academic careers are socially constructed as typical jobs for women graduates as the job are, by nature, secured. Such an argument may also explain a relatively high representation of Thai women in academic careers. In terms of social attitudes, Chompookum & Derr (2004) argued

that Thai people are satisfied with careers which offer job security and fringe benefits; hence, parents are willing to encourage their daughters to be workers in the academic sector.

Also, as pointed out by Reskin & Roos (1990), women can obtain certain jobs over men because men themselves may decide not to compete because the rewards are low. This observation supports the assertion that Thai female science graduates have a better chance of engaging in academic jobs such as lecturer and researcher, while Thai men are more likely to seek positions in the private sector due to the better wage offered 13 percent higher (National Statistical Office, 2008, 2009). As for labour demand, Thai private firms have a preference for men than women as a result of gender bias (Suriyasarn & Resurreccion, 2003). In the Thai scientific community, the proportion of men (62 percent) was found to outnumber that of women (38 percent) in the private sector (National Science and Technology Development Agency, 2008) while women (51 percent) slightly outnumbered men (49 percent) in Thai academic sciences (National Science Technology and Innovation Policy Office, 2007).

Thailand, as compared with other countries, thus has a higher proportion of women joining the academic workforce than that found in industrialised countries. Thai female academics constituted 51 percent of the total academic population (National Science Technology and Innovation Policy Office, 2007) and 25 percent of the total number of academic staff in seniority position (National Statistical Office & Office of Women's Affairs and Family Development, 2008). In contrast, the percentage of female academics in Europe was above 37 percent, and the percentage of female seniority staff was under 20 percent (European Commission Directorate-General for Research, 2009).

3.2.2 Gender segregation in Thai science academe

Although there has been a positive change in terms of a growing Thai female share in academe, women often face discouragement, which results in their dropping out of particular science subjects and limiting their opportunities in scientific fields.

3.2.2.1 Gender division in subject segregation

Between the 1940s and the 1990s, Thai women were discriminated in some subject areas by the National Education Policy. According to Praparpun (2009), the Thai government followed an admission quota system by which the number of women in certain areas of study was controlled because it was thought that certain disciplines, by nature, are better suited to men and vice versa. Several areas of study such as agriculture or veterinary science were deemed inappropriate for women but suitable for men only.

In 1995, Chulalongkorn University, a leading university in Thailand, admitted 114 men and 30 women in its veterinary science courses, although the women generally scored higher than the men. The same quota restrictions were employed in other institutions. There were 18 areas of study, especially in science and technology such as fisheries, veterinary sciences, agro-industry, agronomy, forestry, natural resources and physical education, with a quota system in favour of men. Yukongdi (2005) observed that only a few areas had a quota system in favour of women, and these were restricted to low-paid service sectors such as nursing. The restricted quota system discouraged many Thai female students while reinforcing the notion of gender differences.

Although the quota system came under attack for sexual discrimination and was formally abolished by the end of 1990s (Praparpun, 2009), gender segregation is still reflective in some Thai science subjects. This phenomenon is demonstrated in Figure 3-2, which highlights the number of Thai students that were in higher education in 2007. Thai female students dominate in certain subjects such as medical sciences (70 percent), chemistry and pharmacy (65 percent), but are absent from engineering (22 percent) which means that Thai women tend to enter higher education in some, but not all, areas (National Statistical Office & Office of Women's Affairs and Family Development, 2008). As a consequence, Thai women are underrepresented in certain areas of employment as Thai female researchers in engineering constitute only 17 percent (National Research Council of Thailand, 2008). This suggests that subject areas are gender-qualified which leads to gender segregation in Thai scientific employment.

Figure 3-2 Percentages of Thai women in science by subject areas in 2007
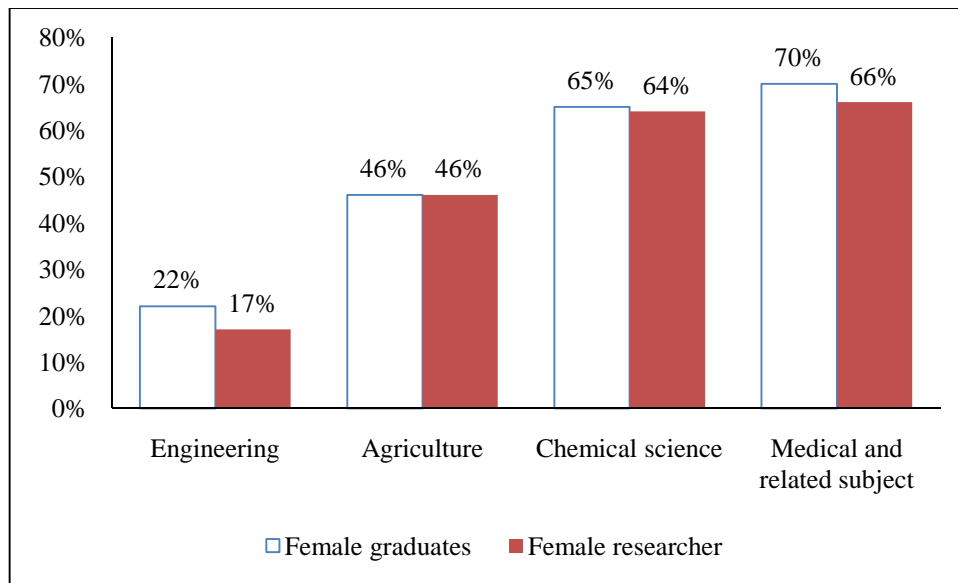
The difference in choice and performance of men and women in Thai science areas
is partly due to social expectations. In Thai society, like many other, women are
socialised to be emotional and nurturing, while men are usually socialised to
inhibit emotions and be powerful (Yukongdi, 2005). Regarding science education,
women's socialisation has emphasised employment in nurturing professions (e.g.
medical science, chemical science, and related subject), whereas men have been
encouraged to excel in engineering. This trend perpetuates the idea of the division
of labour that is deeply rooted in Thai society.

Traditional gender roles which determine the subjects of education that Thai
women choose to study have a long term effect on women's lives. An example of
the effect is that women earn less money than men do. An academic staff member
working in chemistry earns approximately 20 percent less than one with an
engineering job (National Statistical Office, 2009). This means that female
academics who mostly work in the chemistry field enjoy fewer benefits than men
who mostly work in the engineering field. This suggests that the increasing number
of Thai women entering science and technology does not truly represent women's
empowerment.

3.2.2.2 Gender difference and career advancement in Thai science academe

The barrier to Thai women in science and technology is not only caused by sexual socialisation which favours men, but also by institutional bias in Thai academic organisations which are male-predominant (Somswasdi, 2007). At the establishment of Chulalongkorn University, the first university in Thailand in 1916, a belief that Thai women should mainly focus on domestic work and thus not pursue further studies prevailed in society. As a result, women first registered as students in Chulalongkorn University more than a decade later in 1927 (Costa, 1997). Costa (1997) noted that, at that time, female students were not allowed to have lunch with their male classmates as the Thai social norm prevented women from being close to men.

Even with the introduction of law and mechanisms to prevent discrimination against women, most Thai people are still of the opinion that it is acceptable that men, as opposed to women, are granted or rewarded with better career opportunities. Thai female academics are employed more in the lower and middle levels of the occupational hierarchy while being absent from the top positions. With a half of academic personnel being women, only a quarter of executives in academic institution were female (National Statistical Office & Office of Women's Affairs and Family Development, 2008). Among Thai academic institutions, there is only one female chancellor (Office of Women's Affairs and Family Development, 2007). This finding is consistent with the literature (Sonnert, 1999), which identifies that, although there are a slightly higher number of females than males, most female academics stay between the lower and middle levels. Moreover, though academic careers are expected to be impartial or neutral, they still have the gender pay gap around 15 percent, which was higher than that found in the national average in the Thai labour market, in which such a gap was reported at 5 percent (National Statistical Office, 2008).

Overall, the above discussion has addressed the social contexts that shape Thai academic organisations and hinder Thai women from progressing in academic sciences. The rapid economic growth has produced a pool of qualified science and technology candidates in Thailand. This means better opportunities for Thai women in the areas of science and technology. The liberal approach would state

that Thai women play an increasingly important role in science and technology as they are now allowed to be educated and work on equal terms with men. However, the benefits are not equally distributed among men and women. Although the national statistical data demonstrates that more Thai women have participated in science, it is clear that women are poorly represented in certain scientific areas, less likely to be involved in decision making levels and underpaid. All of which suggests that Thai women are faced with gender bias and difficulties succeeding in science education and employment.

3.3   Conclusion

This chapter has discussed how gender socialisation and modernity have moderated the position of Thai women in society and employment. In recent decades, Thailand has established strong ties with the globalised world that has modernised the country. On the grounds of modernity, Thai society now allows women to leave home for education and employment, Thai women are thus more likely to work outside, achieve a higher educational level and enter the public sphere.

However, the literature indicates that Thai women struggle in both vertical and horizontal hierarchies. This suggests that even with the influence of modernity on some elements of the socio-economic background, the unequal practices, which are integral to Thai culture, cannot be easily changed. The evidence has revealed that Thai women remain affected by gender socialisation, which is a result of tradition value. The influence of male dominance and gender segregation in the workplace is still visible. Discrimination against Thai women continues to prevail at work in various forms e.g. pay gaps and glass ceilings of opportunity. In addition, although women in Thai society have experienced socioeconomic changes that have shifted their roles and status to the public sphere, they have to manage to function well at both work and home. As for academic sciences, it seems that Thai women now have the better access and their status is much improved in comparison to their counterparts of many other countries. Yet, women's prospects are still challenged due to gender discrimination.

As stated by Layder (1993), careers are partly a product of the social structure. The issues addressed in this chapter are thus interpreted in the light of the empirical data in subsequent chapters in order to explore the actions of the social structure which impact on gender equality in Thai academic careers. Based on this review of literature, the researcher has employed a range of quantitative and qualitative approach as the research methods in order to understand the outcomes of an interaction among the multilevel variables so as to complete the picture of gender phenomena in Thai academic careers, as detailed in the next chapter.

CHAPTER 4

METHODOLOGY

This chapter presents the pragmatism paradigm as the research methodology. To elaborate, this study combines a quantitative approach, supplemented by a qualitative one while drawing on the multilevel analysis in order to gather evidence on gender issues in Thai academic sciences. This chapter also details the design of data collection, the process by which the research participants were selected, the administration of the fieldwork and the techniques with which data were analysed.

4.1 Research paradigm

As stated in Chapter Two, multilevel analysis (Layder, 1993) was adopted for the exploration of gender equity in Thai academic sciences. This analysis contributes to an understanding of discrimination in society by focusing on the difference in cultural background, the nature of institutions and human diversity in terms of socioeconomic status because each level of analysis alone is insufficient to explain women's underrepresentation in academics careers. In other words, the multilayered analysis (Layder, 1993) is applied to the research paradigm in order to explore the realities of Thai academic community.

With the pragmatic research paradigm, rather than a single (either quantitative or qualitative) approach, the researcher can better examine the reality of the multilayered phenomena of gender in Thai academic careers. Generally speaking, while a traditional research paradigm, the positivist approach, involves confirmation and falsification yet disregards any points for understanding an individual phenomenon, the qualitative approach has been criticised for not providing an adequate rationale for generalisations in wider contexts (Johnson & Onwuegbuzie, 2004). For this reason, the pragmatic paradigm affords the researcher the opportunity to combine macro and micro phenomena (Onwuegbuzie & Leech, 2004) in order to explore gender difference in Thai academic career advancement. Reinharz (1992) also argued that the aim of feminist research is to capture an understanding of women's lives as widely as possible; thereby often

combining quantitative and qualitative approaches in order to gather information from different perspectives.

4.2   Research approach

As there is no single best method for developing knowledge regarding gender issues (Reinharz, 1992), a range of quantitative and qualitative approaches have been taken in this study. Research on gender discrimination has been largely quantitative if it aims to provide statistical information on the existing structure whereas qualitative studies have gained rich detail of individual experience (Bronstein & Farnsworth, 1998). As the aim of this study is to measure the gender gap in Thai academic careers in terms of quantitative indicators and also reveal the reasons for the gender gap, a combination of approaches may assist the researcher in linking the indicators of gender dimensions to the complexity of individual experience.

4.3   Research design

This section focuses on the research design with a combination of quantitative and qualitative approaches in order to investigate gender difference in Thai academic career advancement. According to Teddlie and Tashakkori (2009), the mixed method design has stressed the use of component designs in which different elements are kept separate. In this study, the quantitative approach is suitable to answer the research question asking whether or not men and women working in Thai academe have different opportunities for career advancement, while the qualitative approach is appropriate to investigate of individual experience related to reasons for the gender gap in Thai academe. In parallel, this can provide rich evidence which may deepen some key understanding for the occurring phenomena (Bazeley, 2004).

Two main types of data were collected: primary data which were gathered via such research tools as questionnaires and interviews; and secondary data from published materials such as national studies, organisational publications and other associated printed matter.

One phase of the study includes conducting a cross-sectional survey of Thai academic personnel in order to measure the gender gap in Thai academic careers and to consider the impact of various factors on Thai academic career advancement. A survey questionnaire is appropriate for this analysis because it is a self-reporting tool that can reveal the participants' behaviour (Neuman, 2006). A qualitative method using semi-structured interviews with some of the participants was also employed so as to further examine the issues related to gender in Thai academic careers. This method supports the researcher in indicating a range of topics as well as revealing how a situation may arise (Reinharz, 1992).

In addition, documentary data on gender in Thailand and the details of statistics or regulations that may impact on the advancement of Thai academic careers were obtained from the Office of National Economic and Social Development Board, Office of Women's Affairs and Family Development, the National Research Council of Thailand, the National Statistical Office, and other relevant agencies. The documentation is appropriate for data collection pertaining to social, economic and political views contained in the official reports of bureaucratic organisations (Neuman, 2006). The data from various sources were then compiled and analysed by the researcher.

4.4   Research method

Drawing on the theoretical approaches previously reviewed in Chapter Two, this section explains how the research project was planned and then carried out in order to explore the professional experience of women and men employed in Thai academe. It also describes the research setting and methods used in the fieldwork. The questionnaire employed, along with interviews and documentation, is presented. Finally, the process of data collection is discussed prior to explaining the data analysis techniques used.

4.4.1 Setting

The current study focuses on the experience of academic personnel in academic organisations in Bangkok, the capital city of Thailand, where 35 percent of 33,185 academic personnel population nationwide are based (National Science Technology and Innovation Policy Office, 2007).

As stated in Chapter Two, the gendered values in society as a whole are not the only ones relevant to this research because the organisation is also a society in itself. In this sense, employees' experience are not only associated with social values in wider contexts, but also with the perceptions of their organisations' practices (Maneerat et al., 2005). This research was thus designed to explore the status of women in scientific careers and to see whether or not differences in organisational practices impact on gender and career advancement. Accordingly, purposive sampling is deemed appropriate for this study because the researcher wants to identify particular types of the case for in-depth investigations in order to gain some further insights into these particularities (Neuman, 2006, p. 222).

Two Thai academic organisations were then selected as research sites, according to the types of organisation: university and research institute. A code was assigned to each organisation: UV meant the university, and RI referred to the research institute. Both organisations were chosen in this study because they can represent the characteristics of the Thai academic organisation in science-related fields. One is a leading research university in agriculture, technology and innovation, while the other is a research institute under the Thai Ministry of Science and Technology, which serves scientific services for national competitiveness. Additionally, the researcher herself works as a policy and planning officer at a research organisation in Bangkok and thus is able to establish good contacts with academic organisations and gain access to the research sites, including the research participants of this study. This subsequently facilitated the survey administration of the current study.

Although both organisations are public by nature and share the same goals of developing science and technology, they are different in their organisational characteristics. For example, UV and RI staff possess different job descriptions, as employment contracts dictate UV staff's commitment to teaching, whereas RI staff are committed to providing scientific research with no teaching duties or supervision of postgraduate students. The different natures of organisations can capture a diversity of organisational cultures, rules, regulations and performance evaluations (House, Rousseau, & Thomas-Hunt, 1995). The details of personal profiles, organisational structure, and the promotion process of both organisations are explained in Chapters Five and Six.

4.4.2 Population and sample

4.4.2.1 Population

As the profiles of academics vary across countries depending on the criteria of each nation, or even the values of the community in which they live (Park, 2007), this research presents the characteristics of Thai academic careers: definition of academic staff, categories of academic levels, and appointments to promotions.

In the present study, 'academic staff' refers to Thai academics in science and technology working at public academic organisations under the Royal Secretariat Office, Thailand. The personnel administration of Thai academic staff is under the supervision of the Office of Civil Service Commission (OCSC), the central personnel agency of the Thai civil service. Only Thai academic staff under the public administration were included in this study because the majority (80 percent) of Thai academic staff involved in technology development are employed by public organisations (National Science Technology and Innovation Policy Office, 2007). Although these public academic organisations are financially supported by the Thai government, they are expected to generate some more income from other sources such as collaborative research and development projects and training activities (Tantiwiramanond, 2007). Like other Thai public organisations, lifetime employment (or no lay-off policy) is promised in both organisations (Wailerdsak & Suehiro, 2004).

In order to analyse the grade levels or positions of academic personnel in the Thai context, we should make clear the meaning of 'grade'. According to Metz and Tharenou (2001), a grade refers to a person's work rank in relation to others in the organisation and also represents the status of a person with respect to his or her employment.

Grades or the positions of Thai academic staff are divided into four categories as shown in Tables 4-1. The levels are defined by the Office of Civil Service Commission (OCSC). In broad terms, points are accumulated based on the levels of knowledge, experience and accountability of job positions. As shown in Tables 4-1, grade 'A' means the top management of an organisation with posts of professor and research director in charge of making decisions and establishing

knowledge or the organisation's plan and goal. Grade 'B' refers to middle managers with positions of associate professor and department director that are more involved in formulating policy or knowledge on their control area and budget management. Grade 'C' is the lowest level of management positions in which knowledge and proficiency in a certain specialised field are required. Grade 'D', without academic or managerial position, means a lecturer and a researcher at the bottom level.

Table 4-1 Career path of Thai academic careers

Grade Level	University (UV)	Research Institute (RI)
A	Professor	Research director
B	Associate professor	Department director
C	Assistant professor	Senior researcher
D	Lecturer (without academic or managerial positions)	Researcher (without academic or managerial positions)

According to Liamvarangkoon (2002), in general, a promotion within Thai civil services means both salary increases and appointments to higher positions. Salary increases and appointments to more senior positions are considered by supervisors on the grounds of age, work performance, performance in competitive or selective examinations, and appropriate behaviours. In 1998, the Thai government reform measures introduced a Result Based Management using Key Performance Indicators (KPIs) as an indicator. The aim of this indicator is to develop rules and regulations assuring fairness for Thai civil servants. This indicator has constituted a performance evaluation system for Thai government workers, which allows for screening out those who are not effective, responsible or conscientious. At the same time, this means an effective reward system, for those who perform well, demonstrating fairness and without bias.

4.4.2.2 Sample

The samples for this study were recruited from Thai academic personnel being employed at a university (UV) and a research institute (RI) whose primary job was scientific research. All participants have a degree and the training required to perform scientific work. This ensures that the participants have successfully

completed their professional training and embarked upon research in science-related fields. As part of the selection criteria for the research participants, they were asked to indicate their work responsibilities (academic research or non–academic research). If they selected a non-related field, they did not meet the criteria of participants and were excluded from the study.

4.4.3 Tools and Materials

To understand the complexity of gender and research career advancement in Thai context, multiple tools and materials including questionnaire, interviews, and documentation were employed.

4.4.3.1 Questionnaire development

The questionnaire has been developed, by the researcher, on the basis of the information obtained from the relevant literature (see Appendix 1.1 for details of survey items and the academic sources from which these items are derived). The questionnaire is composed of seven parts (60 items) (see Appendix 1.2) including career and personal information, work responsibilities, career performance, factors supporting academic careers, and perceptions of work environments related to Thai academic careers.

The questionnaire was administered in a pilot study with 31 Thai academics who were not included in the field research sample. The researcher distributed the Thai version of the questionnaire to a sample of the respondents and designated a date to collect the completed questionnaire. This provided the researcher with a good opportunity to immediately identify any confusion among the respondents in answering the questionnaire and to enquire about suggestions for improvement. At the end of the questionnaire, there was an open section for suggestions in order to further develop the questionnaire for the actual data collection process. In this regard, the researcher reviewed the appropriateness of the questions and decided to rewrite some of the items for the final questionnaire and most of them have become shorter than those included in the pilot study.

Prior to the fieldwork, the content validity of the instrument was tested. According to Saunders, Lewis, & Thornhill (2007), when a new instrument is devised, the problem of validity becomes more serious. Therefore, the content validity is

addressed to assess how well the content material represents the conceptual definition of the construct (Neuman, 2006, p. 193). The Content Validity Index (CVI), calculated on the representativeness of the measure could provide information on the representativeness and clarity of each item (McGartland Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003).

In this process, experts were asked to evaluate the validity of the questionnaire items, judge the quantification of the instrument, and also offer suggestions for improving the measure. The expert panel consists of content experts and lay experts. According to McGartland Rubio et al. (2003), a range of two to twenty experts is suggested to establish the sound number of an expert panel, which depends on the desired level of expertise and knowledge diversity. In this study, Dr Sara Connolly and Professor Mustafa Özbilgin acted as content experts. The number of publications and work experience related to the conceptual frameworks are the criteria for selecting these experts (McGartland Rubio et al., 2003). This also assists in determining whether the measure is well constructed and suitable for testing. The lay expert was Dr Premsuda Saman, a member of the Thai academic personnel, because of her relevance to the professional role. The lay expert can also address issues such as phrasing, identifying any unclear terms and recommending other important issues (Grant & Davis, 1997).

The content validity form (see Appendix 1.3), which includes definitions for the content domains of an instrument allowing the experts to compare each item against its definition, was distributed to all three experts by e-mail in September 2009. The experts were then asked to assess the item's representativeness. All three experts returned the questionnaire and rated the items. The CVI for the items was found 1.0. According to (McGartland Rubio et al. (2003), a CVI of 0.80 is recommended for new measures. Therefore, this means that the items are valid and well suited to the measure, and there is no need for revision.

Then, the questionnaire was translated into Thai and translated back into English in order to ensure and maintain the equivalent meaning of the words or concepts between the source (English) and the target language (Thai) (Maneesriwongul & Dixon, 2004). An English instructor in a Thai academic organisation was asked to conduct a translation process. Then, another English instructor of the same institute

was selected to translate the questionnaire back to English. The original English version was finally compared sentence by sentence to the back-translated one. According to Maneerat et al.,(2005, p. 197), in some instances, some modification of a question was needed in order to match the selected organisations and to ensure that the Thai version was as close to the original English as possible.

4.4.3.2 Semi - structured interviews

Feminist research has discovered that interviews offer researchers an access to people's ideas, thoughts, and memories because interviews provide the researchers an opportunity to collect additional information about experiences which are often inaccessible in a survey (Reinharz, 1992). As a result, semi-structured questions exploring the reason for gender gap in Thai academic career advancement were posed in this study. The researcher used eight semi-structured questions based on the published literature (see Appendix 1.4 for details of questions and the academic sources from which these questions are derived), which requires the research participants to recall their experience in Thai academe and allows them some degree of freedom to raise any issue they wish to discuss within a broad framework of gender and Thai academic careers. All respondents were presented with the same semi-structured questions and an opportunity to talk about any relevant issues. At the same time, the researcher attempted to conduct the data collection phases at the university (UV) as similarly as possible to the research institute (RI) in order to make the information comparable (Fox & Colatrella, 2006).

4.4.3.3 Documents

Apart from primary data, secondary data drawn from both external (e.g. national statistics, previous research and available information) and internal sources (e.g. organisational publications) were collected for the study.

The main resource statistics related to the Thai context used in this research were drawn from the data collected by the National Statistical Office, Thailand (NSO) and core agency responsible for Thailand's statistical activities. However, it is very important to recognise the limitations of the statistics provided by NSO. This agency is not a women-oriented organisation so it does not regularly collect gendered statistics. For this reason, even the most recent gendered statistics

available are still considered out-of-date. This problem was also found in the Tenth National Economic Development Plan (2007-2011), Thailand, which relies on the statistics collected in 2005 as the most updated data. Moreover, the statistics available are presented only in the aspects selected by the Thai government, so such statistics may not cover the overall figures of Thai women in academic careers.

Additionally, it is noteworthy that when the researcher attempted to search the data through the Metalib database or Google Scholar, there was limited research online on gender and career advancement in the Thai context. In order to access the Thai literature on relevant topics, the researcher herself did a literature search at the following three key research agencies in Thailand: Research Library of the National Research Council of Thailand (NRCT); Women and Youth Studies Programme: Thammasat University; and Center of Academic Resources: Chulalongkorn University. These research agencies provide a pool of research reports and theses in the paper (hard copy) version, collected from local universities and research organisations. However, gender research in the Thai context or related secondary data is likely to be published in Thai language. Additionally, most of the research tends to focus on women in semi-skilled or unpaid labour markets, women in the sex industry, and also violence against women in Thai society. This suggests that little is known about the issues of gender in academic careers in the Thai context.

Combining different sources of information, including questionnaire, interviews, and documents, the researcher has gained a better understanding of the current situation in Thai academe.

4.4.4 Data collection

In order to access the participants, the researcher contacted a number of academic organisations. The directors of each organisation were asked for their co-operation in the study through an introductory letter explaining the research project and inviting their participation. The information sheet and consent form were enclosed (see Appendix 1.5 and 1.6 for the information sheet and consent form). When they agreed to cooperate, they were asked to inform their personnel about the study. The

questionnaire with a cover letter describing the study, assuring the confidentiality of all information collected, was mailed to staff via the office mailing box. A reminder was sent after two weeks. After the participants completed the questionnaire, they returned it to the researcher by post in order to guarantee confidentiality.

It should be noted that, previously, the online questionnaire is considered an alternative to collecting survey data in this study. As recommended by Neuman (2006), the online questionnaire is the cheapest and this type of survey is suitable for well educated population as the response rate may be high. However, the gate keeper in both organisations advised the researcher to employ the paper, rather than online, questionnaire. From their experience, the previous research using online-questionnaire via intranet system with academic staff in their organisation did not work well (the response rate was less than 10 percent), while the paper-questionnaire could produce the response rate at 30 percent. The reason why online-questionnaire cannot be applied in this case is that some academic staffs do not regularly check their official e-mails. As the organisations being studied distribute information (e.g. news and other documents) by hard copy, it is unnecessary for their academics to check their official e-mails. In addition, the intranet system is often down and the internal e-mail has a limited storage for e-mails, so academics tend to use public e-mail services such as yahoo, hotmail, or g-mail. As a result, the researcher decided to use the paper-questionnaire to collect data.

A range of methods were used to reach the interview participants. Firstly, the respondents were invited to participate in an interview during the process of questionnaire survey. Lists of the academic personnel who were willing to participate in the interview were compiled and an appointment arranged. Some interviewees suggested other potential informants, and others were contacted through networks of friends and colleagues. It is noteworthy that while the snowball technique with a chain-referral sampling may cause a potential sampling bias (David & Sutton, 2011, p. 232), the technique is efficient in terms of an access to the well-known informants that are difficult to interview such as those in the top management (Bernard, 2000, p. 179) i.e., professor or research director (in the case of the current study).

The participants were provided with written information about the study, which guarantees that their personal information is treated with strict confidentiality. According to Neuman (2006), assurances of anonymity enable the participants to relax and actively share their views.

If permitted by the research participants, interview sessions were audio taped and notes taken. In order to make the participants comfortable, the researcher spent 3-5 minutes in 'small talk' with them before starting an interview. Strict confidentiality was confirmed to the interviewees that they were given code names and their identities were kept anonymous in the report and analysis, and how the findings would be utilised was also explained. The interviews took approximately 30-60 minutes. They were asked to describe their work experience in relation to gender difference in Thai academic careers. Some of the interviewees appeared to dislike talking about personal issues surrounding their careers such as promotion criteria and pay. The participants were not probed further when they appeared to feel uneasy about any of the questions. At the end of each discussion, the researcher summarised the key issues raised and then had them re-checked by the research participants to confirm the accuracy of the data (Creswell & Miller, 2000).

4.4.4.1 Sample size for survey questionnaire

The study was conducted from October 2009 to February 2010 in Bangkok, Thailand with two sectors of Thai academic organisation: university (UV) and research institute (RI). Approximately 2,000 questionnaires with a cover letter describing the research purposes and the confidentiality of the respondents were mailed to their staff via the office mailing box. The number of questionnaires conducted was 531 (response rate = 24 percent). However, some of them included incomplete data and were not suitable for analysis.

Prior to conducting the main data analysis, all variables were screened in order to ensure validity. Major descriptive statistics such as minimum and maximum values, means, and standard deviations were computed in order to explore the range and distribution of the variables. Problems were identified with a wage variable at this stage. The wage variable, one of the key variables for this analysis, was a major concern for some of the participants. 29 cases were dropped when the

reported wage was considered to be suspiciously high or low, or when inconsistency between weekly working hours and earning values occurred.

In terms of data errors, the sample survey used in this research was subject to a variety of errors which may be categorised into two types: inability to obtain information from all academics selected in the sample (missing data); and inability to obtain correct information from respondents (inconsistency data). Data was then checked. Most of the error data were the respondent's incomes and grades causing 82 cases to be dropped. The completed questionnaire sample size was 420 for UV (n=124) and RI (n=296) in total. The research population size of 33,185 academic personnel in Thailand means that an effective sample size for regression analyses is 395 (Yamane, 1967), as below calculated. The total sample size of 420 thus reaches an effective sample size for regression analyses.

Sample size formula

$$S = \frac{N}{1+Ne^2} \qquad = \frac{33,185}{1+(33,185)0.05^2} \qquad = 395$$

S = Sample size required

N = number of population (33,185 Thai academic personnel in scientific area)

e = sampling error (0.05), which means that there is a 5 percent probability that the survey response varies.

Comparing the proportions of samples in each gender with that of the whole population in Table 4-2, we can see a pattern similar to the proportion of the Thai academics nationwide. Women's share of employment in both research sites was 47 percent and the proportion of female respondents was 49 percent, a little lower than the national statistics of Thai female academic personnel (51 percent of the total academics). Statistically, this survey could establish a sound representation of the overall population (Neuman, 2006).

Table 4-2 Proportion of academic personnel in Thailand, those employed on the research sites (UV vs RI), and sample sizes classified by gender

Gender	Academic personnel in Thailand	Academic personnel employed on research sites (UV vs RI)	Sample size
Male	49%	53%	51%
Female	51%	47%	49%

Notes: (1) Total number of academic personnel in Thailand = 33,185
Source: National Science and Technology Development Agency, Thailand
(2) Total number of academic personnel in university (UV) and research institute (RI) = 2,204
Source: Annual report
(3) Total number of sample size = 420
Source: Surveys

4.4.4.2 Sample size for interviews

To further identify the reason for gender difference in Thai academic careers, semi-structured interviews with both male and female participants were employed to facilitate further discussions. The researcher interviewed 33 academics employed at the university (n=14) and at the research institute (n=19). According to Guest, Bunce, & Johnson (2006, p.74), any sample size can be sufficient as long as the participants can provide complete and accurate information about the inquiry domain. However, some relevant studies can provide guidance about sample sizes for the current research (Israel, 1992). Previously, a sample of 30 participants have been studied concerning career development in the Thai organisational context (Maneerat et al., 2005). Further, Morse (2000) indicated that a sample of 30 is sufficient to obtain the data richness required for qualitative analysis when using semi-structured interviews. Therefore, 33 participants are deemed sufficient for interviews.

There were some numerical differences of the data set between the university (UV) and the research institute (RI) samples. However, both the questionnaire and interviews involved similar questions within the two organisations. The data in both settings therefore provided comparable amounts of data.

4.4.5 Data analysis

According to the parallel mixed method approach, the quantitative and qualitative data were separately analysed, and the results from each type of analysis were interpreted after both sets of data analyses were completed (Onwuegbuzie & Leech, 2004, p. 779). Based on the multilevel analysis as the conceptual framework (Layder, 1993), the quantitative analysis focused on measuring the gender gap in Thai academic careers, while the qualitative one emphasised the interplay of multi-level variables (macro-organisation-micro level) that create both opportunities and barriers concerning gender in relation to advancement in Thai academic sciences.

In the first phase, the quantitative approach has been introduced to measure gender gap in Thai academic career advancement. The survey questionnaire data was analysed with the Statistical Package for Social Science (SPSS version 16.0 SPSS Inc. Chicago, IL, USA). Descriptive statistics were used to examine personal data and variables. For the purposes of comparison of the differences in Thai academic career advancement between men and women, the gender pay gap was examined using the Oaxaca (1973) decomposition so as to estimate how much women and men were rewarded differently in case that they were of the same characteristics (as a measure of discrimination). In addition, the analysis on career progression was conducted by employing the multiple outcome models, a multinomial logistic regression, which can estimate the probability of employment in differently ranked grade levels in Thai academic sciences.

In the second phase, the qualitative approach has been developed to further explain the gender dimensions in career advancement in Thai academic sciences. In this study, thematic analyses were employed to derive themes from the interview discussions concerning gender issues in Thai academic careers.

Finally, the results from both quantitative and qualitative analyses were used to consolidate critical interpretations (Onwuegbuzie & Leech, 2004). The process of analysis is presented in the next section.

4.4.5.1 The Quantitative analysis

This section illustrates the research hypotheses in the quantitative phases. Then, the process of data analysis including descriptive statistics, wage regression, Oaxaca (1973) decomposition examining the gender pay gap in Thai academic sciences, and multinomial logistic regression investigating the gender grade gap are detailed.

In the quantitative phase, there is a hypothesis that the endowment variables as stated in Chapter Two, including seniority, education, subject areas, academic performance, networks, and family formation, significantly predict Thai academic career advancement for both men and women as follows (to be tested in more detail in chapters Five and Six):

Hypothesis 1: Academic career advancement in Thai science is related to seniority: workers who are older are more likely to hold higher grade positions and receive better pay.

Hypothesis 2: Educational background contributes to the success in Thai academe: workers with doctoral or overseas qualification are more likely to be in higher positions and receive better pay.

Hypothesis 3: Thai academic career progress may vary within science fields: men are more likely to work in hard sciences while women in soft sciences. We test whether or not the different outcomes reflect different rewards across science disciplines.

Hypothesis 4: Thai academic career progress is enhanced by academic performance: workers with more publications are more likely to have higher positions and income.

Hypothesis 5: Thai academic career advancement may be supported by networks: workers who have actively engaged in networks – formal or informal - are more likely to be in senior positions and better rewarded.

Hypothesis 6: Family formation may be important in explaining the obstacles in Thai academic career advancement: family responsibilities are likely to reduce the probability of workers being employed in senior positions and receive more income.

However, before analysing the statistical data, the normal distributions of variables were tested by the measures of skewness and kurtosis. For any variables, if the absolute value of the skewness index and kurtosis index are greater than the absolute value of 3.29, this means that such variables are of extreme non-normality and therefore inappropriate for the model (Field, 2009).

a.) Descriptive statistics

Descriptive statistics, including percentage, mean, standard deviation, t-test statistic, and one-way ANOVA statistic were used to examine demographic data, measure the gender difference in terms of academic career advancement, and perceptions of gender equality in Thai academic organisations.

b.) Multiple regression

Multiple regression is a statistical technique used in this study to investigate the relationship between the endowment variables (or characteristics) and the Thai academic career advancement in terms of wage. In order to explore the gender differentials, male and female wage regressions were separately estimated using the same specification. By comparing two groups of workers in the same field, such separated models could illustrate the details of which gender can affect occupational opportunity (Xu, 2008).

The male and female wage functions can be elaborated as follows:

Male wage function:

$W_{Male} = F$ (Grade, Seniority, Education, Subject, Publication, Network, Family formation).

Female wage function:

$W_{Female} = F$ (Grade, Seniority, Education, Subject, Publication, Network, Family formation).

W is the natural logarithm of monthly salary [ln(wage)] which is the dependent variable in the wage regression equation. The logarithm of the monthly wage data must be taken in order to transform data (Tabachnick & Fidell, 2007) because the wage distribution is skewed with the median earnings, usually being less than the

mean. The log-normal is typically used in many studies to capture the skewness of the earning distribution (Connolly & Long, 2011; Kittisuwan, 2003).

Grade contained dummy variables which were coded in four values. Workers hired as professor (UV) and research director (RI) were coded = A, workers hired as associate professor (UV) and department director (RI) were coded = B, workers hired as assistant professor (UV) and senior researcher (RI) were coded = C and workers hired as lecturer (UV) and researcher (RI) without academic or managerial positions were coded = D as the reference groups.

Seniority variables included in this study were meant to age and work year.

Age is age in years.

Work year is years in which workers have worked in the organisations.

Education variables included in this study were meant to domestic doctoral degree and overseas doctoral degree.

Domestic doctoral is a dummy variable, holding a domestic doctoral degree was coded = 1 and otherwise was coded = 0.

Overseas doctoral is a dummy variable, having earned a foreign doctoral degree was coded = 1 and otherwise was coded = 0.

Subject is a dummy variable, working in hard subjects (e.g. engineering and physical sciences) was coded = 1; working in soft sciences (e.g. chemistry and pharmacology) was coded = 0.

Publication is the number of publications in the form of printed matter (books, chapters, academic articles, academic reports, etc.). The number of publications in the study means the number of papers published or accepted for publications in the past three years prior to the survey. According to Fox (2005), the specification of data for the three-year period helps provide more valid counts and also reduce the effect of the time lags between research, submission, and publication.

Network variables included in this study were meant to both formal and informal networks.

Formal network is the level of participation in academic activity, never was coded = 1, seldom was coded = 2, sometimes was coded = 3, usually was coded = 4, and always was coded = 5.

Informal network is the level of participation in non-academic activities with colleagues, never was coded = 1, seldom was coded = 2, sometimes was coded = 3, usually was coded = 4, and always was coded = 5.

Family formation variables included in this study were meant to being married with children, being married without children, being single, career break and family care.

Married with children is a dummy variable, being married with children was coded = 1 and otherwise was coded = 0

Married without children is a dummy variable, being married without children was coded = 1 and otherwise was coded = 0

Being single (used as the reference group) was coded = 0

Career break is a dummy variable, having career break was coded = 1 and otherwise was coded = 0, which is defined as a break in the respondents' careers (i.e. maternity or priesthood leave).

Family care is the level of participation in share family care, never was coded = 1, seldom was coded = 2, sometimes was coded = 3, usually was coded = 4, and always was coded = 5.

In order to analyse the regression results, this study has drawn on major statistics: sum of squares (R^2); and unstandardised regression coefficient (B). Sum of square (R^2) is the measure of how much of the variability in the dependent variable is accounted for by the independent variables (Field, 2009). It presents the percentage of variation in the outcome that can be explained by the model. While the unstandardised regression coefficients of the variables are compared across the two models (male versus female wage regression) in order to examine the different effects of such variables on men's function and women's (Oaxaca, 1973; Xu, 2008). Each of the regression coefficients has a t-statistic value. If the t-statistic

associated with a regression coefficient is a significant one-tailed test (less than 0.05 at alpha level), it means the variable makes a significant contribution to the model (Tarling, 2009).

In order to see if the model fits the observed data well, the researcher has assessed the regression by looking for outliers (Field, 2009). As an outlier affects the values of the estimated regression coefficients, it is important to detect outliers in order to minimise the bias of the model. The standardised residuals are a statistical value used to detect outliers on the assumption that if more than 1percent of a sample have an absolute value for standardised residuals that is greater than 2.58, then it can be interpreted that the level of errors within the model is unacceptable. In other words, a standardised value that is lower than 2.58 would not be considered extreme (Tarling, 2009).

According to Field (2009) and Tarling (2009), when a regression is estimated, some underlying assumptions should be met such as the absence of multicollinearity, normality of residuals, homoscedasticity of residuals as well as linearity in order to generalise the model.

In multiple regression, according to Field (2009), if there is a strong correlation between independent variables, the data set may not be reliable for analysis. One way to assess multicollinearity among independent variables is to perform correlations. If a correlation coefficient illustrates a correlation of 0.80 or higher, this may demonstrate multicollinearity (Field, 2009).

In this study, the assumption that normality amongst the residuals is indicated by differences between the model and the observed data, which are most frequently zero or close to zero, is tested by two graphical models: histogram and normal probability plots (Field, 2009). The histogram plots of the residuals should be similar to the normal curve with the same mean and standard deviation as those of the data. Also, if the residuals are normally distributed, all points of a normal probability plot should lie on the normal distribution line.

As stated by Tarling (2009), the homoscedasticity assumption that demonstrates the residuals at each level of the predictor variables, which are of similar variance, and the one of linearity that examines the relationship between independent and

dependent variables as a straight line can be tested by a scatter plot and then examined visually. In this study, if no evidence is found for the violation in these assumptions, the standardised residual should fluctuate around zero for all values of the standardised predicted values.

c.) Oaxaca (1973) decomposition

As argued by Long & Fox (1995), reward allocation in science can be divided into two groups: universalism and particularism. Universalism states that the reward allocation should be based on the endowment variables such as academic outputs or demographic variables. In contrast, particularism involving the gender difference in rewards for the same characteristics suggests that discrimination exists. Therefore, in order to study the components of the gender wage gap and determine whether it is generated by discrimination or difference in endowments, the Blinder-Oaxaca Decomposition (1973) breaks down the sources of earning differentials between males and females into: (a) the difference due to the same characteristics, often referred to as discrimination; and (b) the difference due to endowment disparity.

The Blinder-Oaxaca (1973) decomposition of the gender wage gap is given as follows:

$$\overline{\Delta lnW} = \sum_j (\hat{\beta}_{Mj} - \hat{\beta}_{Fj})\overline{X}_{Fj} + \sum_j \hat{\beta}_{Mj}(\overline{X}_{Mj} - \overline{X}_{Fj}) \qquad (1)$$

where,

$\overline{\Delta lnW}$ = the difference in the mean value of the natural logarithm of the monthly wage for men and women

$\hat{\beta}_{Mj}$ = the estimated coefficients of regressors of male earnings function

$\hat{\beta}_{Fj}$ = the estimated coefficients of regressors of female earnings function

$\overline{X}_{Mj}$ = the means of the regressors of male earnings function

$\overline{X}_{Fj}$ = the means of the regressors of female earnings function

(a) The first term exists due to the difference between a constant and a coefficient which can be used to measure discrimination. In equation (1) suppose that men and women share the same average level of endowments (i.e. a doctoral degree). If the employer values men with a doctoral degree more than they value women with the same qualification ($\hat{\beta}_{Mj} > \hat{\beta}_{Fj}$), this first term is positive. This is a part embedded in individuals' attitudes, calculated on the difference between the coefficients of the male and female wage equations. If a wage gap arises because of differential treatments of men and women, this is typically viewed as evidence of gender discrimination in relation to earnings.

(b) The second term measures any advantage in terms of endowments possessed by male employees. This term will be zero when men and women have the same average characteristics in endowments or $(\overline{X}_{Mj}-\overline{X}_{Fj}) = 0$. This part of the raw wage differentials between men and women occurs because the two groups differ in their endowments or skills. This is evident when the gender earning gap is a result of measurable productivity characteristics of universalism, such as numbers of publication or levels of education.

d.) Multinomial logistic regression

As mentioned above, academic career advancement is also measured by progressing along the ranked grades in organisations. In this study, a multinomial logistic regression model is employed to examine the employment of Thai academic personnel in the ranked positions (grades A, B, C and D) as logistic regression is appropriate for examining the relationships between a categorical dependent variable and explanatory variables and also providing an effective way to measure the estimated probability of belonging to a specific population (e.g. the probability of being employed in grade A) (Peng & Nichols, 2003).

An important feature of the multinomial logistic model is that it estimates *K-1* models, where *K* is the number of levels of the outcome variables (Borooah, 2002). The outcome variables in this study included four levels of grade ranging from 1 = grade A, 2 = grade B, 3= grade C, to 4= grade D. Since there were multiple

categories, the researcher chose grade D to function as a base category for the purposes of comparison. The model was estimated separately by the types of organisation as follows.

The multinomial logistic model: University (UV) function

$Y_{UV} = F$ (Gender, Seniority, Education, Subject, Publication, Network, Family formation).

The multinomial logistic model: Research institute (RI) function

$Y_{RI} = F$ (Gender, Seniority, Education, Subject, Publication, Network, Family formation).

where,

Y=1, workers being employed in grade A as professor (UV) or research director (RI), while 0 represents otherwise.

Y=2, workers being employed in grade B as associate professor (UV) or department director (RI), while 0 represents otherwise.

Y=3, workers being employed in grade C as assistant professor (UV) or senior researcher (RI), while 0 represents otherwise.

Y=4, workers being employed in grade D as lecturer (UV) or researcher (RI) (without academic or managerial positions) used as the reference group.

The independent variables include gender, seniority, education, subject, publication, network, and family formation.

In order to examine the effectiveness of multinomial logistic model, we can assess the model in three ways (1) overall model evaluations; (2) statistical tests of each explanatory variable; and (3) the correct percentage of prediction.

In order to assess the overall fit of the final model, according to Peng & Nichols (2003), -2(Log Likelihood) of the null model including the intercept only and the final model including the specified predictor variables were compared. If there is

any difference in the -2(Log Likelihood) values associated with the models, this suggests that the model is appropriate. If the significance of the chi-square statistics is less than 0.05, then the model is a significant fit of the data. This indicates that at least one explanatory variable is a significant predictor.

In order to examine significant statistical tests of each explanatory variable, the individual coefficients (B) were tested with the use of the Wald statistics. According to Peng & Nichols (2003), if the Wald test associated with a coefficient is a significant one-tailed test (less than 0.05 at alpha level), we would reject the null hypothesis and conclude that the regression coefficient for the predictor has been found significantly different from zero for the outcome variables in relation to the reference group given in the model.

As explained previously, the multinomial logistic model predicts the probability of being employed in grade levels from a set of explanatory variables. Tarling (2009) argued that once the predicted probability of grade is calculated, it should be compared with the actual grade to determine whether or not the predictor of academic grade is associated with the actual data. In other words, if the model has a high value in the correct percentage of prediction, it suggests that the model is effective.

In multinomial logistic regression, like ordinary regression, we have assumed no multicollinearity as it becomes difficult to examine the effects of variables if they are highly correlated (Field, 2009). Therefore, in order to generalise the model, the absence of multicollinearity is assumed as an important condition in the multinomial logistic model.

Considering the quantitative analysis, the results of quantitative phases can describe the causal relationship between the endowment variables and academic career advancement as well as measuring the gender gap in Thai academic careers. However, such results cannot explain how such a causal relationship is generated. As argued by Bronstein and Farnsworth (1998), the quantitative approach finds it difficult to explain the academic principles of fairness and equal opportunity in rich detail about individual experience. Therefore, previous research on women in science has complemented their qualitative work with a quantitative approach

(Sonnert, 1995/1996). The benefit of a qualitative approach is to support the researcher in taking a close look at the inter-relation of all factors in order to gain further insights into the gender difference arising in academic career advancement (Cubillo & Brown, 2003). For this reason, the qualitative approach should be brought to this study. The process of qualitative analysis is presented in the next section so as to make a further contribution to the debates on gender dimensions in Thai academic careers and to uncover the reason why women face such discrimination.

4.4.5.2 The Qualitative analysis

The qualitative analysis focuses on the reason behind the gender gap in Thai academic careers in science and technology disciplines by employing the research questions and the research conceptual frameworks as a principal guide for analysis (Layder, 1998). The researcher interviewed 33 Thai academics employed at the university (n=14) and at the research institute (n=19). The interviews explored their understanding of career advancement, the criteria for promotion, the perceived barriers to and opportunities for career advancement, and their opinions on the gender difference across Thai academic careers. An interview guide, developed in accordance with the research questions concerning the reason behind the gender difference in academic careers, was used as a tool for keeping the conversation flowing (Reinharz, 1992). However, these questions were adjusted to suit each situation during the interviews. The interviews took between 30 and 60 minutes. At the end of each interview, the researcher summarised key issues arising out of the questions and had them checked by the participants to confirm the accuracy of the data (Creswell & Miller, 2000).

Each participant was assigned a specific number (e.g. such as ABXYZ) for the purposes of anonymity. Interview participants were coded in the following way. The first two letters denoted the organisation type: UV as higher education and RI as research institute; X for the number assigned to the individual participants; Y for the sex of participant as M for male and F for female. Z was the grade level at which participants stay, that is, A for participants employed at grade A level; B for participants employed at grade B level; C for participants employed at grade C level; and D for participants employed at grade D level.

The process of data analysis was based on the qualitative principle (Boyatzis, 1998; Braun & Clarke, 2006; Creswell & Miller, 2000; Creswell & Plano Clark, 2007; Layder, 1998; Saldana, 2009). The procedures of the interview data analysis were as follows:

First, all interviews were recorded on a tape recorder and the researcher began transcribing audio-recorded data verbatim (Braun & Clarke, 2006). Second, the researcher translated the interview data from Thai to English and followed with the translation check for accuracy. In order to maintain the format of recording data, the researcher used a template providing text columns in Thai and English versions, coding, and memo writing. This was done on Microsoft Office Excel 2007 programme to organise the data sets into tables. The researcher also assigned each participant a specific number for the purposes of anonymity.

Then, the researcher began analysing the data coding of interview transcriptions. As stated by Creswell & Plano Clark (2007), coding has been described as a systematic process in which specific statements are categorised into meaning clusters that represent the phenomenon of interest. The coding process included the reading through of data and reducing it into one or two phrases. Actually, the researcher undertook an informal analysis of interviews when transcribing. While listening to the tapes, the researcher jotted notes about the meaning of the conversation in that particular instance. According to Saldana (2009), this way of highlighting and writing notes is useful for the researcher to consider the meaning behind the words.

Then, the formal stage of analysis was done when the researcher read interview transcriptions several times, and started to identify emerging issues. As shown in Table 4-3, code words were written in the right hand column of data sheets and the researcher also inserted the page numbers of the interview transcript to make it easy to return to the whole script. The coding in this step had two levels (Layder, 1998). The first level was a pre-coding that came from the participants' words or the researcher's summary of what the participants seemed to be referring to or explaining the specific points. The second level was that codes were revised by re-reading the text segments related to a code to gain more awareness of the content

of what was said and observe the issues with which the participants were
concerned.

Table 4-3 Example of a coding table

Sheet	Text-Thai version	Text-English version	Code 1st level	Code 2nd level	Memo writing
14-HEFA-012	14-HEFA-012 (แล้วทำไมผู้ชายการมีครอบครัวมันไม่มีผลล่ะคะ?)ในขณะที่ผู้หญิงพอแต่งงานปุ๊บสังคมก็จะคาดหวังให้เราอยู่กับบ้านดูแลบ้านดูแลลูกผู้ชายก็ได้อิสระเลย	14-HEFA-012 (Why doesn't a family formulation make a case for men?) If women are married, people expect them to stay home, taking care of the house and children so men have their freedom.	Women need to stay home, while men not.	Family is the first priority for women.	Society values family responsibilities as the woman's job, while not for the man.

The emerging issues were then sorted and grouped. The researcher considered the
meaning behind the words, started to build common themes and ended with a set
of categories for organising the data (Braun & Clarke, 2006). As shown in Table 4-
4, the first and second columns consist of the data themselves – interview
transcripts in Thai and English versions. The third and fourth columns contain sub-
categories and categories which contain key words, phrases, and concepts to
consider the areas of emerging themes. The fifth column lists a set of themes for
organising the data. The sixth column contains the memo writing.

Table 4-4 Example of coding sets

Text-Thai version	Text-English version	Sub-categories	Categories	Theme	Memo writing
14-HEFA-012 (แล้วทำไมผู้ชายการมีครอบครัวมันไม่มีผลล่ะคะ?)ในขณะที่ผู้หญิงพอแต่งงานปุ๊บสังคมก็จะคาดหวังให้เราอยู่กับบ้านดูแลบ้านดูแลลูกผู้ชายก็ได้อิสระเลย	14-HEFA-012 (Why doesn't a family formulation make a case for men?) If women are married, people expect them to stay home, taking care of the house and children so men have their freedom.	Family is the top priority for women	Double burden of work and domestic responsibility	Factors creating a gender gap in Thai science academic career advancement	Society considers family responsibilities as the woman's main job, while it is not so for men.

Finally, the step of drawing a conclusion was brought into the format to make it easy to understand for readers (Braun & Clarke, 2006). The researcher wrote an analytic text of the meaningful data for each theme and provided sufficient data extracts to demonstrate the prevalence of the themes.

4.4.5.3 The integration of quantitative and qualitative findings

In order to consolidate the quantitative and qualitative data, the researcher compared the quantitative results against the issues related to the interview findings. From this step, the researcher built categories and themes by connecting the codes among the range of data sources, as shown in Table 4-5.

Table 4-5 Example of comparing the quantitative and qualitative findings

Themes	Categories	Finding
Factors creating a gender gap in Thai science academic career advancement	Double burden of work and domestic responsibility	QT, QL

Note: QT = Finding found in the quantitative findings
          QL = Finding found in the qualitative findings

In order to compare the different perspectives in terms of the diversity of organisations, the researcher presents the evidence from the research settings: the university (UV) and the research institute (RI). The relevant findings of the two settings have been displayed in the forms of matrix table (Boyatzis, 1998) in order to capture the similarities and differences of gender in Thai academic career advancement. Table 4-6 is an example of comparing the findings of the two settings with reference to the research questions. The researcher has also reviewed the relevant literature in order to investigate the concepts of gender issues that may influence advancement in academic careers. The evidence from the three sorts of data is valuable and necessary to triangulate data for theme identification (Creswell & Miller, 2000).

Table 4-6 Cross-case findings between university (UV) and research institute (RI) from multiple data sources

Themes	Categories	Quantitative finding	Qualitative finding	Compare finding to the literature
Factors creating a gender gap in Thai science academic career advancement	Double burden of work and domestic responsibility	UV	UV, RI	T

Note: UV= Finding found in the university (UV)
RI = Finding found in the research institute (RI)
T = Finding found that is similar to the West, but from a different perspective

Based on the research methodology as stated above, many techniques were used to ensure the validity of the results. In order to achieve confirmation, triangulation strategies were employed in this study to confirm the accuracy of the findings (Creswell & Miller, 2000). The questionnaire, semi-structured interviews, and official documents were utilised for gathering data so as to explore the gender difference in Thai academic career advancement and also to confirm each other's results. In order to achieve transferability, the researcher has attempted to provide the rich descriptions of design, data collection, data analyses, and the findings in order to enhance the readers' understanding of this study. This procedure is stated by Creswell & Miller (2000) as another method for establishing credibility. Finally, this study has been conducted under the supervision of the researcher's supervisors, Dr Sara Connolly and Professor Mustafa Ozbilgin, who are familiar with the study or the phenomena being explored and acted as peer debriefers. That is, they could provide feedback to the researcher or serve as a sounding board for ideas to enhance the research credibility (Creswell & Miller, 2000).

4.5   Ethical issues

This study proposal has been approved by the Faculty of Social Sciences Ethics Research Committee of the University of East Anglia (UEA), United Kingdom. The Norwich Business School, University of East Anglia sent a letter to the directors of each academic organisation, which assisted in obtaining permission to conduct the study in their organisations.

4.6 Conclusion

Drawing on the multi-level analysis (Layder, 1993) as the framework, the current study can link the impact of the social structure, the organisational practices and the individual level to the gender gap in Thai academic sciences. The methodology design is based on the research questions and conceptual framework related to gender and academic career advancement. The pragmatism approach was deployed as a research philosophy because it could provide ample opportunity to examine a range of micro and macro phenomena (Onwuegbuzie & Leech, 2004) by which Thai women are supported or constrained in academic careers.

According to the mixed method design, the quantitative and qualitative data collected from the academic personnel of two academic sectors - university (UV) and research institute (RI) in Bangkok, Thailand - as the research sites were analysed separately, and then drawn together in the interpretative phase. A cross-sectional survey of Thai academic careers was conducted in order to measure the gender gap in Thai academic careers. At the same time, the reason for the gender gap in Thai academic career advancement was further explored by using interviews and documentation.

In the quantitative analysis, descriptive statistics, multiple regressions analyses, the Oaxaca decomposition (1973) and multinomial logistic model were employed to measure the gender gap in Thai academic career advancement. In the qualitative analysis, thematic analysis was used to analyse the narrative data collected from the interviews. The results were then integrated in the interpretative phase of this study (Onwuegbuzie & Leech, 2004). In order to ensure the validity of the results, many techniques were employed including triangulation, peer debriefing, rich description, and member checking (Creswell & Miller, 2000).

The next two chapters, Chapter Five and Chapter Six, present the results from the questionnaire and interviews conducted at the university (UV) and the research institute (RI), with the theoretical frameworks outlined in Chapter Two and Chapter Three in order to answer the research questions. The results from both organisations are then compared in Chapter Seven.

CHAPTER 5

GENDER AND CAREER ADVANCEMENT:

A THAI HIGHER EDUCATION CASE

This chapter is aimed at revealing whether or not a difference in rewards between men and women persists in science-oriented faculties in Thai higher education. The study was conducted between October 2009 and February 2010 at a university, Bangkok Thailand, administering 124 completed questionnaires and undertaking 14 interviews with some of the Thai university staff. A code assigned to the Thai university was UV.

The findings revealed that there is a difference in rewards between genders in academic careers. Such a difference is due to traditional norms towards gender socialisation in Thai society which make male and female academics utilise their individual endowments differently. Even though the unfair advantage of men over women was identified in the Thai higher education, Thai female academics do not perceive the existence of discrimination against women in scientific careers. That is because the liberal feminist stance on gender equality is dominant in Thai higher education.

Four main findings are revealed. Firstly, a gender difference in career advancement does exist in Thai higher education, and such a gap partly originates from gender discrimination. Then, a qualitative analysis was utilised to explore the reasons behind the difference between male and female teaching staff members in science-related faculties. The findings found multilevel variables that constrain the career progress of Thai female faculty staff: Thai traditional norms that prevent female academics from making social connections; women's underrepresentation in engineering which is the top priority subject in Thai science community; Thai gender roles that push female academics to place importance on their family rather than careers; Thai academic organisation norms where men are more appreciated; lack of seniority that makes That female academics less accepted; and assignments that put Thai female academics in less-rewarded job.

Next, the study has gained further insights into the supports and strategies Thai female academics draw on in order to deal with such gender biases. These include acquiring academic qualification; forging a network group with other females; adopting the same working style as their male peers; deploying a compromising relationship in the workplace; relying on organisational rules and regulations; being single and depending on supportive family members.

Finally, the study found that the influence of liberal feminist stance, which measures gender equality on the equal access to career opportunity, leads some Thai female academics in higher education to perceive that they can equally gain the career opportunity in science as equally as men. Though they face gender bias in Thai higher education, they tend to find it trivial or even unnoticed.

5.1   University (UV) setting

In 2008, there were 165 higher education institutions in Thailand (The Office of the Higher Education Commission, 2008). Among them, UV is a leading research university in technology, innovation and agriculture. UV, established as a public university in the early 1940s under the Commission on Higher Education of Thailand, is currently partly subsidised by the government while generating some income through research activities. Because UV has been prepared for a new status as a forcibly privatised - yet public – university, the UV promotion process is likely to be based on the internal management structure, which is approved by the Management Development Committee comprised of board members. This means that UV has become less dependent on the bureaucratic standard criteria (Tantiwiramanond, 2007). It is noteworthy, however, that the long-established bureaucratic culture of the Thai organisation (e.g. seniority) is still deeply rooted in UV management structure, which can be illustrated by the fact that the executives were senior, long time employees, or former students of the university.

The UV main campus is situated in Bangkok, with four subsidiary campuses in other parts of Thailand. However, this research only included samples from academic staff in Bangkok campus, which is well equipped with main research laboratories and facilities. For this reason, the majority of UV academic staff in

this campus carries out science research. Also, the core functions of academic administration are operated in Bangkok.

UV provides education across 14 faculties including science and social sciences. However, the scope of this study was limited to three faculties with the greatest involvement in the provision of science and technology knowledge as well as the management of research projects related to science. This included the faculties of science, engineering, and agriculture.

It should be noted that the statistical information provided by UV was drawn from the 2008 UV annual report because the personnel information related with career promotion in UV is treated with confidentiality. This report included a section illustrating the total number of staff in each faculty, but without any information about gender issues. Accordingly, the researcher needed to access the websites of the faculties in order to explore individual academic staff profiles which included names, positions, genders (classified by Mr. and Ms.), and research performance.

The total number of UV's employees was 2,700. Approximately 700 of them belonged to the faculties relevant to science and technology, of which the employment contracts specify commitment to teaching and administrative duties. 45 percent of teaching staff of these faculties was female, slightly lower than the national level as shown in Figure 5-1. This suggests that the evidence of gender discrimination in terms of 'sticky floor' was not prevalent in Thai higher education. When investigating by faculty, however, the evidence of subject segregation by gender was found in the UV faculties, where women outnumbered men in the faculty of science and men outnumbered women in the faculty of engineering, as shown in Figure 5-2.

Although female academics accounted for nearly half of the UV total academic personnel, women made up for only 37 percent of professors employed in UV (see Figure 5-3), reflecting the evidence of 'glass ceiling'. This suggests that UV seemed to have an organisational culture that 'prefers' men for leadership positions, giving them certain privileges. Especially, at the faculty of engineering, where women was outnumbered by men, there was no female staff at all for professor positions (see Figure 5-4). At the faculty of science, where female

faculty staff made up a third-fifth of total, females had difficulties in reaching the top ranks. Only, in the case of faculty of argiculture, where women accouted for half of faculty staff, the female progression can be observed (58 percent of professor positions held by women).

In order to reveal the phenomenon of gender and caeer advancement in the Thai higher education context, the next section presents a detailed analysis of the data related to gender and career advancement obtained from the questionnaires and interviews conducted with UV academic staff.

Figure 5-1 Academic employment by gender at national level and that found in UV
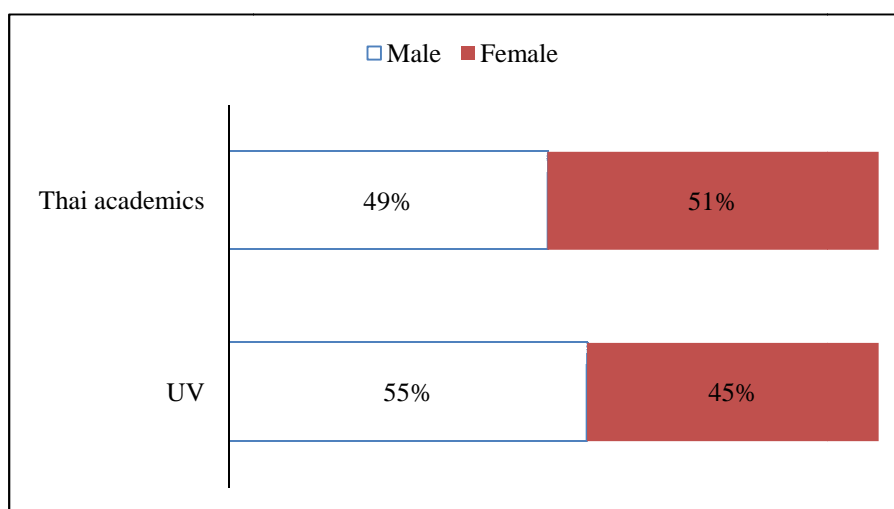
Figure 5-2 Employment proportion by gender in the major science-related faculties in UV in 2008
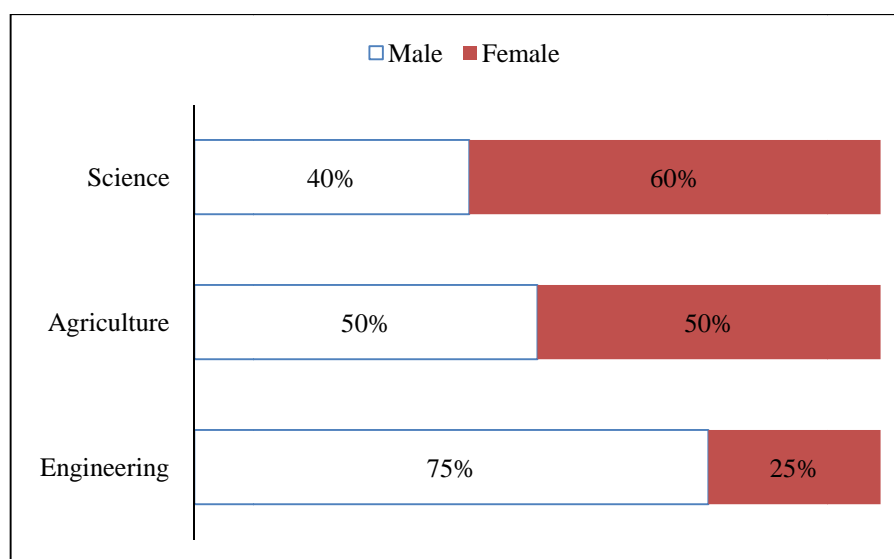
Figure 5-3 Employment by grade in UV in 2008
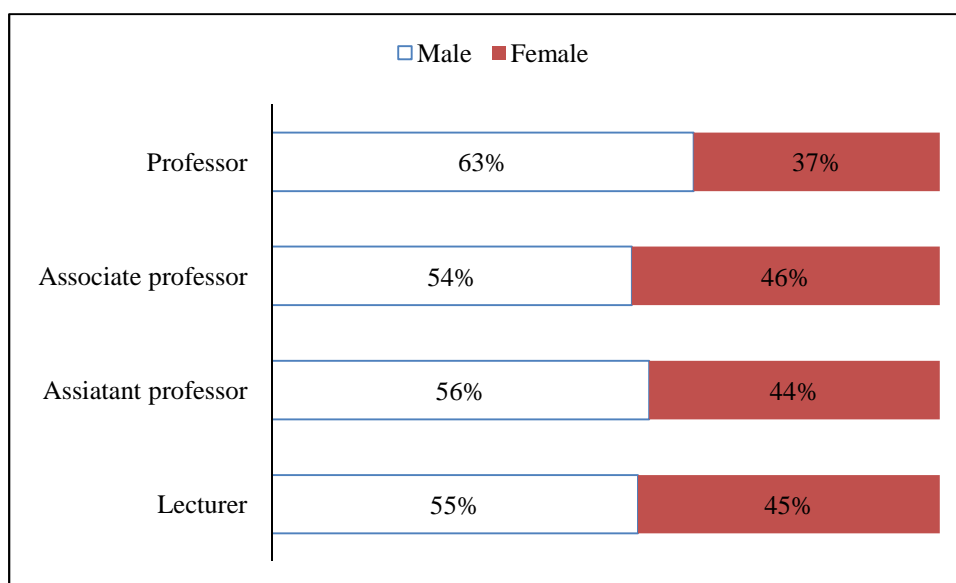
Source: UV staff profiles, 2008

Figure 5-4 Proportion of male and female staff employed in UV in 2008 arranged by faculty and seniority levels
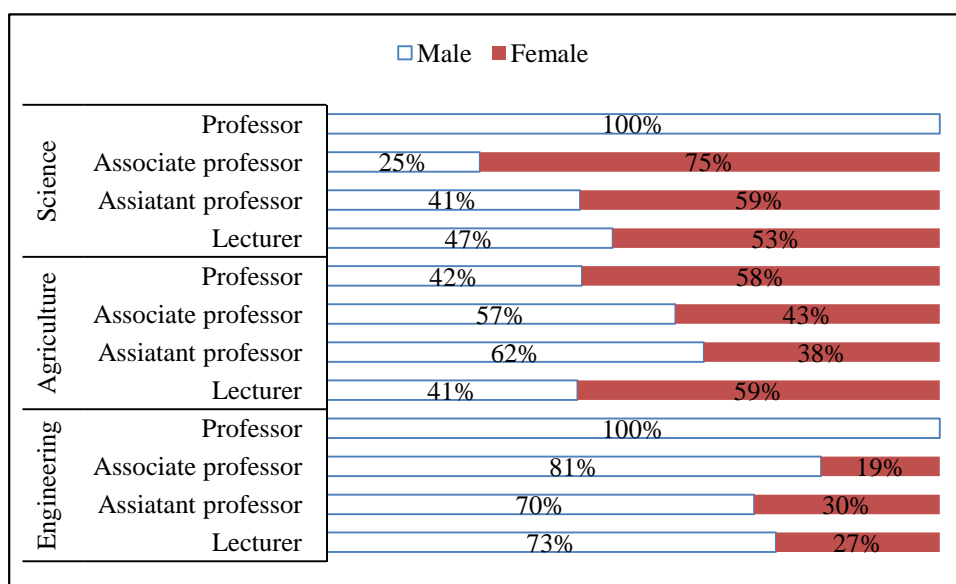
Source: UV staff profiles, 2008

5.2   The quantitative analysis

This section outlines the quantitative results in order to investigate whether or not a gender gap in Thai academic science exists, and also identify whether such a gap is derived from difference in endowment variables or difference in treatment toward men and women, even they have the same qualification. Wage regressions for Thai male and female academics were estimated to measure the decomposition of gender pay gap by the Oaxaca Decomposition (1973), while multinomial logistic regressions were employed in order to measure the gender grade gap, by comparing the probability of employment in each grade position between men and women in Thai higher education. Furthermore, opinions on gender equality within the organisation were solicited. Prior to that, details of the participants' demographic data, the data screening, and a series of hypotheses are presented.

5.2.1 Profiles of the research participants

This section provides a detailed analysis of the participants' demographic data obtained from 124 questionnaires completed by the faculty staff in science-related fields at the Thai university, UV, as shown in Table 5-1.

Generally, female faculty staff at UV were less likely to hold an overseas degree, have a child, and get their research published. This suggests that men have a better chance in terms of overseas education or are less geographically restricted. In addition, UV female academics may delay a marriage and parenthood because marriage and motherhood may have a negative impact on science careers. The data also suggest that there may be some relationship between gender and academic outcomes, when UV female academics may have less academic productivity than men. That may be because women have to deal with document or administrative work more often than men. On average, UV female academics are likely to work in soft science subjects and have actively engaged in academic networking.

Table 5-1 Respondents' socio-demographic characteristics observed at UV

Socio-demographic variables		Male (N=51)	Female (N=73)
Gender		41%	59%
Seniority	Age 55+	47%	53%
	Age 45-54	58%	42%
	Age 35-44	34%	66%
	Age < 35	41%	59%
	Average ages in years	41.7	40.1
	(Standard deviation)	(±10.0)	(±7.9)
	Year in org. 30+	56%	44%
	Year in org. 20-29	30%	70%
	Year in org. 10-19	61%	39%
	Year in org. < 9	42%	58%
	Average years in org.	14.0	11.5
	(Standard deviation)	(±10.5)	(±7.9)
Education degree	Overseas doctoral degree	57%	43%
	Domestic doctoral degree	21%	79%
Subject area	Hard science (e.g. engineering, physics, and mathematics)	46%	54%
	Soft science (e.g. chemistry, pharmacology, and biology)	37%	63%
Academic performance	More than 3 publications	53%	46%
	1 - 3 publications	34%	66%
	No publication	11%	89%
	Average publication	3.8	2.4
	(Standard deviation)	(±3.2)	(±2.0)
Network	Level of participation in formal network (academic activity)	3.1	3.3
	(Standard deviation)	(±0.9)	(±0.8)
	Level of participation in informal network (non-academic activity)	2.8	3.0
	(Standard deviation)	(±0.9)	(±1.0)
Job	%Academic work	66%	65%
	%Management work	21%	16%
	%Document work	13%	19%
Family formation	Married with child	62%	38%
	Married without child	27%	73%
	Single	43%	57%
	Career break	70%	30%
	Level of shared care in family	3.6	3.9
	(Standard deviation)	(±1.0)	(±1.0)

Source: UV survey data, between October 2009 and February 2010

5.2.2 Data screening

In order to ensure the appropriateness of the statistical results obtained from UV samples, checking for normality and the absence of multi-collinearly were required in the multivariate analysis (Field, 2009).

All independent variables included in the models were distributed normally and met the conditions of multivariate normality, except the scale of the number of publications showed a deviation from normality which had the absolute value of the skewness index and the kurtosis index of each variables were higher than the absolute value of 3.29 (Field, 2009), as presented in Appendix 2.1 – Appendix 2.2. This problem was solved by the use of dummy variable. That is because the characteristic of dummy variable is not continuous, thus the normal distribution assumption is not required (Field, 2009). Thus, the researcher adjusted a publication variable into the dummy, coding as three values: over three publications (average publications); one to three publications, and no publication as the reference group (coded = 0).

There were some independent variables with a high degree of correlation (> 0.80) (Field, 2009), including years of age versus years in organisation, and married with child versus a career break, as presented in Appendix 2.3 – Appendix 2.5.

Age was highly correlated with years of work experience as older employees tend to be in their current job for a longer period of time than young ones. As a result, age was shown to be related to how long a person had been in their job. In order to solve this problem, work years were excluded from the analysis on the grounds that seniority in terms of age are more significant in the Thai organisational hierarchy (Bhanthumnavin, 2003), and thus age is likely to be more relevant to career advancement.

Married status was shown to be related to whether a person had taken a career break. Not only Thai married women are likely to have a career break of maternity leave, but Thai married men also are likely to have a career break when becoming a monk, according to a Buddhist norm which suggests Thai men become a monk before marriage (Praparpun, 2009). Both males and females have the same right to take a career break, according to the Thai public organisation's labour regulations,

but they are not likely to take a career break for over three months as they are not paid with full salary. Therefore, the researcher removed the career break variable from the analysis as three months with career break is less likely to be relevant to career advancement.

Overall, the quantitative analysis conducted with UV samples focused on the independent variables; thereby being applicable to the multivariate data analyses: age, domestic doctoral degree, overseas doctoral degree, subject area, publication, formal network, informal network, married without a child, married with a child, and family care.

5.2.3 Gender gap and hypothesis test for factors affecting science career advancement in Thai higher education

Before illustrating the details of how much of the total gap in Thai higher education is derived from women's endowments or discrimination, the gender gap in career advancement of Thai higher education is assessed in order to compare the difference in salary and being employed in grade position between Thai male and female faculty staff at UV, as shown in Table 5-2.

Table 5-2 Gender difference in career advancement in UV

Career advancement	Male	Female
Monthly salary	£ 666 (S.D. = ±329.43)	£ 581 (S.D. = ±238.15)
Gender pay gap 15%		
Gender grade gap		
Professor	70%	30%
Associate professor	53%	47%
Assistant professor	29%	71%
Lecturer	41%	59%

Source: UV survey data between October 2009 and February 2011

A gender pay gap was found in Thai higher education as the pay differential between Thai male and female faculty staff was 15 percent. In addition, the UV data exhibited that men were more dominant in the professor rank than women with the male faculty staff proportion of 70 percent, while female faculty staff dominated the lecturer position (59 percent).

The evidence suggests the existence of gender inequality in the dimensions of career advancement in UV. Base on the literature reviewed in Chapter Two, these differences may vary by individual characteristics. Following this, the directional predictions of each hypothesis are estimated that the endowment variables of Thai academic personnel would significantly predict academic career advancement in terms of wage and grade.

Hypothesis 1: Academic career advancement in science-oriented faculties of Thai higher education is related to seniority: workers who are older are more likely to hold higher grade positions and receive better pay.

Hypothesis 2: Educational background contributes to the success in Thai academe: workers with doctoral or overseas qualification are more likely to be in higher positions and receive better pay.

Hypothesis 3: Thai academic career progress may vary within science fields: men are more likely to work in hard sciences while women in soft sciences. We test whether or not the different outcomes reflect different rewards across science disciplines.

Hypothesis 4: Thai academic career progress is enhanced by academic performance: workers with more publications are more likely to have higher positions and income.

Hypothesis 5: Thai academic career advancement may be supported by networks: workers who have actively engaged in networks – formal or informal - are more likely to be in senior positions and better rewarded.

Hypothesis 6: Family formation may be important in explaining the obstacles in Thai academic career advancement: family responsibilities are likely to reduce the

probability of workers being employed in senior positions and receive more income.

5.2.4 Estimating decomposition of gender wage differences in Thai higher education

In order to examine the hypotheses and illustrate the details of how much of the total pay gap in Thai higher education is derived from women's endowments or discrimination through the Blinder-Oaxaca Decomposition (Oaxaca, 1973), the UV wage functions need to be estimated by multiple regressions, as presented in Table 5-3. The evidence presented that in order to receive better pay, UV female workers need to earn an overseas doctoral degree, be in higher grade positions, or have a lower share in family care. While for UV male academic workers, they were more likely to have higher income if they hold higher grade positions. The result conforms to the hypothesis test that educational background can contributes to the success in Thai academe, being higher paid is related to grade position, and family duties are an obstacle in career advancement in science.

The suitability for wage regressions was supported by various indices including the outlier investigation, the assumption of normality of residuals, homoscedasticity, and linearity. As presented in Appendix 2.6 – Appendix 2.7, the outliers were examined and there was less than one percent of each sample that had standardised residuals with an absolute value above 2.58 (0.0 percent of UV female samples and 1.0 percent of UV male samples). Thus the wage models were appropriate for representing the actual data (Tarling, 2009). In addition, underlying assumptions including normality of residuals, homoscedasticity, and linearity were accepted (Field, 2009; Tarling, 2009). The histogram and normal probability both in male and female UV samples are shown in Appendix 2.8 – 2.9. The histogram plots of the residuals were similar to the normal curve with the same mean and standard deviation of the data. Furthermore, most points of the normal probability plot lay on the normal distribution line. Therefore, the residuals were normally distributed. In addition, the graph of the standardised residuals versus the predicted values indicated that all points dispersed randomly throughout the graph and that the assumption of homoscedasticity and linearity were satisfied.

Table 5-3 Wage regressions by gender in UV

Independent variables		Female		Male	
		B_F	Sig.	B_M	Sig.
Constant		6.72	0.00	5.83	0.00
Seniority	Age	0.01	0.36	0.02	0.26
Educational degree	Overseas doctoral degree	**0.34**	**0.00**	0.08	0.06
	Domestic doctoral degree	0.07	0.14	0.03	0.35
Subject area	Hard sciences	- 0.09	0.07	0.02	0.28
Academic performance	More than 3 publications	- 0.03	0.36	0.04	0.40
	1-3 publications	- 0.08	0.20	0.02	0.44
Network	Level of participation in formal network	- 0.06	0.04	0.02	0.24
	Level of participation in informal network	- 0.02	0.25	0.01	0.27
Family formation	Married with child	- 0.06	0.24	0.10	0.03
	Married without child	- 0.04	0.27	- 0.01	0.40
	Level of shared care in family	- **0.06**	**0.02**	0.01	0.44
Grade	Grade A: Professor	**0.70**	**0.00**	**0.96**	**0.00**
	Grade B: Associate professor	**0.51**	**0.00**	**0.45**	**0.00**
	Grade C: Assistant professor	**0.28**	**0.00**	**0.28**	**0.00**
Adjusted R Square			0.69		0.90

Note: 1. Dependent Variable: ln (Wage)
   2. Statistically significant of 5 percent level (one-tailed test) indicated by bold

Considering the wage regression by gender in this case, p-value < 0.05 significance level (one-tailed test) was applied to determine the individual significance of the coefficients in the wage equations. The female UV wage regression indicated an adjusted R square = 0.69. The factors positively influencing female wages in UV were an overseas doctoral degree earned and grade position, while the level of share in family care had a significantly negative influence on UV female wages. However, at the 95 percent level of confidence, no significant difference was found within the wages of UV female workers, regardless of age, domestic doctoral degree, subject, number of publication, participation in both formal and informal networks, or family formation.

The male UV wage regression revealed an adjusted R square = 0.90. The regression result suggests that the grade positions were significantly positive in relevance to male wages in UV. However, at the 95 percent level of confidence, no significant relationship was found within the wages of UV male workers, regardless of age, educational degree, subject, number of publication, participation in both formal and informal networks, or family responsibility.

The Blinder-Oaxaca Decomposition of gender wage differences, as presented in Figure 5-5, illustrated the details of how much of the total pay gap is derived from women's endowments or discrimination. This was calculated by utilising the information from the UV wage functions in Table 5-3 and only concerned the independent variables that had a significant effect on UV wage regressions.

Figure 5-5 Decomposition of gender pay gap in UV
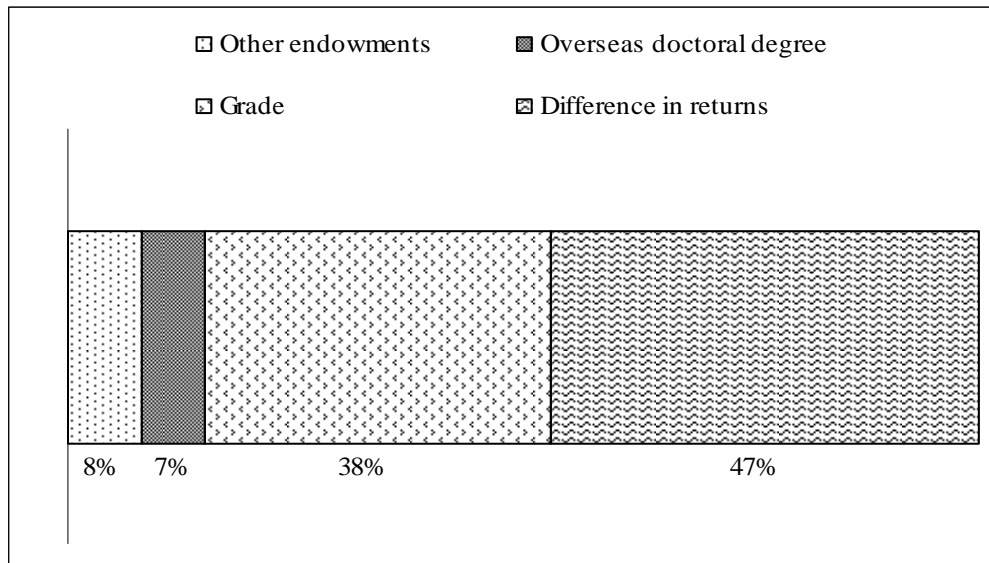
The results revealed that difference in characteristics accounted for 53 percent of the overall pay gap between male and female academic staff in UV; 38 percent of which came from male academics who were generally employed at a higher grade; and 7 percent of which was from male academics who graduated overseas. In turn, the other half (47 percent) of the gender pay gap originated from different treatments of the same qualities, presenting evidence of gender discrimination; the majority of which were derived from an imbalanced concern for domestic responsibilities between male and female academics. The evidence was identified by a positive sign of the difference of the coefficient within the family care variable in the UV male and female wage function, as illustrated in Table 5-3 ($B_{\text{Male with family care}} = 0.01$ and $B_{\text{Female with family care}} = -0.06$).

The difference of the coefficients within the same variables across male and female wage regressions can indicate the existence of a wage advantage for Thai male academics. For this reason, Thai male and female academics experienced a different effect from family responsibilities even though they shared a similar level of family care. The result is consistent with Becker's (1975) theory that the gender wage differential partly arises from the fact that women focus more on responsibilities at home than men do. Women might choose to leave their careers when they have children, subsequently losing their focus on work. Although

'leaving the careers' is not exactly the case for the present time, it is yet visible that Thai women place family roles or responsibilities as top priority.

To sum up, a gender pay gap was found in Thai higher education as the pay differential between Thai male and female faculty staff employed in UV was 15 percent. Nearly a half of such a pay difference stems from an imbalanced return for domestic responsibilities between men and women and therefore is evidence of discrimination.

5.2.5 Estimating the gender grade gap in Thai higher education

In this study, the multinomial logistic regression was applied to UV samples in order to test the hypothesis that endowment variables would significantly predict career advancement in Thai higher education in terms of grade position, as presented in Table 5-4. In general, it is worth noting that workers who are older or with more publications are likely to hold higher grade positions in Thai higher education, which confirmed the hypothesis assumption that academic career advancement in science-oriented faculties of Thai higher education is related to seniority and enhanced by academic performance. This is also related to UV staff profile as UV has based the promotion criteria on age of the employees and staff's capabilities. Noticeably, the level of shared care in family was negatively related to the career progress of Thai faculty members in bottom, rather than top, levels. That is because male and female academics may have a child in early age; thereby having to devote time for family, which adversely affects the advancement in their early careers.

Table 5-4 Multinomial logistic model – Thai academic science (UV)

Variables		Professor			Associate professor			Assistant professor		
			$B_{Grade\ A}$	Sig.		$B_{Grade\ B}$	Sig.		$B_{Grade\ C}$	Sig.
Intercept		-	99.60	0.00	-	51.57	0.00	-	18.41	0.00
Gender	Male		2.07	0.27	-	1.62	0.15	-	1.97	0.02
Seniority	Age		**1.76**	**0.00**		**0.87**	**0.00**		**0.53**	**0.00**
Educational degree	Overseas doctoral degree		2.29	0.16		1.79	0.12	-	0.28	0.40
	Domestic doctoral degree		4.80	0.10	-	18.88	0.12	-	0.14	0.44
Subject area	Hard sciences	-	4.76	0.09	-	0.35	0.40	-	0.30	0.36
Academic performance	More than 3 publications		**18.10**	**0.00**		**19.91**	**0.00**		0.22	0.44
	1 - 3 publications		**25.13**	**0.00**		**25.98**	**0.00**		**3.96**	**0.01**
Network	Level of participation in formal network	-	2.31	0.05	-	1.35	0.11		0.09	0.43
	Level of participation in informal network	-	0.97	0.24	-	0.43	0.27	-	0.31	0.24
Family formation	Married with child		1.06	0.33		1.02	0.28		1.81	0.06
	Married without child		1.08	0.36	-	1.50	0.20	-	0.13	0.45
	Level of shared care in family	-	0.55	0.33	-	0.87	0.13	**-**	**1.01**	**0.02**

Model Fitting Information	
-2 Log Likelihood (intercept only)	286.93
-2 Log Likelihood (final)	94.90
Chi-Square	192.03
Degree of freedom	36.00
Sig.	0.00
The overall correct percentage of prediction	88.71%
Grade A (Professor)	90.00%
Grade B (Associate professor)	73.33%
Grade C (Assistant professor)	85.71%
Grade D (Lecturer)	93.75%

Note:　1. Lecturer as reference group

2. Statistically significant of 5 percent level (one-tailed test) indicated by bold

The effectiveness of the UV multinomial logistic model was supported by multiple indices: the overall test of all explanatory variables of the model; the predictive power of the model; and the statistical significance of each explanatory variable. Firstly, the log likelihood at convergence was 94.90 and the log likelihood with constants only was 286.93, suggesting that the UV multinomial logistic model was more effective than the null model. The chi square values rejected the null hypothesis that the model did not have a greater explanatory power than an "intercept only" one (p-value < 0.05). This means that at least one explanatory variable was a significant predictor of being employed in academic positions (Peng & Nichols, 2003).

Moreover, the correct percentages of each prediction of academics holding the positions of professor, associate professor, assistant professor, and lecturer were 90.00 percent, 73.33 percent, 85.71 percent, and 93.75 percent respectively, of the corresponding sample proportions in each grade position. The overall correct percentage of prediction was 88.71 percent, denoting that the multinomial logistic model could predict the individual probabilities of being employed in each grade position were nearly equal to the sample proportions (Tarling, 2009).

In this case, 0.05 significant level (one-tailed test) was applied to determine the individual significance of the coefficients in the multinomial logistic regression. The evidence suggests that holding all other explanatory variables constant, aged academics or those with publications were more likely, than their counterparts, to be employed in higher positions in Thai academe (p-value < 0.05). Specifically, the likelihood of an academic holding as assistant professor position was negatively related to the level of shared care in family. However, no significant difference was found within holding senior positions in science-oriented faculties of Thai higher education whether they were men, earned an overseas doctoral or domestic degree, worked in any subject, engaged both in formal and informal networks, or had a family formation.

Then, in order to investigate whether male and female academic faculty members in UV, who were of the same qualifications, were more likely to be promoted to senior positions, the probabilities of male and female academics being employed in a particular grade were calculated by utilising the multinomial logistic regression

in Table 5-4. The study focuses on independent variables with a significant effect on UV multinomial logistic regression only, that is, age, number of publications, and level of shared care in family.

Given gender was insignificant in UV's multinomial regression models, it seemed that with similar qualifications, whether men or women, they would be equally promoted. However, it can be noticed that men, rather than women, tend be employed in more senior positions. The evidence supports the argument that Thai academic organisations seem under the organisational norms that favour male academics over women (Somswasdi, 2007). As shown in Figure 5-6, in controlling age and publication variables at average age (40 years) and average publications (3 publications), the probability of being an associate professor was 0.45 for women, compared with 0.48 for men.

Figure 5-6 Evaluated probabilities of being employed in each grade (given average age and publications) in UV
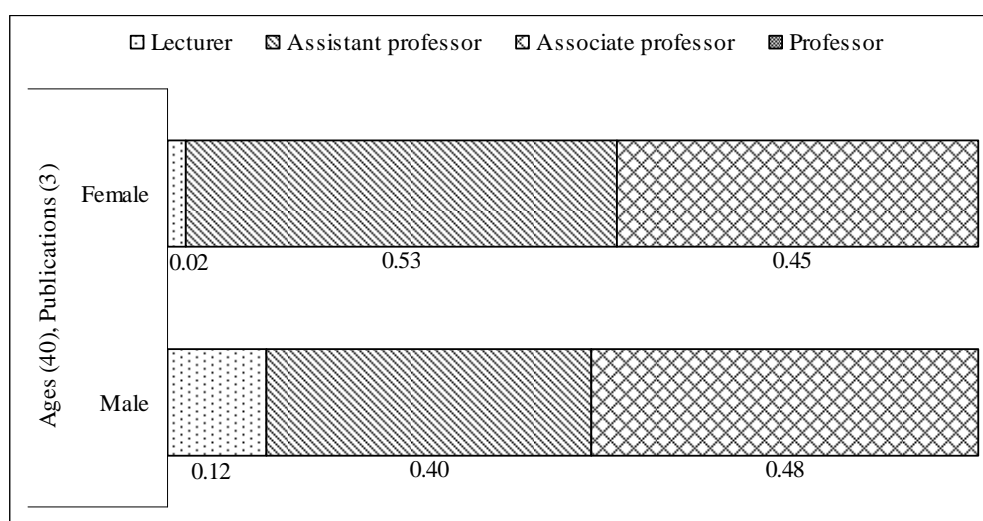
Note: The probability of females and males being employed in a professor position = 0

In addition, UV men were found to gain more from seniority. Evidence of the probabilities of males and females of different ages being employed in a particular grade is shown in Figure 5-7, indicating that the difference was obvious for men and women of older age. For example, at the age of 55, men had a higher probability of holding top positions than women as the probabilities of being a professor were 0.95 for a man and 0.34 for a woman.

Figure 5-7 Evaluated probabilities of being employed in each grade by age (given average publications) in UV
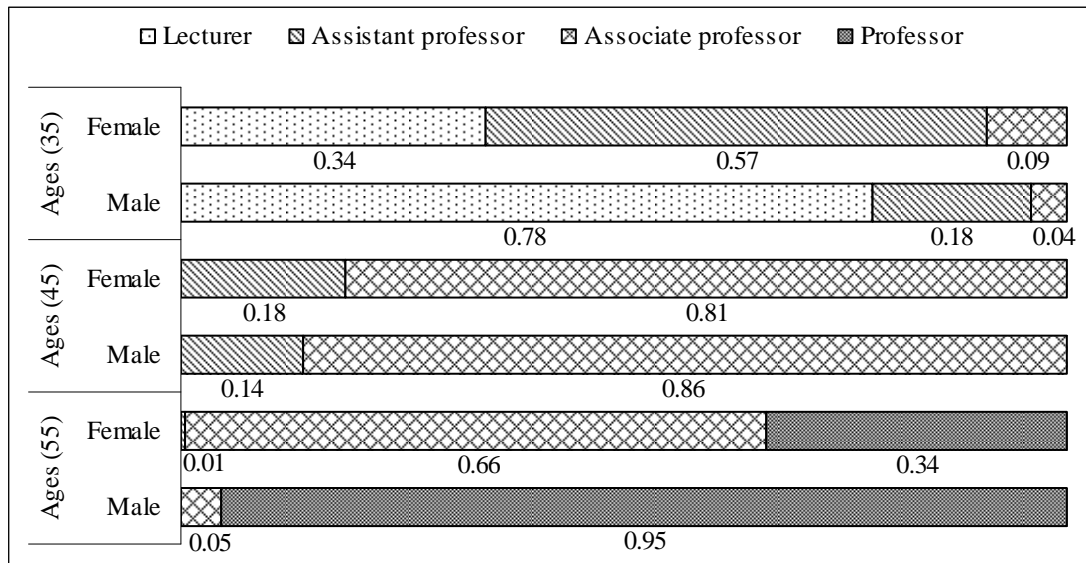
Men also seemed to gain more from academic performance, yet the difference was not statistically significant. Given an impact of academic outputs on the distribution of employment across grades as shown in Figure 5-8, for those with more than three publications, the relative probabilities of being an associate professor were slightly higher for men (0.92), compared to women (0.90).

Figure 5-8 Evaluated probabilities of being employed in each grade by publications (given an average age) in UV
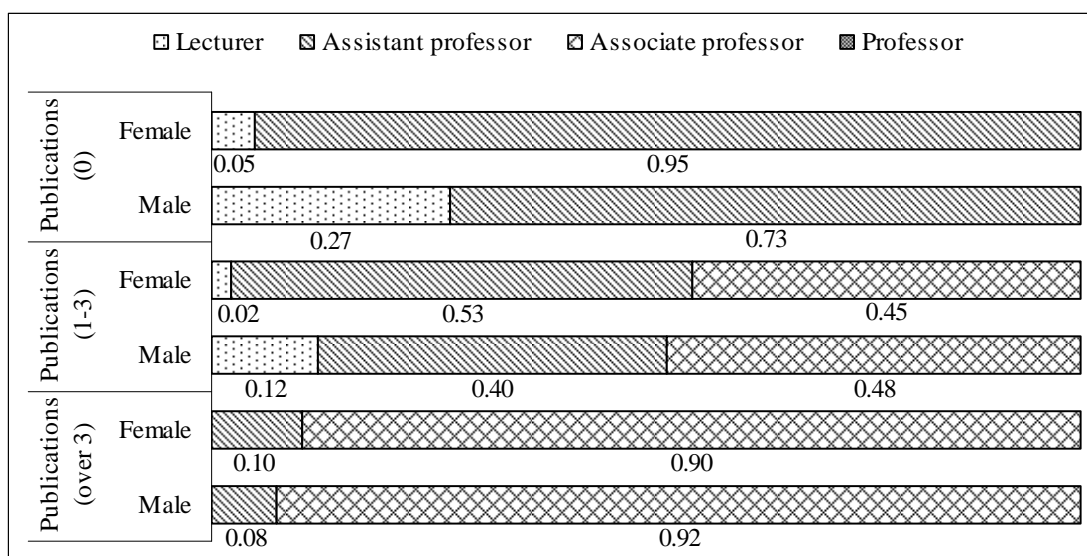
Note: The probability of females and males being employed in a professor position = 0

As shown in Figure 5-9, the evaluated probabilities indicated that UV men were likely to be in less senior positions when they had a higher level of family shared care. At the five-score level of family shared care (always engaged in family shared care), men had a lower probability of being employed in senior positions than women did (the probabilities of being an associate professor were 0.05 for men and 0.18 for women).

Figure 5-9 Evaluated probabilities of being employed in each grade by the level of shared care in family (given average age and publications) in UV
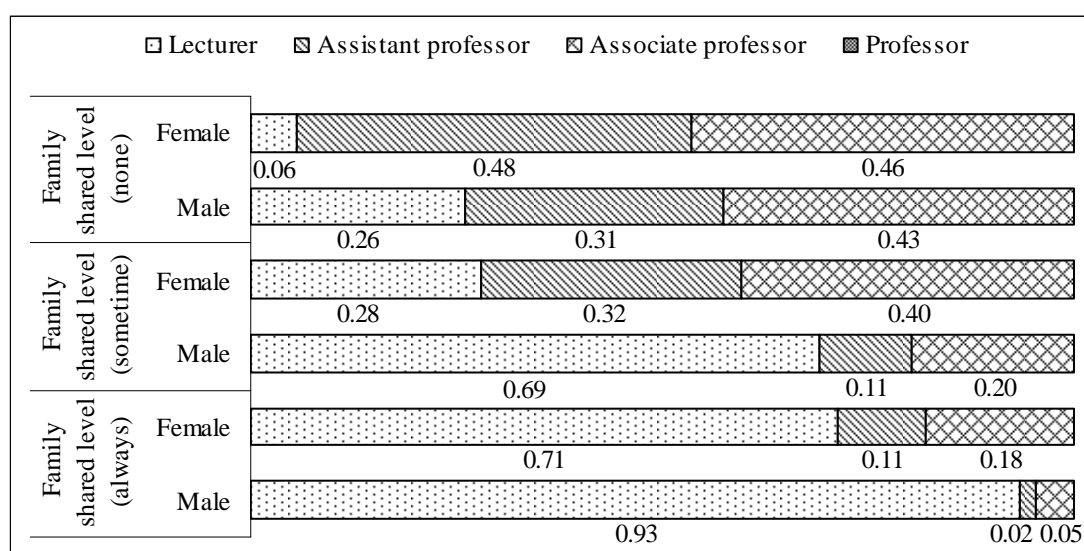
Note: The probability of females and males being employed in a professor position = 0

5.2.6 Perception towards gender equality in science-oriented faculties of Thai higher education

As evidence of the reward difference between male and female academics at UV was found, this section aims to investigate whether or not UV female and male academics perceived such a situation. In order to do so, the UV respondents were asked whether they agree or disagree with the following statement: "Even with the same qualification, men have more promotion opportunities than women do". The question was coded 1-5 score where strongly disagree with the statement = 1 score, neither agree nor disagree = 3 score, and strongly agree = 5 score.

As shown in Figure 5-10, in the current situation where women work with men in science, women tend to believe they can progress equally and have the same

opportunity as men do. Considering the attitudes toward gender equality in UV classified by gender, it was clear that over a half of female faculty disagreed that men have more opportunity to be promoted in science, whereas only two-fifth of UV female staff were of the view that there is unfairness for women in scientific fields. However, on average, a mean value of perception towards gender difference in career advancement in Thai higher education among the female academics (mean scores = 2.32) is similar to those of men (mean scores = 2.33). Considering the result of t-test analysis, the mean value between genders in attitudes towards gender disparities in academics is not significant at 0.05 level (as detailed in appendix 2.10A).

Figure 5-10 Attitudes towards gender difference career advancement in UV science-oriented faculties "Even with the same qualification, men have more promotion opportunities than women do" by gender
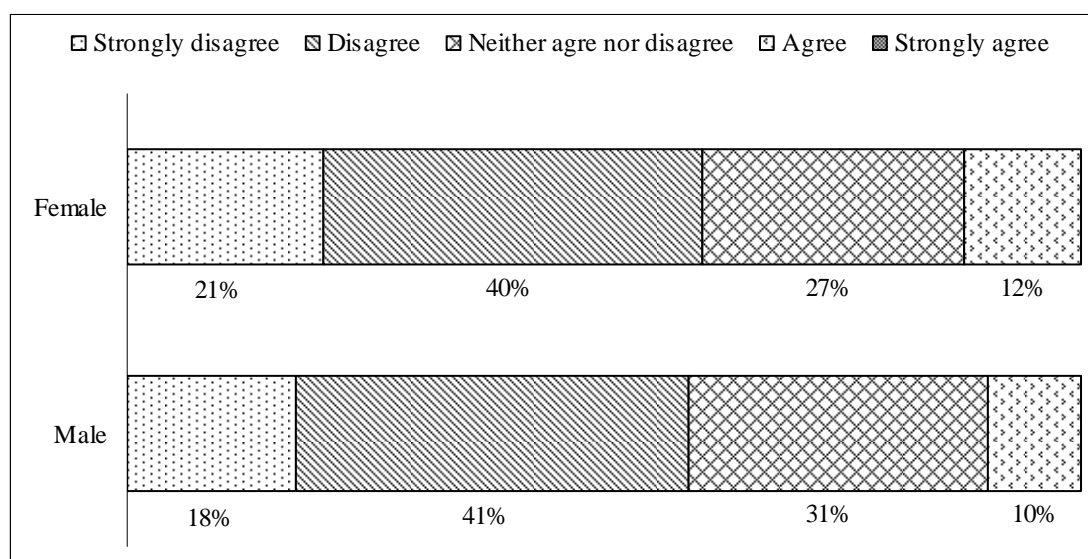
Note: UV female academics' mean scores = 2.32
         UV male academics' mean scores = 2.33
         The proportion of female and male academics strongly agreed with the statement = 0

However, the finding indicated that UV young female academic staff tended to report gender bias in the organisation, as shown in Figure 5-11. For the female respondents' opinions classified by age, the younger UV female research staff (age lower 35 years) had a higher perception than that of their senior female peers that men were likely to be promoted than women (women with lower 35 years' scores = 2.80 and women with over 55 years' scores = 2.38). Because younger female workers had just started their careers, they might have some possibility to face a gender barrier. In turn, this suggests that seniority, as integral part of the organisational norms in the Thai academic organisation, can advantage senior women so they face less discrimination in the workplace.

Figure 5-11 The average value of attitudes towards gender difference career advancement in UV science-oriented faculties "Even with the same qualification, men have more promotion opportunities than women do" by individual characteristic and gender
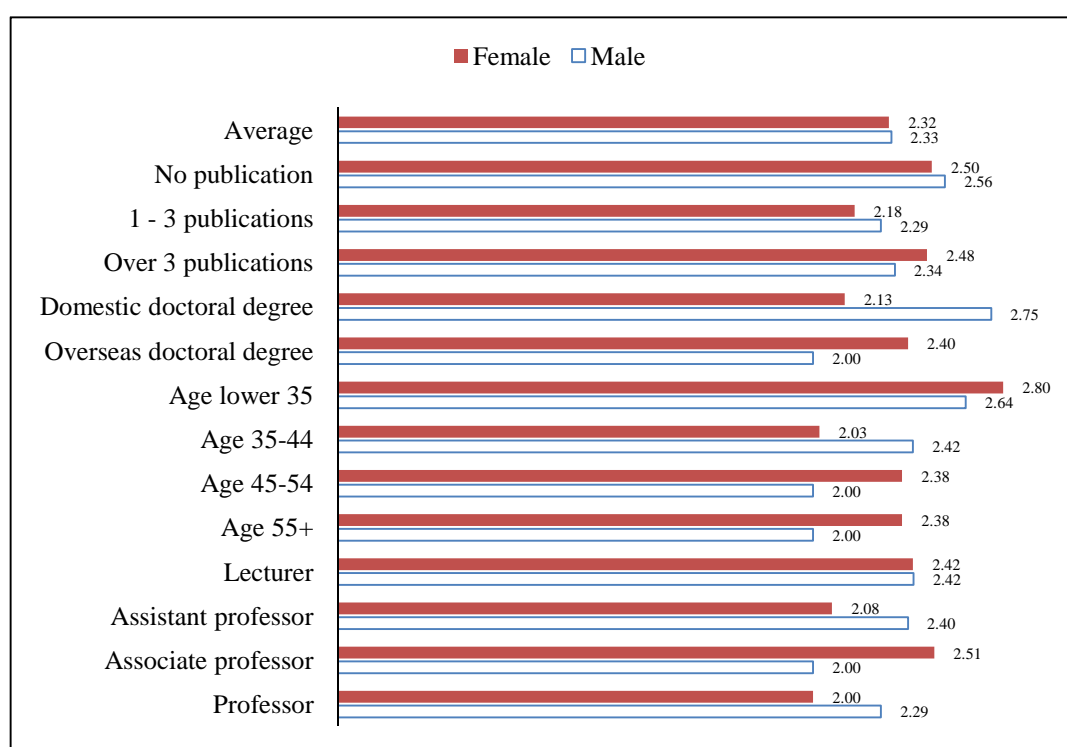
Note: The question is coded 1-5 score where strongly disagree with the statement = 1 score, neither agree nor disagree = 3 score, and strongly agree = 5 score

Considering the result of one-way ANOVA (as detailed in appendix 2.10 B-appendix 2.10 E), there was a relation between the age groups of the female respondents and their perception of gender inequality in the UV (p-value < 0.05). However, no significant difference was found within the attitude on whether women were employed in different grade positions, earned an overseas doctoral or domestic degree, and had publications.

It is noteworthy that there was no difference in perceptions on gender bias among the male faculty members in scientific fields, whether they were older, employed in senior grade positions, earned an overseas doctoral or domestic degree, and had publications. This suggests that whatever men they are, they are unlikely to perceive their domination in scientific fields. This is consistent with the literature that individuals who dominate the field are less likely to perceive discrimination (Bourdieu, 1990).

5.2.7 Conclusion: the quantitative results

This study found 15 percent of the gender pay gap in UV. Of this, a half resulted from differences in endowments as men were employed at a more senior grade and were better educated whereas the other half of the gender pay gap was due to differences in reward, derived from family responsibilities. Even if men and women shared the same level of family duties, women were more adversely affected in terms of pay. This means that Thai women have to sacrifice their careers for family responsibilities in comparison to Thai men. In terms of the gender grade gap in UV, given the same qualification, even though no statistically significance was found, men were more likely to hold senior positions. However, when men and women are engaged with family responsibilities at the same level, women can earn the same senior position as men.

That is because in the Thai public organisations, one of criteria for promotion to the high ranks is governed by work performance which is based on job description (Liamvarangkoon, 2002). This means that if women can manage the balance between work and family and perform well in line with the specified job description, they are likely to advance in terms of academic positions as equally as men. Nevertheless, women are likely to earn less income. That is because faculty

staff members can earn extra income from other sources i.e., extra teaching or consulting. Such an extra income is irrelevant to being promoted to higher positions, but it can make a difference in terms of pay. Because women, rather than men, are likely to be involved in family matters, female academics do not seek extra jobs such as after hours teaching or consultancy. They tend to devote their time to family instead. As argued by Hubbard (2001), although men and women are equally engaged in family duties, they not equal in family care, leaving women in science with no opportunity to look for extra jobs and incomes. For this reason, UV women cannot earn as high as their male counterparts. It is noteworthy that, although gender discrimination seems to happen in Thai higher education, female faculty members are less likely to observe the existence of gender discrimination in the workplace.

The comparison of the hypothesis results of the wage regression and the multinomial logistic regression conducted with UV academic staff is presented in Table 5-5.The findings identified family responsibilities as a key factor that negatively affects the career advancement of faculty staff in Thai higher education, especially at the start of their career. In particular, Thai female academics, rather than men, were likely to be negatively affected by family responsibilities because the level of shared care in family had a significantly negative relationship with UV female wage regression.

The quantitative results were in agreement with some of the literature which argues that the cause of gender differentials in academic career advancement originates from either the difference of individual endowments (Stack, 2004) or gender disparity (Sonnert, 1999). However, in order to fully understand why such a gender disparity has occurred, this study incorporates a qualitative analysis to complement the interpretation of the quantitative findings, as illustrated in the next section.

Table 5-5 Summary of hypotheses and results of wage regression and multinomial logistic model in Thai higher education

Hypotheses				Wage		Grade		
	Hypotheses	Variables	B	Women	Men	Professor	Associate Professor	Assistant Professor
H1	Academic career advancement in science-oriented faculties of Thai higher education is related to seniority: workers who are older are more likely to hold higher grade positions and receive better pay.	Age	$B > 0$	x	x	√	√	√
H2	Educational background contributes to the success in Thai academe: workers with doctoral or overseas qualification are more likely to be in higher positions and receive better pay.	Overseas doctoral	$B > 0$	√	x	x	x	x
		Domestic doctoral	$B > 0$	x	x	x	x	x
H3	Thai academic career progress may vary within science fields: men are more likely to work in hard sciences while women in soft sciences. We test whether or not the different outcomes reflect different rewards across science disciplines.	Subject area	$B \neq 0$	x	x	x	x	x
H4	Thai academic career progress is enhanced by academic performance: workers with more publications are more likely to have higher positions and income.	Publications	$B > 0$	x	x	√	√	√
H5	Thai academic career advancement may be supported by networks: workers who have actively engaged in networks – formal or informal - are more likely to be in senior positions and better rewarded.	Formal network	$B > 0$	x	x	x	x	x
		Informal network	$B > 0$	x	x	x	x	x
H6	Family formation may be important in explaining the obstacles in Thai academic career advancement: family responsibilities are likely to reduce the probability of workers being employed in senior positions and receive more income.	Married with child	$B < 0$	x	x	x	x	x
		Married without child	$B < 0$	x	x	x	x	x
		Shared care in family	$B < 0$	√	x	x	x	√
H7W	Wage is related to grade positions. Those who are in higher positions are more likely to be better paid.	Professor	$B > 0$	√	√			
		Associate professor	$B > 0$	√	√			
		Assistant professor	$B > 0$	√	√			
H7G	Grade position is related to gender as men are likely to be in more senior positions.	Gender	$B > 0$			x	x	x

Note: √ = Finding found accepted the hypothesis at significance at p-value = 0.05 level

X = Finding found rejected the hypothesis at significance at p-value = 0.05 level

5.3 The qualitative analysis

The concept of multilevel analysis (Layder, 1993) is employed as a conceptual framework for examining what makes Thai female and male academics in science-related faculties act differently in accordance with their sex and their understanding of the power of individual attributes in career achievements.

Based on this approach, the first section has been organised on the basis of the endowment variables and organisation practices which may have an impact on the gender gap in career advancement in Thai higher education. Then, the researcher explores the supports and various strategies that women employ in order to deal with such a gender bias. Finally, the researcher draws primarily on two feminist approaches: liberal and radical, in order to assess the perceptions of academic personnel towards the current status of women in science-oriented faculties within Thailand higher education. The 3 main themes, composed with 11 sub themes which have linked to the original data, are illustrated as shown in Table 5-6.

Interviews were conducted with 14 UV academic employees across various backgrounds. 11 were women and 3 were men. Among them, 5 of the interviewees were professors; 3 were associate professors; 4 were assistant professors and the other 2 were lecturers. As for education, 10 graduated with a doctoral degree and 4 with a master degree; 9 graduated from overseas, while 5 earned a domestic degree. 9 participants were married, while 5 were single. Most participants were childless, only 5 had a child or children.

A code was assigned to each participant such as UVXYZ. The first two letters denoted the organisation type: UV as the university and X as the number assigned for the individual participants. Y referred to the sex of participants as M for male and F for female. Z was the grade level which participants held. That is, A was for participants employed as professor; B for participants employed as associate professor; C for participants employed as assistant professor and D for participants employed as lecturer. For example, when the researcher coded UV14FA, meaning a UV female participant assigned for number 14 employed as professor.

Table 5-6 Themes and subthemes from UV interview findings

Themes	Subthemes
Theme I: Factors creating a gender gap in career advancement of Thai higher education	- Social norms deprive Thai female academics from social capital, leading to limited access to career opportunity in science - Female underrepresentation in engineering has caused female academics to have a lower status in Thai science academe - Double load of work and domestic responsibilities - Thai science community is a place for men
Theme II: Supports and strategies women operate in response to the gender bias in Thai higher education	- Academic qualification support in gaining female acceptance in scientific careers - Empowerment through bonding with each other - Family support and the single status allow Thai women to maintain their focus on scientific careers - Rules and regulations; and working style
Theme III: Perception towards women's status in science-oriented faculties of Thai higher education	- Liberal feminism view: Thai women seem to have an equal status as men in science academe. - Radical feminism view: the norms of Thai tradition value and Thai science community prefer men over women. - Thai female academic view: gender discrimination is unnoticeable by female academics.

5.3.1 Factors creating a gender gap in career advancement of Thai higher education

This theme explains how endowment variables and organisational practices in Thai higher education lead to differences by gender in academic career advancement in several ways. The findings include that female faculty staff in Thai higher education are discriminated by various factors: social norms preventing women from making social connections; underrepresentation in engineering as a priority field in science academe; and family responsibilities as a main barrier to time allocation and focus on work. Additionally, the finding revealed forms of gender discrimination implemented by men in order to prevent women's incursion into the sector such as making research and development as a men-only realm.

5.3.1.1 Social norms deprive Thai female academics from social capital, leading to limited access to career opportunity in science

Thai women and men have been traditionally dictated by social value to behave differently. Men have freedom while women must behave in line with Thai social norms. For this reason, Thai male academics seem to have the better opportunity in making use of social capital in order to achieve career gains in science.

Thai women have been protected by a custom that places women's virginity at the core, men are not even allowed to touch women, even the hands (Tantiwiramanond, 2007). As a result, Thai women are not permitted to stay close to men even in the workplace and that hinders them from connecting with men in science community. A female associate professor recalled her experience about a gossip when she had a field trip with her male colleagues.

> *'Yes, there is a boundary that we have to watch. When I was younger, I was commented on my behaviour. For example, if I walked side by side or ate at the same table with a male colleague, people would think of me as his new girlfriend. Just eating together could make me someone's girlfriend.'*
> *UV7FC*

In turn, a social tension on the male-female relationship may prevent men to invite women to join the male groups. Concurrently, a Thai male academic mentioned that he should treat his female colleagues with precaution.

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'With male lecturers, even if we're not well acquainted, we can talk but we can't do that with female peers. There is some barrier of appropriateness between us.' UV6MD

While Thai women need to be extremely careful when entering the male networks as a result of such Thai tradition norms, men are comfortable and can do well within their own networks. Some female academics felt that male academics benefit from such a social attitude that reinforces the male power.

'Men can talk outside the working context. So when men get together, they can pull each other to help the job. So their network can expand. After work, men go socialise, but it doesn't look good if woman join the guy. So women, we're left behind.' UV14FA

Whereas male faculty staff had a network to support their careers, female academics were excluded and considered as outsiders, and thus could not reach the top in science which is regarded as male-predominant. As a UV female professor argued that due to the female exclusion from the male networks, there was the scarcity of women in senior positions.

'When it comes to the vertical line, there are more women coming in but just staying at the bottom. They can't make it to the top where men have been there since the foundation of the institute. So men pull their peers up and it's hard for women to get in.' UV14FA

As a result, in Thai higher education, male academics are more likely to get an advantage as a result of expanding social capital. For example, they act as gatekeepers providing the opportunity and helping each other in order enter the academic field.

'People with networks, friends, senior or junior fellows from the university, it's a support for them. Especially if we have a senior fellow from our university days, then we will have a good start than not having previously known anyone.' UV1MA

To sum, Thai male academics can make use of social capital in order to progress in science, whereas women are restricted by Thai social values; thereby leaving them with a small chance to move upward in science.

5.3.1.2 Female underrepresentation in engineering has caused female academics to have a lower status in Thai science academe

Though subject areas did not have a significant effect on pay and grade in UV's quantitative results, the interview findings identified the existence of gender division in science subjects and such a division makes women and men receive a different status in science.

The national statistical data revealed that gender segregation existed among Thai academics as men were likely to stay in hard sciences and women in soft sciences (National Research Council of Thailand, 2008). Most people in Thai society believe that engineering is a men-only field because this subject often involves physically hard work which is not customary for Thai women (Yukongdi, 2005). Consequently, when asked why Thai women are not generally considered suitable for such hard sciences as engineering, several participants identified a range of physical differences as the reasons. A male lecturer in the faculty of engineering viewed engineering a subject which reserves most of the opportunity for men both in school and at work.

> *'In Thai society, sometimes women are viewed as not as capable as men, especially in engineering. They consider women intolerant with hard work and thus lack stamina. With that mind-set, not so many women study engineering. And the parents are reluctant to send women to the engineering school because it's a men's job. The parents don't think this field is healthy for the girls. My field is civil engineering where few girls, more or less 20%, have studied. People consider engineering men's realm.'*
> *UV6MD*

Additionally, gender disparity in Thai science academe caused by subject segregation is observed by a female professor in UV who pointed out that as women have been confined in soft sciences, which seem to be low pay subjects, there is inequality between men and women in scientific career advancement.

> *'There is a career boundary in science in accordance with gender. Hard sciences like engineering are for men. But soft sciences like biotechnology are for women. This separation makes a point here. Mostly the money-making or better-looking science belongs to men more than women. So women earn the lower status.'* UV14FA

Moreover, although Thai women try to go for the engineering field, Thai male academics were unwilling to accept female colleagues in such fields. A male assistant professor in the faculty of engineering admitted that he did not believe in female suitability for engineering due to a lack of competence.

> *'(When women work as engineers, do they perform as well as men?) Not exactly, there was some test. Women have no ambition in exploring new knowledge. That's why they can't be as good as men, even with the same degree. They lack aggression and knowledge to excel their skills.'* UV4MC

A female assistant professor in the faculty of engineering experienced a gender bias of male lecturers because engineering has always been viewed much more suitable among men than women.

> *'As for engineering instructors, there is no such consideration for women. Although men know that we have the same education and knowledge, they consider themselves as leaders. That's how they look at the field.'* UV2FB

To sum, women are outnumbered in engineering, a field with a seemingly better prospects in Thai science academe. Thai female academics are thus likely to be inferior to men in Thai higher education in science-related fields.

5.3.1.3 Double load of work and domestic responsibilities

Family responsibilities have become the most important barrier to obstruct Thai women from a chance of success in science as women seem to face with a double burden of work and household tasks in which men do not equally participate.

A female participant gave a clear reason why Thai women are expected to place family as their top priority, while men are not. Based on Thai traditional values,

there is a gender division of labour within the household, where Thai women do the social work, while Thai men, on the other hand, take roles outside of the home.

> *'In our culture, the work at home is regarded as a typically female job. If women are married, people expect them to stay home, taking care of the house and children so men can go out freely because they have someone to watch the house now.'* UV14FA

In some developed countries (e.g. France), financial responsibilities that belong to men bring women to accept the core function of family matters (Lewis & Humbert, 2010). Yet in Thailand, the case is different. Thai men and women can share an equal role in seeking income; nevertheless, women remain in charge of domestic chores. A male assistant professor admitted that although women can support the family financially, family responsibilities are not shared equally between Thai men and Thai women.

> *'Some women have salaries higher than men do. Still, they have to care for their family.'* UV1MC

This argument was largely agreed by male academics (UV4MC and UV1MC), who did not identify family responsibilities as an obstacle to their careers and were of the view that men can ignore their family responsibilities. In Thai culture, Patana (2004) argued that, men has been traditionally regarded as a household head. With this role, Thai men have the authority to see work as priority, while the women play a passive role of completing household chores and childcare. This leading role has permitted men to leave domestic duties to women.

> *'Men have no problem at all, leaving all house chores to women. I can stay up late at office. Even a married man can stay late because they don't have to care for the family.'* UV4MC

> *'Men, on the contrary, have the excuse that they have to work or attend a meeting so the family care is a female duty.'* UV1MC

This practice is based on a Thai tradition value in which men are superior to women and that determines gender stereotypes in the family. Girls or daughters are

required to absorb family duties, taught to be followers to their husbands and to pay full attention to the wellbeing of the whole family. A female professor reiterated that caring responsibilities largely fall to women who are also expected to fill that role by men.

> *'For men, marriage is an expectation of having a wife to take care of the house, cook, and clothing, etc. That eases their responsibilities so there is no effect on them.'* UV14FA

That is why, although women have to work outside the home, they must ensure that these work responsibilities do not affect their duties at home. As a result, female academics replied that it is extremely difficult to keep a good balance between work and family. Many felt that working at work, coupled with being wives or mothers, is torn by such a conflict of interests. A female professor considered family responsibilities as difficulties continuing her career.

> *'When women are destined to care for the house, it's hard for them to go somewhere else, overseas or the country. They have concerns back home. Women can't stay up late in the lab. Who will pick up the kids? After sending the kids to bed, it's late to read papers. I think so, especially for women. The wife or mother roles conflict with the careers.'* UV14FA

Although women need to work outside for income to support the family, the expectations of a perfect wife or mother remain unchanged. It is clear that Thai men's share of domestic duties is limited and women are still expected to carry out most of domestic work. Thus, it is more difficult for Thai female academics to maintain a balance between work and family, compared to their male peers.

5.3.1.4 Thai science community is a place for men

Gender discrimination is deeply rooted in science community, which is regarded as the male realm (Long & Fox, 1995). That is because men, as opposed to women, are considered more compatible with science (Sonnert, 1999). Similarly, many forms of gender bias are observed in Thai higher education such as a positive view on masculine characteristics, less-rewarded assignments to women, and a lack of seniority leaving women with low acceptance.

It has been widely recognised that logic and analytical thinking is the core of science, which seems to fit well in masculine characteristics (Long & Fox, 1995). This attitude particularly leads to the notion of lower scientific capacity of women, compared with that of men. Negative expressions, as mentioned by male academics, about women seems obstruct the career development of women in science.

> *'There was some test. Women have no ambition in exploring new knowledge. That's why they can't be as good as men, even with the same degrees. They lack aggression and knowledge to excel their skills.' UV4MC*

As women are viewed less suitable for scientific skills, science has turned to a not-for-women place, does not allow women the opportunity to participate and takes them away from scientific expertise.

> *'The science community doesn't welcome women that much. Perhaps, they believe women have flaws: lack of logical thinking, for example. And the society doesn't encourage women to join the science force, considering that an incompatible match.' UV14FA*

Another important obstacle is the Thai tradition norms that assign certain inferior roles to women. Thai traditional norms dictate that women's prime duties are house work (Chompookum & Derr, 2004). Therefore, men expect women to place family responsibilities, rather than duties at work, on top priority. A female professor expressed her experience during her participation in an academic meeting where some of the male faculty members made fun of female duties.

> *'After my graduation, I got a job at university. I heard the male lecturers referring women as 'those women" in every sentence and they also used the words to unite the men to dislike women. We always heard what people said:"Being a woman, why do you bother getting a PhD? If you're better than the husband, your family will fall apart or the husband will leave you". Another thing is: "women don't' have to study a lot, just find a good guy to marry." Everything we heard is a discrimination against women.' UV20FA*

As Thai women have been viewed as inferior to men, men are likely to show an aggressive behaviour to blame women for incompetency with their colleagues around. Some female academics found themselves judged harshly by male colleagues once they attempted to challenge the male boundary. A female associate professor expressed that male colleagues had no trust in her when she was in the position of authority with male colleagues as her subordinates. The reactions from men to this circumstance can develop into an outright protest.

> *'Some men were strongly against me as they were unsure of my capability or whether we were able to control the instructors. There was some feedback at the meeting where men argued strongly.' UV2FB*

The notion that different genders possess different skills does not only advocate gender bias in Thai science community, but also results in different kinds of job being assigned to male and female academics. The patterns of job assignment in Thai university seem to give women supportive or administrative duties while men are likely to be put in academic roles; thereby denoting discrimination on career advancement between genders in Thai higher education.

Although women and men are members of the same occupation, they are likely to work in different jobs (Acker, 2006). This is in agreement with a survey result that UV female faculty staff spent more of their time on paperwork while men allocated less of their time on it. Such a job division stems from the assigned role of women within the family (i.e., the helpmate role). Thus when women work outside the home, they are expected to work in jobs that associate with supportive roles (Yukongdi, 2005).

Consequently, the interview findings suggest the job segregation by gender in Thai higher education where women were mainly assigned to non-academic jobs in order to support office and administrative work (UV5FC). Conversely, male academics performed primarily academic jobs (UV1MC).

> *'Apart from teaching, there are other jobs e.g. scheduling, introducing a new course, managing prospecting and graduating students. It depends on the orders given to me.' UV5FC*

> *'I teach and do researches e.g. research grants, consultancy, and designs of engineering systems.'* UV1MC

It is apparent that UV female academic staff members were likely to be discredited on job assignments that suit supportive functions, rather than academic ones. This helps perpetuate gender difference in career advancement in Thai higher education.

> *'At university, women are given jobs differently from men. Men take the academics but women do the detailed paperwork - administrative job. So women seem to have no outstanding job to present and then we have few career opportunities.'* UV14FA

Furthermore, the status of women in Thai higher education appears to depend on seniority in terms of age, which is an important factor to being respected in the Thai organisation (Bhanthumnavin, 2003). The finding identified a lack of seniority as a cause of low acceptance of young female academics among senior male ones, leaving the female ones with low confidence and less power in the science community. This is relevant to the survey findings that the younger UV female academic staff, rather than their old counterparts, might have some possibility to face a gender barrier.

A female assistant professor confirmed the existence of the less power of women in academic sciences when she was challenged by older male colleagues during the department meeting. The effect is due to the nature of Thai organisations, where seniority is a major concern. Although academic performance can guarantee knowledge capability, lack of seniority can earn female academic staff unacceptable from male colleagues.

> *'I felt their aggression…not participating in a department meeting, not submitting assignments, strong arguments. We can realise from their reaction. They are older and thus have developed an ego.'* UV5FC

Additionally, Thai senior male academics are likely to indirectly discredit younger female colleagues by treating them as "girls". For example, a female assistant professor elaborated how senior male colleagues called her "Nu" implying that she was just a little girl. The lower position of younger women in society is reflected in

the Thai language such as "Nu" which means "a little person (in age)" to address a younger sister. Although this term can simply signify a young age, it is often used to differentiate the lower status of women relatively to men, suggesting no expertise.

> *'If men think I'm younger, they address me "Nu", it means they see me as a girl.'* UV7FC

Not being accepted by senior male colleagues, young female academics are likely to evaluate themselves as having less power than men in the science community. A female professor revealed her experience that when she was young, she had no confidence in working among male colleagues.

> *'Some events are not for women to present themselves. When I look around, I see men only. So I have no confidence and feel awkward to engage in conversations. Because I'm a young woman in the middle of men so I don't know how to act.'* UV14FA

The relatively lower position of junior women relatively to men in science can be explained by "a father-daughter model" introduced by Reskin (1978), which demonstrates that the relationship of junior female scientists and senior male ones is in the form of obedience, ultimately leads to the lower status of women and less power in the organisation. Thus, the status of Thai women in academic science is related to seniority: female faculty staff who are younger or with less years of experience are more likely to be inferior in science.

In the Thai science community, men tend to be valued more positively and women more negatively and thus women are viewed as relatively incompetent when compared to men. These societal gender stereotypes promote men to gain more acceptance, in turn, discouraging women in science.

In summary, this section has identified the factors affecting gender difference in career advancement in Thai higher education including networks, subject areas, family responsibilities, and gender bias in the workplace. However, in order to seek how women deal with the gender bias situation, the researcher explores the

support and practices on which Thai female academics have drawn on in the next section.

5.3.2 Supports and strategies women operate in response to the gender bias in Thai higher education

This section provides how UV female academics have reacted to the gender discrimination practices as previously stated. For example, they manage to acquire academic qualification, bond with each other, and adjust their working styles in the workplace. This research has further explored the supports that facilitate women do careers in Thai university including a family assistance as well as rules and regulations.

5.3.2.1 Academic qualification support in gaining female acceptance in scientific careers

It is necessary for Thai female academics that they should receive an advanced degree or professional certificate in order to equip them well in the scientific careers.

In the science community, academic performance is considered a key to career achievements. The previous research has identified academic performance as an important factor determining academic career advancement (Tien, 2007). This is in agreement with the empirical data of this study. The researcher found that both men (UV1MC) and women (UV3FA) in either senior or junior levels identified academic outputs as a significant factor.

> *'(Can you tell about the promotion criteria?) Basically, it is about how much you have achieved the work objectives e.g. your teaching performance, consultancy and research work, book writing and how well you did all that.' UV1MC*

> *'(Are there any known criteria?) They mainly look at academic proficiency.' UV3FA*

Especially for women in science, those with a good academic background can make progress in careers. Similarly, Payne & Nassar (2002) pointed out that academic degree is viewed as one of the powerful capital that can guarantee

women's competence. As a result, academic qualification can upgrade women's capacity. Similarly, in Thai society, it cannot be denied that an acceptance of individuals very much depends on high education (Tantiwiramanond, 2007). Therefore, a privileged educational degree can provide women with more opportunity of presenting themselves as rivals in academe. A female assistant professor recalled how she was invited to be the head of department after earning a doctoral degree.

> *'After I earned a PhD, I got this position – head of department. They approached me before the appointment.' UV7FC*

Education does not only enhance academic capabilities for females, but it also solves gender bias in organisations by hitting the glass ceiling in male-predominant organisations. For Thai people, an educational degree is regarded as symbolic capital to help women enter the public realm (Tantiwiramanond, 2007). With education, a female academic believed that women could increase their power and win acceptance from colleagues.

> *'If women can reach a certain point of education, people will accept them.' UV5FC*

Fortunately, a greater opportunity for education has opened for Thai women in academic science. The national development and the educational system have allowed more women to join the higher education. With the increasing education opportunity, some female academics advocated that Thai women were more likely to join science careers.

> *'There are a lot of women here. New programs such as overseas scholarship are open to support the national development. A lot of women can join these programs.' UV7FC*

To sum, in order to gain acceptance in science, Thai female academics have made use of their academic qualification in order to compete with men.

5.3.2.2 Empowerment through bonding with each other

As noted by Metz & Tharenou (2001), human capital such as education may give women an access to the career opportunity, yet social networks may assist them in an upward movement. As a result, in addition to increase academic degree, female academics have established their own network groups in the science community in order to secure the better status.

According to McDonald & Hite (1999), women bond with each other in order to increase their power and serve as a resource to promote their chance in careers. This is true in Thai higher education, where women are more likely to believe that no one but their female peers or mentors can advise them about climbing up the career ladder. A female professor was of the opinion that the female connection is a good tool for women to support each other.

> *'I think women should help each other. Connection is the key. It's important to know who we know, starting from the job or study application and senior-junior fellows. We can tell it's the patronage system but that can support women too. I personally pull anyone right for the job to assist me. It's like I help myself too - easier to talk to women. They can learn from my lessons through the way on how to behave and speak so as to gain compliance. It's a shortcut for them better than letting them learn by themselves.' UV14FA*

Similar to their male peers, women were likely to establish networks of their own to consolidate their powers in Thai science academe which assists them in cohesion within the organisation. Without such ties, a female academic admitted that she could not make it to the top.

> *'There are more women than men here in the management, creating a higher chance of women for promotion. But if the case is opposite, it is likely that women won't be in most managerial positions like this.' UV5FC*

In other words, the female network can empower Thai women in scientific careers. This is in agreement with the statement that because women have moved up slowly in science, where men's power is concentrated elsewhere, thus female academics

should build entrenched networks in order to compete with the power primarily by men (European Commission, 2008).

5.3.2.3 Family support and the single status allow Thai women to maintain their focus on scientific careers

Although Thai female academics need to work outside of home, together with domestic chores and child care, they can draw support from family members. However, the study found that in order to avoid any tensions arising from having a family, some women choose to be single.

As a result of the characteristics of extended Thai family, Thai female academics can continue the job in parallel with family responsibilities. Provision of childcare from relatives means that female academics have more time for office tasks so these women can manage a balance between career and family, as a female professor pointed out:

> *'Some women can do two jobs at a time. In my case, I'm lucky to have relatives to help so I can concentrate on my job.' UV14FA*

Interestingly, the researcher found that some husbands were willing take a cooperative role in jointly caring the family with women. Despite the superior role of men in Thai culture, both a husband and a wife need to share the family burden, as a male respondent reiterated.

> *'My wife takes care of the clothes and food. Sometimes I help her with that. I take care of the house maintenance and drive my kid to school. We have to spend time caring for the family. I could stay up late at work while being single. But now my child goes to bed at 9 pm. So I take him to bed and I'll do my things after 9 pm.' UV6MD*

As a result, some female academics who are married to supportive men have no worry as they can go for a meeting or stay overnight anywhere. A female professor explained how her husband has supported her career.

> *'I appreciate my husband giving me the opportunity to work at my best. He's the big part of raising our child, helping with the homework. I can*

decide everything on my own, without having to ask for his permission. I'm lucky to have this kind understanding, which is significant to support each other for work. If a man is narrow-minded, it would cause an obstacle in my job.' UV20FA

In turn, in order to achieve milestones in their careers, some female academics seem to delay their marriage. A female professor agreed that freedom from being single has provided her the opportunity to devote time for work. As opposed to married women, she could do whatever she wanted to with no worry of housework or any responsibilities. This is in agreement with Jones (1999) that, in the Southeast Asian countries, women who advanced levels of education tend to stay single because a single life can offer them independence and freedom.

'I think I have a lot more freedom than married colleagues. Well, I can work up until late. While married people, they worry about their family, but I focus on work only.' UV3FA

As Thai women cannot leave family duties to men, Thai female academics need support from family member such as relatives or husband. This is consistent with Elliott & Gray (2000) that although nuclear families are being seen more, the pattern of extend families, which relatives come in to help, can be visible in Thai society. However, in order to avoid family obligations so they can work with freedom, some Thai female academics decide to stay single.

5.3.2.4 Working style; and rules and regulations

As stated earlier that the science community in the Thai higher education context seems to reserve a place for men, so Thai female academics need to be habituated to their working styles: doing like a man; relying on UV rules and regulations; and compromising their own working style in order to survive in the academic workplace.

In order to be successful in their scientific careers, several female academics are likely to adopt some behaviours such as doing like a man to become a top in academic science, where masculine characteristics seem more welcomed. As a female associate professor put it, as she can break away from the female

stereotypes, she can gain compliance in this profession. This means that women have to avoid showing the female style, and thus should behave in line with the male standards.

> *'I have some characteristics that are unlike women's. So if I need to fight or take risks for work, I can do that without hesitation.' UV2FB*

Additionally, in order to gain compliance from men, some Thai women draw on rules and regulations as a strategy. The working of Thai public organisations is framed by clearly written laws, rules, and regulations which delegate authority and responsibilities (Maneerat et al., 2005). Thus, female academics have the right to order and the male subordinate needs to perform duties in response to the superior's commands and orders, regardless of their sex.

> *'There might be some arguments but we can fix or follow the rules and regulations. So there is no problem because we do the right thing, without prejudice.' UV16FA*

As a result, female academics are likely to rely on rules and regulations as a strategy to prevent male employees from defying their authority and power.

However, it is interesting to note that rather than changing themselves (e.g., doing like a man) or employing rules and regulations in order to strengthen their power in science, the ability to coordinate and avoid crises is viewed by female academics as a key to their career gains in science on the grounds that they can maintain a smooth working environment.

Female unique characteristics such as sensitivity and communication skills have been reported by UV female academics as strategies to survive in Thai higher education. A female professor revealed that she has attempted to avoid offending anyone while preserving good relations, and preferred negotiations and compromises.

> *'To be a good leader, I need to work with principles. If I'm too tough, I'll be cut off so you need strategies, giving chances to members and leaders for*

discussion. At the same time, I need to cut off what they say, without hurting their feelings - smooth things over.' UV20FA

In addition, in an attempt to avoid conflicts with team members, Thai female academics are likely to accept extra workloads with no complaint. This is confirmed by Chompookum & Derr (2004) that the working style of Thai women mainly focuses on devotion in order to maintain a good relationship. Thai women, by nature, do not fulfill their own needs or wants only, but also put others' needs before their own. A female associate professor reiterated this point, saying that her organisation is her top priority.

'Sometimes we work for the organisation and if we keep complaining, the job won't go anywhere so we have to let it go.' UV2FB

Hence, this section has identified various supports and strategies on which women in science-oriented fields of Thai higher education draw in response to the obstacles in academic careers. Examples of the strategies include acquiring privilege education; bonding with each other; and adopting a range of working styles such as doing like a man and preserving a good relationship. In addition, a support from the extended-Thai family; being single; and the reliance on rules and regulations can promote women for a greater chance of success in science.

5.3.3 Perception towards women's status in science-oriented faculties of Thai higher education

Two main approaches are focused regarding the perception towards women's status in scientific-related fields of Thai higher education. With the radical feminist approach, Thai female academics are discriminated as a result of the traditional values from either Thai culture or the science community. On the other hand, based on the liberal feminist view, Thai women seem to have an equal status as men in science academe because Thai women have the better access to scientific fields. Accordingly, gender discrimination in Thai higher education tends to be less noticeable or even disregarded by most women in science.

The liberal feminist approach principally stresses on the notion of rights and equality (Holmes, 2007). Based on such a concept, several female academics

advocated that the academic realm has welcomed women to enjoy equal opportunities. The equal rights to educational attainment between men and women in science are highlighted.

> 'It's much better now. Women can go to university and make science their choice.' UV14FA

Although modernisation allows women to participate more in science, women in Thai science academe are likely to be disadvantaged. A female professor reiterated this point, saying that gender inequality still persists in science.

> 'If we simply take the principles, it is very fair. But we take a deep look at the core, I think women are deprived of opportunity or have obstacles along the way, even though we can get the same pay. Still we're more tired and sacrifice more of ourselves. I don't think that's fair.' UV14FA

Although women may have the rights by law, their status are yet not as equal as men's and it seems difficult for women to gain acceptance in the male-dominated environment. According to the radical feminist approach which acknowledges differences in the status of women and men in society (Beasley, 1999). A female professor elaborated how the women's status is lower than men's in Thai science academe, largely citing some feminine traits that are not a good match to science.

> 'Generally speaking, women and science are not quite compatible with each other. Hardly, we are able of naming female scientists. In daily life, women are considered not in connection to anything technical or mechanical. That's why they say woman is a lousy driver. Woman is stupid with engines, think non-sense and non science. That could come from their physical and mental nature. Science requires hard work at laboratory. Women may not be able of staying that late. And science work needs logical thinking but women prefer emotions. That causes them a lack of learning or makes people unable to accept them. It's not true - no difference from other sciences. Gender inequality still exists in Thai society. Most of the scientists are men. Academic institutes are founded and ruled by men so it's mostly their territory even there are more women now.' UV14FA

In addition to the biased attitude toward women in the science community, Thai society is less likely to accept that women can have a leadership charisma. This view reflects the persistence of male superiority in Thai higher education where most of the top positions are seemingly reserved for men. A male respondent disagreed that women have leadership capacity and thus claimed that women should conform to their social roles, meaning the lower status than men's:

> *'Why do women want to be in high positions? I don't get that. Why don't we screen lousy men out of the management and let the women care for the family? If women want to be leaders, I will step out and take care of the whole house chore. And we see if women can earn money as much as men do. We need both the leader and the follower. We can't walk together, except that you're extraordinarily good.' UV4MC*

Nevertheless, a dimension regarding the perception towards gender discrimination emerges in Thai science academe. According to the current findings, Thai female academics did not notice any gender discrimination in Thai science. Some women believed that Thai society offers an equal opportunity for both genders so it is rare to find bias towards women, compared to men.

> *'Generally speaking, Thai society makes it equal for both men and women so I feel no advantage or disadvantage for being a woman.' UV19FB*

This positive attitude towards the public concern, especially on gender equality, makes Thai female faculty members no longer feel that the existence of gender discrimination; thereby believing that they can work side-by-side with men. This argument is consistent with our questionnaire survey which revealed that women seemed to disagree that men were more likely to be promoted than them.

5.3.4 Conclusion: the qualitative results

The opportunity for women to participate in science in the Thai context of higher education has improved at the present time, yet inequality among men and women still exists among Thai faculty members of science-oriented fields. Nevertheless, Thai women in science are less likely to observe such gender discrimination.

There are multi level variables that hinder Thai women from progress in science careers in the higher education context. Firstly, Thai women are required to play the roles of wife and mother, which conflict with the demanding scientific careers. In addition, the social norms prevent Thai women from making connections to the male network in science community. Moreover, based on Thai traditional customs and scientific norms, men are favoured over women so there are barriers to female advancement in Thai higher education. Also, UV female academics were challenged by professional attitudes in several ways (e.g. an exclusion from the engineering field and leaving women with assignments unrelated to career advancement).

In order to survive in the current situation where Thai women are subordinate in science, female academics have deployed a working style such as doing men do; maintaining a smooth relationship; bonding with each other in academic activities; accumulating an advanced professional degree; and relying on rules and regulations in order to deal with the bias against them in science-oriented faculties of Thai higher education. In addition, while some female academics choose to be single, supports from the extended Thai family can also promote women to deal with difficulties in balancing their work and family.

5.4 Comparative findings of quantitative and qualitative analysis on gender equality in science-oriented faculties of Thai higher education

This study aims at raising an understanding of gender issues in science-oriented faculties that exist at a university (UV) in Thailand. Key findings of the quantitative and qualitative results are illustrated in Table 5-7. Findings from both analyses complement each other well, enhancing the understanding of Thai women's status in the science sector of higher education.

This study employs the multilevel analysis, proposed by Layder (1993) as a guide. The various endowment variables and organisational practices were examined in order to explore the gender phenomena and career advancement in Thai higher education.

Firstly, one main question of this research is directed towards investigating whether or not a gender gap exists in the science sector of Thai higher education. This study found a gender gap in this area as female academics were paid 15 percent less than men. This is consistent with the national statistical data that Thai women in science were paid 15 percent less than men as well (National Statistical Office, 2008). Also, given the same characteristics, Thai male faculty staffs were slightly more likely to be promoted than their female counterparts in terms of grade position, however, such a difference is statistically insignificant.

Then, the study investigates the factors affecting the gender difference in science-oriented faculties in Thai higher education. Some factors yielded corresponding results in both quantitative and qualitative analyses while the others were contradictory.

The findings on the impact of family responsibilities on Thai women's advancement are worth mentioning. In the quantitative analysis, the level of shared care in family was negatively related to UV female wages. The qualitative results also indicated that Thai women are expected to place their family as top priority, while men can leave family matters to women. In order to avoid any problem arising from having a family, some Thai women choose to be single. However,

having a supportive husband or family members, Thai married female academics can do well both at work and home.

In terms of organisation practice, the results identified some academic organisation norms, which dictate that science and technology is the male realm. This results in difficulties for Thai women to gain acceptance from male colleagues. The barriers experienced by UV women were determined not only by the bias within the workplace, but also by implicit discrimination such as giving women with assignments unrelated to career advancement in science.

The results revealed the influence of seniority on career advancement for female academics. The qualitative results indicated that, without seniority, it was difficult for Thai female faculty members to be accepted in the science community as junior female academics were likely to be challenged by senior men. The quantitative analysis supports this argument as the multinomial logistic regression analyses showed that younger academics were less likely to be promoted to senior positions. It is noteworthy that, in the quantitative survey, only the young female faculty staff reported gender bias in the workplace. The perception and evidence of bias in the qualitative findings, however, were more broadly expressed by women in all age groups.

Another important finding of this study is the difference of academic career advancement between men and women in Thai higher education on the impact of networks and subject segregation. Thai men can employ social capital gained from their male networks for their career gains, whereas a sense of belonging to a social unit and Thai conservative norms may prevent women from joining the male groups. In addition, as a result of physical differences and customs, Thai female academics have been segregated from hard science subjects such as engineering and this division leaves women with lower reward in science.

However, networks and subject segregation were often mentioned and thus have a greater effect on the qualitative results, rather than quantitative ones in which both variables were not significantly related to wage and grade functions. A lack of effect on social capital and subject segregation in the survey findings confirms the argument of Metz & Tharenou (2001) that a qualitative approach may better

reflect women's experience in the workplace because it opens an opportunity for the participants to reveal barriers and supports to their career advancement.

In order to answer the third research question asking how Thai women react to the gender disparities in academic organisations, the support and career experiences associated with gendered practices in Thai higher education were examined.

The empirical data both in the survey and interview support the concept of cultural capital (Bourdieu, 1986) as academic qualification can increase women's empowerment in science-oriented faculties of Thai higher education. This is also consistent with the review of literature (Park, 2007), which advocates that holding an advanced academic degree signals the capability of scientists and hence increases the advancement opportunity in scientific careers.

In order to survive in the current situation where females are in the male-dominant empire, UV female academics have utilised various strategies including establishing female networks in the workplace in order to secure their status. Adoption of masculine working styles and reliance on rules and regulations can also strengthen their capability and increase their power at work. However, Thai female academics were also likely to maintain a smooth relationship because they attempted to avoid conflicts in the workplace.

Although gender socialisation and hegemonic patriarchy were still reported as obstacles to advancement by UV female academics, suggesting the radical feminism, some of them were of the view that they had the promotion opportunity in science careers. Such a positive attitude towards their equality with their male counterparts in the workplace reflects that Thai female academics are less likely to notice gender differences in career advancement in Thai higher education.

Table 5-7 Comparison of the results across the quantitative and qualitative analyses in science-oriented faculties of Thai higher education

Note: QT = Finding found in the quantitative findings
           QL = Finding found in the qualitative findings

Themes	Main findings	Finding
I. Gender gap in career advancement in the Thai higher education	- Thai female academics were paid 15 percent lower than men and nearly a half originates from the evidence of gender discrimination. - With the same qualification, Thai male academics were more likely to hold senior positions.	QT
II. Factors creating the gender gap in Thai science academic career advancement	Social norms prevent Thai female academics from social capital, leaving them with less access to opportunity in science	QL
	Female underrepresentation in engineering causes Thai female academics have a lower status in science academe	QL
	Double burden of work and domestic responsibility	QT, QL
	Thai science community is a place for men only - Masculine characteristics are more welcomed in Thai science - Thai female academics are assigned in less rewarded job - A lack of seniority makes Thai female academics less accepted	QL QT, QL QT, QL
III. Supports and strategies women draw on in response to the gender bias in the Thai higher education	Academic qualification support Thai women to gaining in academic science	QT, QL
	Bonding with each other empowers female academics in science	QL
	Family supports and single status facilitate Thai female academics to make balance between life and work in academic careers.	QL
	Rules and regulations & working style - UV Rules and regulations - Doing as a male style - Working with compromise	QL QL QL
IV. The perception towards the status of women in Thai higher education	Liberal feminism view: Thai women seem to have an equal status as men in science academe	QL
	Radical feminism view: the norms of Thai tradition value and Thai science community prefer men over women.	QL
	Thai female academic view: gender discrimination is unnoticeable by female academics.	QT, QL

5.5 Conclusion

This chapter has provided an analysis of data collected from academic staff in science-related fields in Thai higher education. The findings revealed that traditional norms towards gender socialisation influence the endowment variables, behaviour, practice and status of men and women in academic careers. Moreover, negative attitudes towards women, embedded in Thai culture and the science community, present barriers to women's advancement in science-oriented faculties of higher education. Such barriers may impact on the career advancement of female academic staff at a greater extent than that of academic qualifications. As a result, Thai women's advancement in scientific careers cannot be achieved by upgrading their profession qualifications alone. Thai female academics also need support from others, which may be beyond their control.

The findings further indicate that as scientific education and the promotion system are applied equally to all, Thai female academic in higher education seem to generally agree that they are equal to men. The gender-neutrality argument has been well accepted, as reflected in the Thai female academics' responses. This suggests that the liberal feminist mindset, rather than the radical one, prevails among Thai women in academic fields.

As different types of institution may have different patterns of professional behaviour, Chapter Six analyses the career advancement of research staff in the Thai context of research agency by providing details of a research institute as the other research setting. Similarities and differences in academic career advancement in relation to gender in these two research settings (the university and the research institute) are discussed in Chapter Seven.

CHAPTER 6

GENDER AND CAREER ADVANCEMENT:

A THAI RESEARCH INSTITUTE CASE

This chapter presents an analysis of the findings of the current research conducted between October 2009 and February 2010, through the administering of 296 completed questionnaires and 19 interviews with the research staff of a Thai research institute. The code assigned to the research institute was RI.

The research results confirmed that the behaviours of men and women are controlled by social norms which apply to both genders differently. Thai women are disadvantaged by Thai social values, claiming that women's practice should be restricted to supporting roles solely; thereby men and women being assigned duties and responsibilities in different aspects both in daily life and careers. Interestingly, the research found that the imbalance in scientific careers between female and male academics has been accepted, rather than being viewed as problematic, by women themselves. Gender inequality is perceived by Thai female academics as part of daily life. Therefore, women in the Thai research organisation are less likely to make gender inequality in scientific careers an issue of concern. Similar to hierarchical or other unfair issues in Thailand, this situation is probably viewed as the norm in Thai society.

Similar to the case of Thai higher education, four main findings are explored. Firstly, the quantitative results found that the gender gap in terms of reward also exists in the Thai research institute context, half of which originates from the difference in treatment (i.e., gender discrimination). According to the qualitative analysis, the findings identified various factors behind the difference in career progression between Thai male and female research staff. The findings suggest that the individual endowments of men and women are operated differently according to the gender socialisation. These include informal networks providing social contacts which are an advantage to male academics, rather than female ones; gender attitudes obstructing women from hard sciences; tradition Thai values

pushing Thai women to focus on family solely, and feminine characteristics that are less welcomed in the Thai science community.

In order to overcome such gender biases, the findings discovered that Thai female research staff operate various professional practices including accumulating academic background; forging women-only networks; and attempting to avoid conflicts. Moreover, Thai female researchers can resort to support provided by their extended family members and colleagues to diminish the family duties. Also, the rules and regulations of Thai bureaucracy, coupled with the seniority system, can facilitate Thai female academics to battle against the gender bias in the workplace. However, the findings uncovered that female researchers themselves are likely to accept the superior status of men in Thai research community because inequality, derived from tradition values, is embedded in the structure of Thai society and its culture.

6.1   Research institute (RI) setting

There were 14 research institutes under the Thai Ministry of Science and Technology (Ministry of Science and Technology, 2011). Among them is RI, which served as the other research site of the current study. RI, established as a state enterprise in the early 1960s, aims at providing scientific services for national competitiveness, with no teaching duties or supervision of postgraduate students required. Operating under the Ministry, RI's recruitment and promotion process are likely to be based on the standard of the Thai bureaucracy, with an exemption from salary scales. This is because RI has a status as 'state enterprise'. As in the case of UV, RI is mainly supported by government funds.

Apart from the head office in Bangkok, three subsidary research units are situated in the main provinces of Thailand. However, the survey for this research was conducted with the staff in the Bangkok office only. Similar to the case of UV, Bangkok campus of RI is central to conducting key research areas, with numerous laboratories and facilities. Most of the research staff is stationed in this campus, where the core functions of academic administration are also located.

In RI, the organisational structure was divided into five sections: research development for sustainable development; research development for bio-industries; industrial services; business development and marketing; and administration. However, this study only focused on the sections related to research and development in sustainable development and bio-industries, which are of the most concern in the science research projects.

It is noteworthy that, although the researcher gained full access to RI in order to carry out the questionnaire and interviews, there was limited statistical information with reference to the gender comparison, as reflected in its annual report having no information on staff profiles classified by gender. Similar to UV, RI did not pay attention to classifying the statistical data related to personnel by gender. This suggests that gender issues are disregarded, either in Thai higher education or research institute sectors.

Similar to the UV case, the promotion process in RI is treated with confidentiality. According to Bowornwathana (2000), in the Thai public organisation, information related to career promotion is likely to be secret as a usual practice. However, the human resources department at RI was willing to provide raw data on the personnel, including the details of gender (classified by Mr, Miss, Mrs), positions, educational background, and marital status.

As in the case of UV, the evidence of gender discrimination in terms of 'sticky floor' does not exist in the RI. The total number of RI employees was approximately 1,400 and half of them were female, this proportion was nearly equal to the proportion of the female scientific personnel at national level (National Science Technology and Innovation Policy Office, 2007), as shown in Figure 6-1.

Figure 6-1 Academic employment by gender at national level and observed at RI
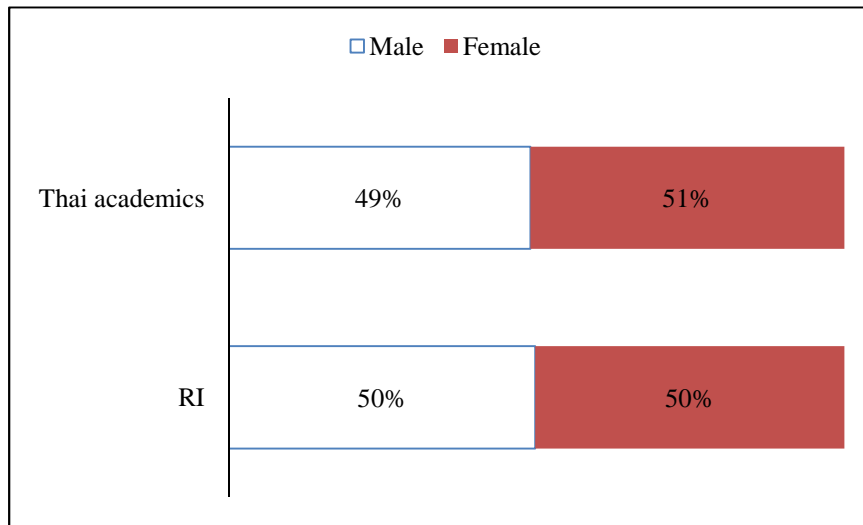
However, female researcher in RI tended to cluster in subject areas involving the soft sciences (i.e., chemestry and pharmacology) while more men tended to work in the engineering department, as shown in Figure 6-2. It should be observed that as women are underrepresented in the engineering field, they were likely to be implicitly excluded from the overseas educational scholarships programme, supported by the Ministry of Science and Technology. The programe mainly targets those studying in engineering because this field is determined as one of the key areas to the national development (National Innovation Agency, 2007). For this reason, more men (59 percent) than women (41 percent) in RI earned an overseas degree.

Figure 6-2 Employment proportion by gender in the main science departments of RI in 2008
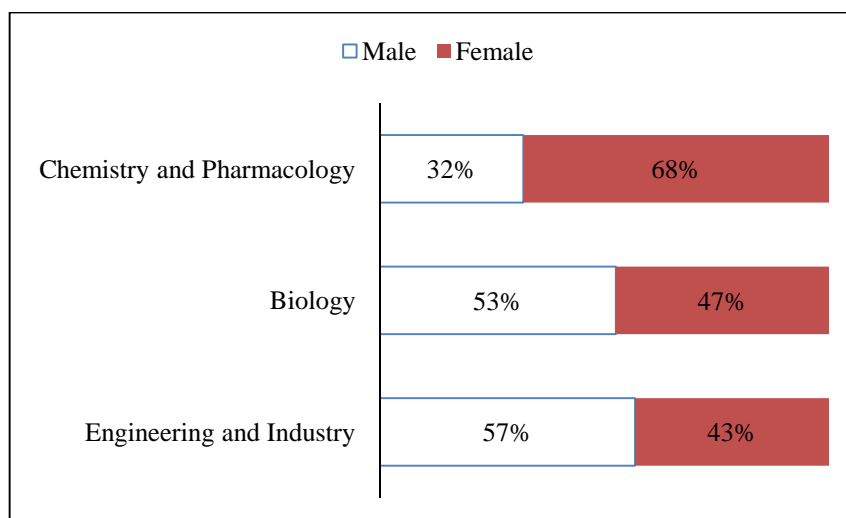
Similar to the UV case, the evidence of 'glass ceiling' was also found in RI. Although a half of the RI staff was female, only one-third of top management positions were held by women, as shown in Figure 6-3. The reason why RI women were underrepresented in top executive posts could be obtained from the executive profiles. To become a top executive at RI, the possession of a degree in either engineering or from abroad seemed meaningful. Consequently, women may find it difficult to reach executive positions at RI either because they were underrepresented in engineering fields or had a lower opportunity to secure an overseas scholarship. This could be noticed from the fact that since its establishment in the early 1960s, of the thirteen top executives, only two have been female (a female leader was appointed in 2005 for the first time). Nevertheless, females were likely to hold the top positions in the chemistry and phamaceutical departments, where women outnumbered men, as shown in Figure 6-4. This suggests that career progression among men and women at RI may vary with scientific areas.

Figure 6-3 Employment by grade of RI in 2008
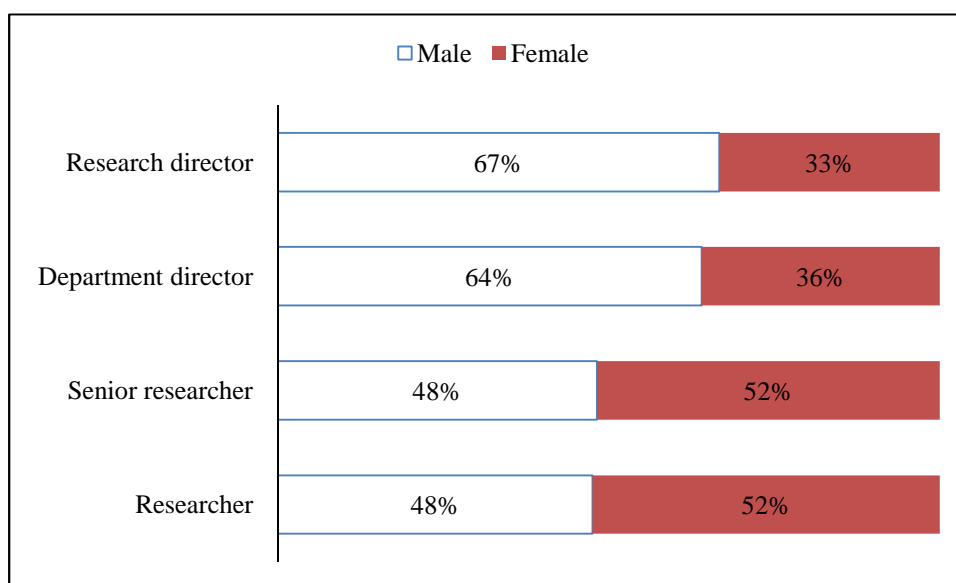
Source: RI staff profiles, 2008

Figure 6-4 Proportion of male and female staff employed of RI in 2008 arranged by department and seniority level
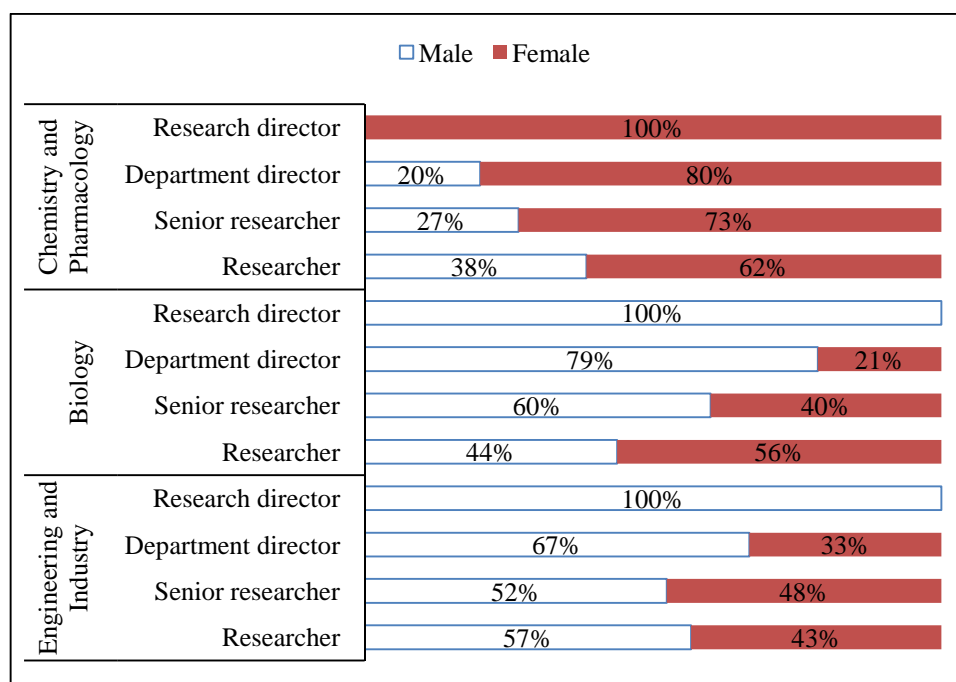
Source: RI staff profiles, 2008

There was also some difference in the marital status between male and female research staff as shown in Figure 6-5. The RI staff profile presented that 53 percent of male staff were married whereas only 37 percent of female employees were. Further, the proportion of divorced female researchers was nearly double that of men. This suggests that scientific work in RI may delay female staff's decision about marriage and that family formation affects the female staff more than their male peers.

Figure 6-5 Employment by marital status in RI
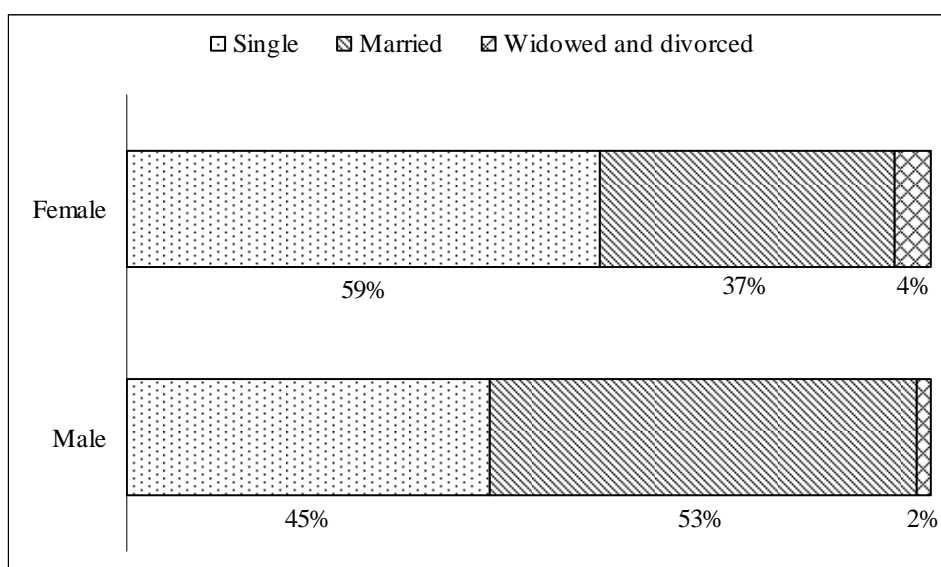
Source: RI staff profiles

6.2 The quantitative analysis

This section relates the quantitative results to the first research question asking whether a gender gap in terms of reward exists in Thai research science and also determines whether such a gap is derived from difference in individual variables or difference in treatment toward men and women even when they have the same qualification (i.e., gender discrimination). Similar to the UV case, wage regression for Thai male and female researchers were estimated to measure the decomposition of gender pay gap by using the Oaxaca Decomposition (1973) while multinomial logistic regressions were employed in order to compare the probability of employment in each grade position between men and women in the Thai research institute. The perception towards gender equality in the Thai research organisation is also explored.

6.2.1 Profiles of the research participants

The completed questionnaire sample size conducted with RI's research staff was 296, in which a detailed analysis of the participants' demographic data was illustrated in Table 6-1.

In general, female RI research staff were less likely to hold a doctoral or overseas degree, work in engineering areas, and have a family. The data suggests that the male researchers were likely to have a better opportunity in terms of education and face fewer restrictions in terms of overseas education. In addition, the data revealed that, strong gender segregation to employment within the science and technology disciplines was found in RI as female researchers were dominated by male counterparts in engineering. The descriptive data also presented that RI female research staff was likely to be single. The evidence suggests that RI female research staff may anticipate more family responsibilities; thereby delaying their decision about marriage in order to advance their academic career. On average, RI female researchers were young and likely to actively engaged in academic networking.

Table 6-1 Respondents' socio-demographic characteristics observed at RI

Socio-demographic variables		Male (N=153)	Female (N=143)
Gender		52%	48%
Seniority	Age 55+	81%	19%
	Age 45-54	59%	41%
	Age 35-44	48%	52%
	Age < 35	48%	52%
	Average ages	39.8	37.3
	(Standard deviation)	(±8.9)	(±7.3)
	Year in org. 20+	42%	58%
	Year in org. 10 -19	73%	27%
	Year in org. < 9	52%	48%
	Average years in org.	11.4	10.4
	(Standard deviation)	(±7.6)	(±6.5)
Education degree	Overseas doctoral degree	56%	44%
	Domestic doctoral degree	83%	17%
Subject area	Hard science (e.g. engineering, physics and mathematics)	65%	35%
	Soft science (e.g. chemistry, pharmacology and biology)	34%	66%
Academic performance	More than 3 publications	55%	45%
	1- 3 publications	50%	50%
	No publication	47%	53%
	Average publication	2.8	2.6
	(Standard deviation)	(±2.7)	(±2.6)
Network	Level of participation in formal network (academic activity)	3.0	3.1
	(Standard deviation)	(±0.9)	(±0.8)
	Level of participation in informal network (non-academic activity)	2.9	2.9
	(Standard deviation)	(±1.0)	(±1.0)
Job	% Academic work	65%	66%
	% Management work	19%	17%
	% Document work	16%	17%
Family formation	Married with child	62%	38%
	Married without child	59%	41%
	Single	45%	55%
	Career break	65%	35%
	Level of shared care in family	3.7	3.9
	(Standard deviation)	(±1.1)	(±1.0)

Source: RI survey data, between October 2009 and February 2010

6.2.2 Data screening

As mentioned in the previous chapter, in order to ensure the validity and reliability of statistical calculations, the multivariate normality and the absence of multi-collinearlity are tested with RI's sample data.

Fisher skewness coefficient and kurtosis coefficient were calculated in order to examine the normality assumption as presented in Appendices 3.1 –3.2. As conducted with the UV sample data, the researcher adjusted the publication variable into dummy variables in order to solve the deviation of this variable from normality, coding as three values: over three publications; one to three publications; and no publication as the reference group.

Then Pearson correlation of the variables for RI was calculated in order to examine the multi-collinearity problem as presented in Appendice 3.3 –3.5. Similar to the UV case study, years of age variable versus years in the organisation and a marriage with child variable versus career break had a high degree of correlation (over 0.80) (Field, 2009). As in the UV case, years in the organisation variable and the career break variable were then excluded from the model.

Overall, the quantitative analysis conducted with RI samples scoped the independent variables: age, a domestic doctoral degree, an overseas doctoral degree, subject areas, publications, formal and informal networks, marriage without child, marriage with child, and family care, all of which were thus applicable to the multivariate data analyses.

6.2.3 Gender gap and hypothesis test for factors affecting science career advancement in Thai research institute

The gender gap in Thai science research institute is presented in Table 6.2. The descriptive data indicated that a gender pay gap exists in RI as the pay differential between men and women was 12 percent. In addition, the difference in academic career advancement was observed by positions in the organisational hierarchy. The RI data suggested that although both male and female research staff started at the bottom in nearly the same proportion, the male ones were likely to occupy top

positions because they accounted for 65 percent in research director positions, presenting evidence of a glass ceiling in RI.

Table 6-2 Gender difference in career advancement in RI

Career advancement	Male	Female
Monthly salary	£825	£739
	(S.D. = ±339.52)	(S.D. = ±254.97)
Gender pay gap 12%		
Gender grade gap		
Research director	65%	35%
Department director	56%	44%
Senior researcher	51%	49%
Researcher	49%	51%

Source: RI survey data, between October 2009 and February 2010

As discussed in the literature review, there may be some differentials in career advancement between male and female academics in science in accordance with their endowment variables. This section thus focuses on testing the hypotheses whether or not the endowment variables of research staff would predict gender differences in academic career advancement in terms of wage and grade in Thai research science as follows:

Hypothesis 1: Academic career advancement in Thai research institute is related to seniority: workers who are older are more likely to hold higher grade positions and receive better pay.

Hypothesis 2: Educational background contributes to the success in Thai academe: workers with doctoral or overseas qualification are more likely to be in higher positions and receive better pay.

Hypothesis 3: Thai academic career progress may vary within science fields: men are more likely to work in hard sciences while women in soft sciences. We test whether or not the different outcomes reflect different rewards across science disciplines.

Hypothesis 4: Thai academic career progress is enhanced by academic performance: workers with more publications are more likely to have higher positions and income.

Hypothesis 5: Thai academic career advancement may be supported by networks: workers who have actively engaged in networks – formal or informal - are more likely to be in senior positions and better rewarded.

Hypothesis 6: Family formation may be important in explaining the obstacles in Thai academic career advancement: family responsibilities are likely to reduce the probability of workers being employed in senior positions and receive more income.

6.2.4 Estimating decomposition of gender wage differences in Thai research institute

In order to inspect the hypotheses and demonstrate the details of how much of the total pay gap in Thai research institute was derived from individual endowments or discrimination through the Blinder-Oaxaca Decomposition (Oaxaca, 1973), the RI wage functions were estimated by multiple regressions, as presented in Table 6-3. The RI wage regression reflects that female researchers in RI seemed to be better paid if they were older, hold an overseas doctoral degree, or employed in higher grade positions. For RI male workers, those who were older, hold a doctoral degree, had publications, or were employed in higher grade positions were likely to earn more. The data accepted the hypothesis assumption that being better paid in science is related to seniority, educational background, academic performance, and higher grade positions.

Table 6-3 Wage regressions by gender in RI

Independent variables		Female			Male		
		B_F	Sig.		B_M	Sig.	
Constant		6.04	0.00		6.06	0.00	
Seniority	Age	**0.01**	**0.01**		**0.01**	**0.03**	
Educational degree	Overseas doctoral degree	**0.23**	**0.00**		**0.07**	**0.05**	
	Domestic doctoral degree	0.06	0.23		**0.10**	**0.04**	
Subject area	Hard science	0.04	0.07		0.02	0.25	
Academic performance	More than 3 publications	0.03	0.19		**0.09**	**0.03**	
	1-3 publications	0.02	0.34		**0.12**	**0.01**	
Network	Level of participation in formal network	-	0.01	0.23		0.01	0.26
	Level of participation in informal network		0.01	0.30	-	0.02	0.14
Family formation	Married with child	-	0.01	0.44		0.10	0.01
	Married without child		0.09	0.01		0.02	0.33
	Level of shared care in family		0.01	0.25		0.01	0.44
Grade	Research director	**0.60**	**0.00**		**0.80**	**0.00**	
	Department director	**0.50**	**0.00**		**0.62**	**0.00**	
	Senior researcher	**0.25**	**0.00**		**0.22**	**0.00**	
Adjusted R Square			0.77			0.74	

Note: 1. Dependent Variable: ln (Wage)
       2. Statistic significance of 5 percent level (one-tailed test) indicated by bold

In order to examine whether or not the model fits the observed data, firstly the outliers were examined. As presented in Appendix 3.6 – 3.7, less than one percent of the sample had standardised residuals with an absolute value greater than 2.58 (0.0 percent of RI female samples and 1.0 percent of RI male samples). Hence, the model was appropriate for representing the actual data (Tarling, 2009). Secondly, the assumptions including normality of residuals, homoscedasticity, and linearity were found to satisfy the generalisation of the model (Field, 2009; Tarling, 2009). The histogram and the normal probability plot line, both in the RI male and RI female samples, are illustrated in Appendices 3.8 – 3.9. The histogram plots of the residuals were similar to the normal curve with the same mean and the standard deviation of the data. Moreover, most points of the normal probability plot were paralleled on the normal distribution line. This means that the residuals were normally distributed. Finally, the graph of the standardised residuals versus the predicted values was presented, in which all the points scatter randomly and throughout the graph, indicating that the assumptions of homoscedasticity and linearity were satisfied.

Given the RI's wage regressions by gender, p-value < 0.05 significance level (one-tailed test) was applied to determine the individual significance of the coefficients in the wage equations. The female RI wage regression indicates adjusted R square $= 0.77$. The factors positively influencing female wages in RI were age, overseas doctoral degrees earned, and grade positions. However, at the 95 percent level of confidence, no significant difference was found between the wages of RI female workers, whether or not they had a domestic doctoral degree, worked in any subject, had publications, engaged both in formal and informal networks, or by family formation.

The RI male wage regression indicates adjusted R square $= 0.74$. The regression result showed that age, an overseas doctoral degree earned, a domestic doctoral degree earned, publications, and grade positions were significantly positive relevant to male wages. However, at the 95 percent level of confidence, no significant relationship was found between the wages of RI male workers, by subject area, engaged both in formal and informal networks, or by family formation.

Blinder-Oaxaca Decomposition of gender wage differences, as presented in Figure 6-6, was then calculated by utilising the information from the RI wage functions in Table 6-3 in order to illustrate the details of how much of the total pay gap was derived from individual endowments or gender discrimination. The variables with a significant effect on wage regressions: publications; age; educational degree; and grade were examined.

Figure 6-6 Decomposition of gender pay gap in RI
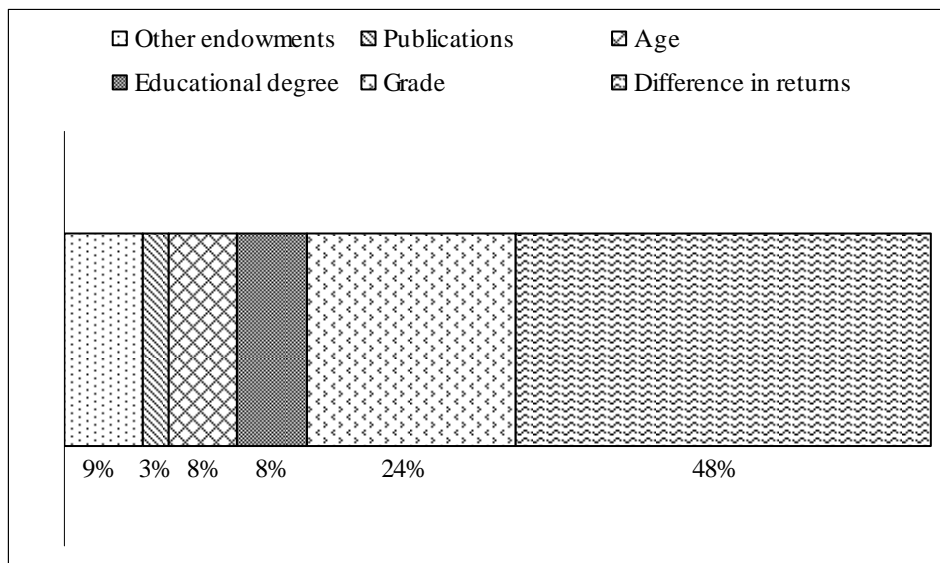
The findings illustrated that the difference in characteristics accounted for 52 percent of the overall gender pay gap in RI: 24 percent of which was generated from men employed at higher grades; 8 percent of which came from men holding higher educational qualifications (doctoral degree or overseas degree); and another 8 percent of which were originated from men being older than their female peers.

The other half of the RI pay gap was derived from the differences in treatments for men and women, meaning evidence of gender discrimination. As stated in the UV case, wage differentials as a result of difference in rewards can be seen in the difference of the coefficients within the same variables across RI male and female wage regressions. The positive sign of such difference indicates that a wage advantage for male workers exists.

Thus a positive sign of the difference of the coefficient within the domestic doctoral degree variable ($B_{M \text{ domestic degree}} = 0.11$ and $B_{F \text{ domestic degree}} = 0.06$),

publication one ($B_{M \text{ over 3 publications}} = 0.09$ and $B_{F \text{ over 3 publications}} = 0.03$), and grade position one ($B_{M \text{ Grade A}} = 0.80$ and $B_{F \text{ Grade A}} = 0.60$) in the RI wage function as shown in Table 6-4 suggests that even with the same academic qualifications (i.e., the number of publications, similar doctoral degrees or being employed in the same grade position), Thai female research staff had been less well rewarded than their male colleagues in terms of wage. This result is consistent with Ceci & Williams (2011)'s work that gender discrimination in science is largely cited on the grounds of unfairness in rewards on academic qualifications, research publications and academic positions.

In conclusion, a gender pay gap was found in RI as we can identify the pay differentials between male and female research staff employed in RI at 12 percent. Nearly half of such a pay difference presents evidence of discrimination; most of which stems from the differences in treatment for men and women, even when they have the same academic qualification.

6.2.5 Estimating the gender grade gap in Thai research institute

This study has applied the multinomial logistic regression, as shown in Table 6-4, with the RI sample in order to test the hypotheses that the endowment variables would significantly predict career advancement in terms of grade in Thai research institute. The evidence suggests that age and privileged education were identified as main criteria for promotion to more senior levels in Thai research institute. However, in order to be promoted to top ranks such as a research director position, engaging in a formal network have become the key factor. Conversely, for middle senior positions such as a department director position, academic publications are identified to be meaningful. These results are confirmed by the hypothesis testing that seniority, educational background, engaging in a formal network as well as academic outputs can contribute to the success in Thai research institute.

Table 6-4 Multinomial logistic model – Thai research science (RI)

Variables		Research Director		Department director		Senior researcher	
		$B_{Grade A}$	Sig.	$B_{Grade B}$	Sig.	$B_{Grade C}$	Sig.
Intercept		- 58.90	0.00	- 36.15	0.00	- 9.44	0.00
Gender	Male	- 2.30	0.02	- 0.77	0.10	- 0.39	0.15
Seniority	Age	**0.63**	**0.00**	**0.33**	**0.00**	**0.19**	**0.00**
Educational degree	Overseas doctoral degree	**4.22**	**0.00**	**3.50**	**0.00**	**1.82**	**0.00**
	Domestic doctoral degree	**4.76**	**0.01**	**4.98**	**0.00**	**3.29**	**0.00**
Subject area	Hard science	1.19	0.11	- 0.19	0.37	- 0.10	0.39
Academic performance	More than 3 publications	**20.77**	**0.00**	**17.82**	**0.00**	0.01	0.49
	1- 3 publications	**20.06**	**0.00**	**18.41**	**0.00**	0.75	0.06
Network	Level of participation in formal network	**1.49**	**0.01**	0.54	0.06	0.27	0.12
	Level of participation in informal network	- 0.19	0.34	- 0.04	0.45	- 0.12	0.26
Family formation	Married with child	2.16	0.03	- 0.09	0.45	0.36	0.20
	Married without child	2.48	0.03	1.19	0.04	- 0.51	0.15
	Level of shared care in family	0.42	0.19	0.35	0.12	0.31	0.05

Model Fitting Information

-2 Log Likelihood (intercept only)	683.78
-2 Log Likelihood (final)	390.57
Chi-Square	293.21
Degree of freedom	36.00
Sig.	0.00
The overall correct percentage of prediction	70.61%
Grade A (Research director)	64.71%
Grade B (Department director)	38.46%
Grade C (Senior researcher)	62.14%
Grade D (Researcher)	86.86%

Note: 1. Researcher as reference group

2. Statistic significance of 5 percent level (one-tailed test) indicated by bold

The effectiveness of RI multinomial logistic model was confirmed by multiple indicators, including the model's overall test of all explanatory variables, the predictive power of the model, and the statistically significant tests of each explanatory variable. The log likelihood of the full model was 390.57, and the log likelihood with constants only was 683.78, namely, the final model was more effective than the null one. The chi square values rejected the null hypothesis that the full model did not have any greater explanatory power than an "intercept only" one (p-value < 0.05). This meant that at least one explanatory variable was a significant predictor of being employed in a research position (Peng & Nichols, 2003). Moreover, the overall correct percentage of prediction was 70.61 percent, meaning that the multinomial logistic model can predict the individual probabilities of being employed in each grade position nearly equal to the sample proportions (Tarling, 2009).

It is noteworthy that, in this case, the 0.05 significant level (one-tailed test) is applied to determine the individual significance of the coefficients in RI multinomial logistic regression. This evidence suggests that the Thai research staff who were older or had a privileged education (i.e. an overseas doctoral degree and a domestic doctoral degree) were more likely than their counterparts to secure higher senior positions in Thai research institute (p-value < 0.05), holding all other explanatory variables constant. Specifically, the likelihood of Thai research staff holding the researcher director and department director positions was positively related to publications. In addition, the likelihood of a research staff holding the research director position was positively related to engagement in a higher level of formal networks. However, no significant difference was found in those holding senior positions, whether they were men, worked in any subject, engaged in informal networks, or with family formation.

Then, in order to determine whether RI male research staff or their female counterparts are more likely to be promoted to senior positions with the same qualifications, the gender grade gap was estimated by evaluating the probabilities of males and females being employed in a particular grade using RI's multinomial regression models as shown in Table 6-4. Only the variables with a significant

effect on RI multinomial logistic model: age; educational degree; publications; and the level of participating formal networks were examined.

Given that gender was insignificant in RI multinomial regression models, it seemed that women would be equally likely to be promoted as men, with similar qualifications. However, it can be noticed that women were less likely than men to remain in lowest grades. As shown in Figure 6-7, when controlling, by average, age (40 years) and publications (3 publications) variables, the probability of being a researcher was 0.85 for women compared with 0.89 for men.

Figure 6-7 Evaluated probabilities of being employed in each grade (given average age and publications) in RI
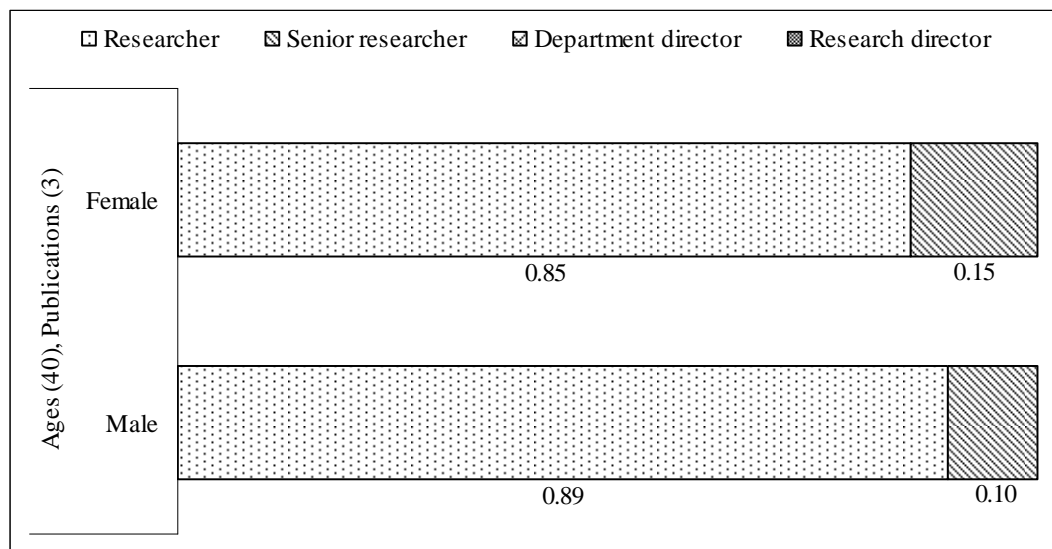
Note: The probability of females and males being employed in a research director position and a department director position = 0

Additionally, the findings revealed that RI female research staff seemed to gain greater benefits from age, publications, education, and formal networks. Noticeably, most of these factors are related to academic involvement. In other words, with good academic background, Thai women are more likely to hold higher grade positions in Thai research institute.

Evidence of the probabilities of males and females of different ages being employed in a particular grade in Thai research institute is shown in Figure 6-8. The evaluated probabilities indicate that career prospect for female research staff in science is getting better as they become older. For example, at the age of 55, RI female staff had a higher probability of holding top positions than men (the probability of being a department director was 0.15 for women and 0.10 for men).

Figure 6-8 Evaluated probabilities of being employed in each grade by age (given average publications) in RI
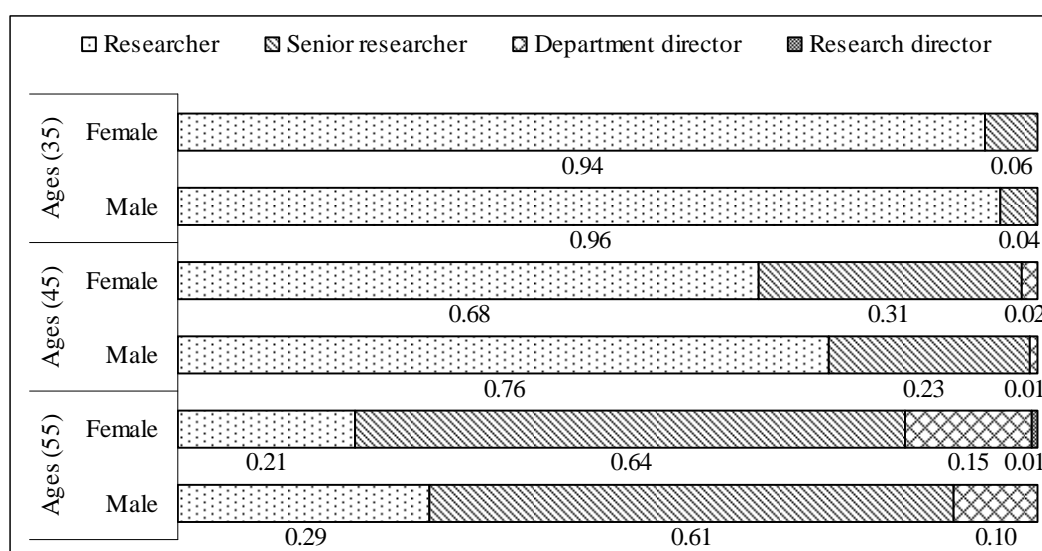
Given the impact of academic outputs on the distribution of employment across grades as shown in Figures 6-9, it was clear that with the same number of publications, Thai female research staff were more likely to be employed in higher grades. For example, amongst those with more than three publications, the relative probabilities of being a senior researcher were 0.26 for women and 0.20 for men. This finding is consistent with the literature (Park, 2007), reflecting that female academics with more publications are likely to attain career advancement.

Figure 6-9 Evaluated probabilities of being employed in each grade by publications (given average age) in RI
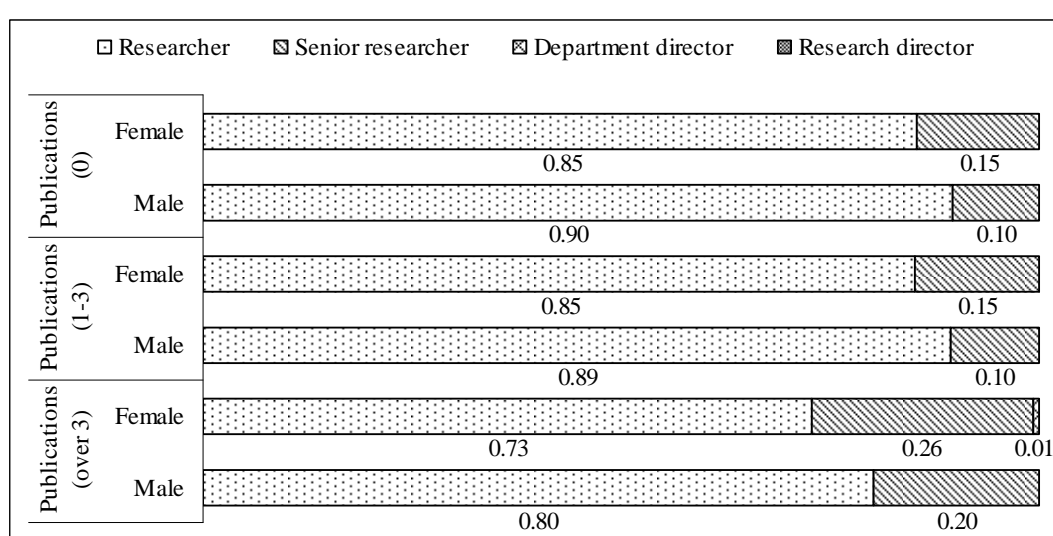
Note: The probability of females and males being employed in a research director position = 0

According to the model when controlling for the differences in educational background as shown in Figure 6-10, women were more likely to be employed in higher grades in Thai research institute. For those holding an overseas doctoral degree, the probability for women of being a department director was 0.08, compared with 0.05 for men. Holding a domestic doctoral degree, the probability for women of being a department director was 0.12, compared with 0.08 for men.

Figure 6-10 Evaluated probability of being employed in each grade by educational degree (given average ages and publications) in RI
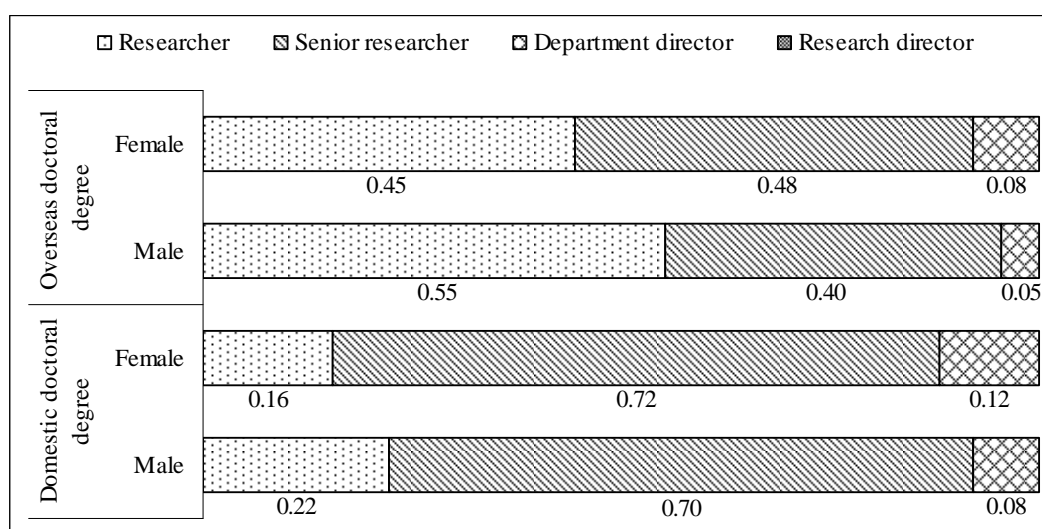
Note: The probability of females and males being employed in a research director position = 0

In addition, the evaluated probabilities indicate that Thai women, rather than men, were more likely to be employed in higher grades when engaging in the same level of networks, as shown in Figure 6-11. For example, in the case of workers who always participate in academic activities, the relative probability of being a department director was 0.05 for women and 0.02 for men.

Figure 6-11 Evaluated probabilities of being in each grade by formal networks (given average age and publication) in RI
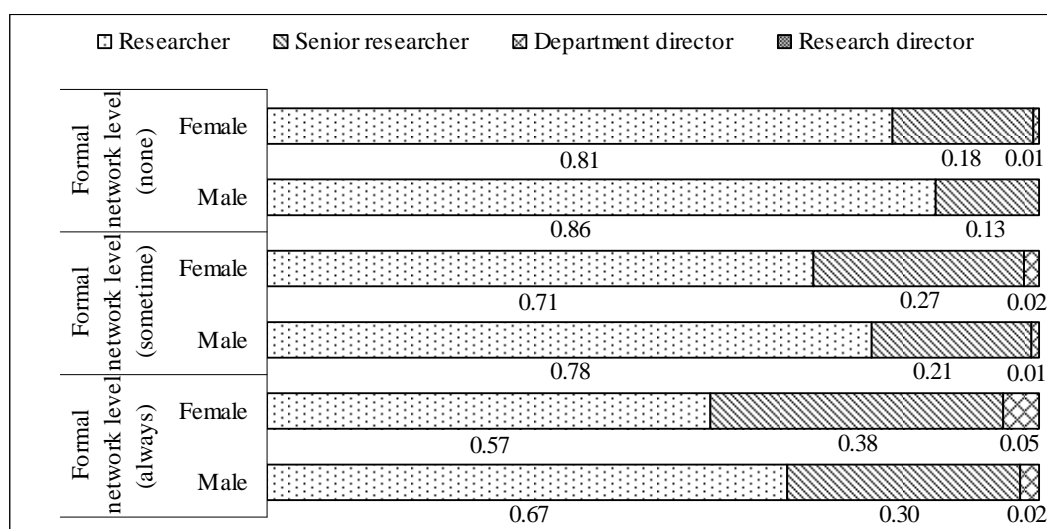
Note: The probability of females and males being employed in a research director position = 0

6.2.6 Perception towards gender equality in Thai research institute

As in UV, the RI research staff were asked whether they agreed or disagreed with the following statement: "[e]ven with the same qualification, men have more promotion opportunities than women do" in order to know how research staff members perceive their situation in terms of gender equality at work in Thai research institute. The question was coded 1-5 score where strongly disagree with the statement = 1 score, neither agree nor disagree = 3 score, and strongly agree = 5 score.

Considering the attitudes towards gender equality in RI classified by gender as presented in Figures 6-12, the findings revealed that gender bias in RI in terms of career opportunity was not perceived among female research staff. Over half of the

RI female researchers disagreed that men have more opportunity to be promoted in Thai research institute whereas only a few were of the opinion that women in science are treated unequally with men in the workplace. On average, a mean value of perception towards gender difference in career advancement in Thai research institute for female academics (mean scores = 2.10) was slightly higher than with that of men (mean scores = 2.06). As for the result of t-test analysis, the mean value between genders in attitudes towards gender disparities in academics indicated no difference at 0.05 significance level (as detailed in Appendix 3.10A).

Figure 6-12 Attitudes towards gender difference career advancement for RI research staff "Even with the same qualification, men have more promotion opportunities than women do" by gender
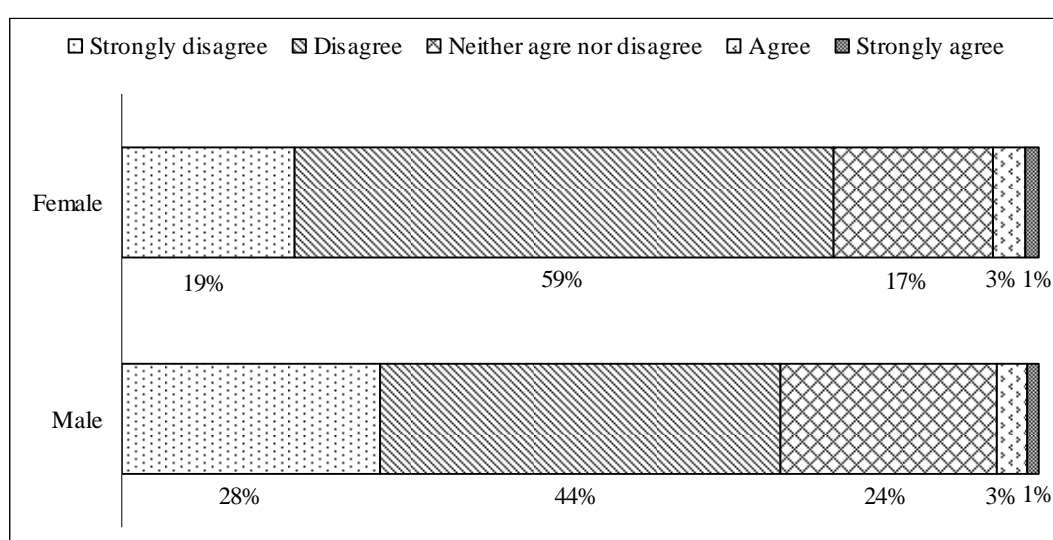
Note: RI female academics' mean scores = 2.10
          RI male academics' mean scores = 2.06

However, the findings suggest that female research staff with more senior positions were likely to perceive a gender bias in Thai research institute. As shown in Figures 6-13 concerning the female respondents' opinions classified by grade position, those being employed in the research director positions were more likely, than their junior female counterparts, to perceive that men tended to be promoted than women (female research director' scores = 2.50 and female researcher' scores = 2.13). This means that the gendered barrier may not be found in RI at the early stage of research careers, whereas it is likely to occur in the top positions. This is relevant to the RI staff profile that although the evidence of 'sticky floor' was not found, the situation of 'glass ceiling' was likely to happen. However, according to the one-way ANOVA result shown in Appendix 3.10E, which was applied to test

the association between grade position and attitude towards gender bias in RI, the evidence did not present any significant difference between being employed in any grade position and the perception of gender inequality among the RI female respondents at 0.05 significance level (p-value > 0.05).

The findings also revealed that male researchers with more publications were likely to believe that men and women, in fact, can equally receive the chance for success in Thai research institute. As shown in Figures 6-13 concerning the male respondents' opinions classified by number of publications, those with more publications were less likely, than their counterparts without any publication, to perceive that men seem to get more promoted than women in the workplace (men with over 3 publications' scores = 1.93 and men with no publications' scores = 2.70). According to Hesse-Biber et al. (2004), people who are in privilege class are less likely to recognise bias in the field. Therefore, RI male research staff with a greater number of publications, seen as an elite in academic careers, might be less likely to perceive inequality in the career field. According to one-way ANOVA test as shown in Appendix 3.10B, the evidence also presented the difference in the number of publications and the perception of gender inequality among the RI male respondents at 0.05 significance level (p-value < 0.05). Hence, for RI male staff, there is an association between the academic performance and attitudes towards gender bias in science.

Figure 6-13 Attitudes towards gender difference in career advancement in Thai science research institute "Even with the same qualification, men have more promotion opportunities than women do" in RI
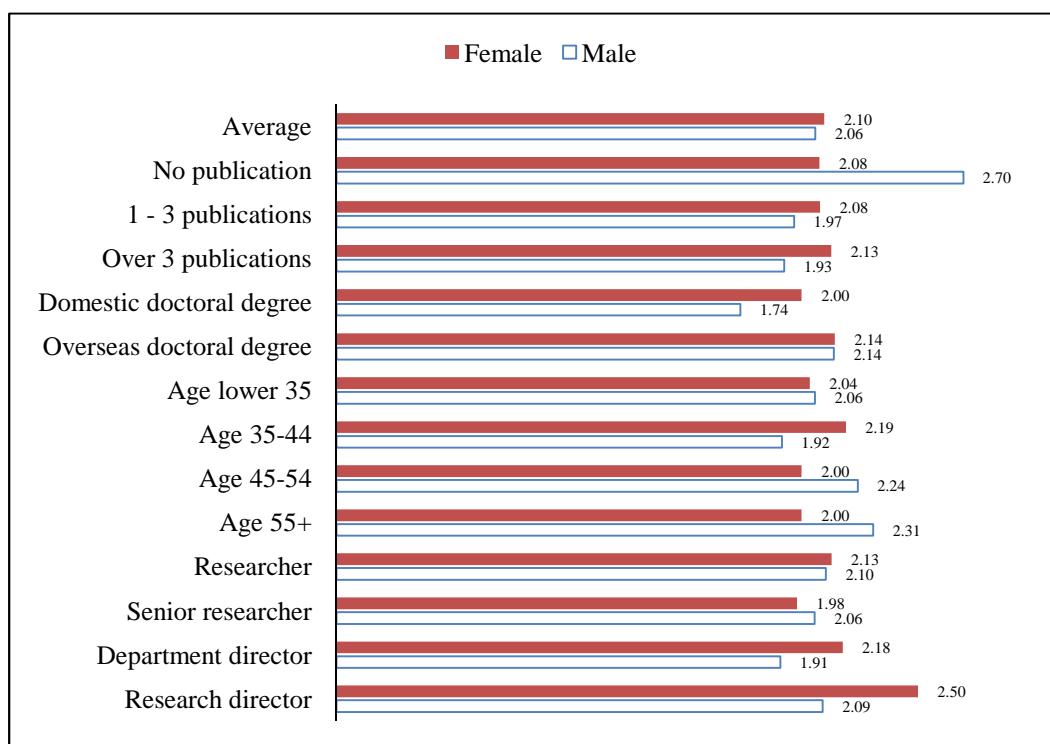
Note: The question is coded 1-5 score where strongly disagree with the statement = 1 score, neither agree nor disagree = 3 score, and strongly agree = 5 score

6.2.7 Conclusion: the quantitative results

This study found a 12 percent gender pay gap in Thai research institute. Over a half of the wage differentials resulted from characteristics associated with individual endowments, such as the RI's male staff being employed in higher grades, better educated, and also older. In turn, the other half of the gender pay gap originated from the difference in rewards. Even male and female researchers had similar academic qualifications (i.e., having the same number of publications, sharing a similar educational degree or being employed in the same grade position), women were likely to be less paid.

In turn, it seems that, if women have the same characteristics or endowments as men, particularly in terms of academic qualification, women are likely to be promoted equally to men. That is because the academic background is an important criterion for being promoted in senior position in Thai academic organisation. Therefore, if both genders can acquire the same academic degree, they are likely to achieve the same career gains.

The differences in career outcomes may be attributable to the difference in scientific disciplines between men and women in Thai research science. As argued by Astin (1984), the paid advantage in science is not always generated from the difference in effectiveness in producing academic productivity. If researchers belong to some fields of less recognition, they may have a lower opportunity in terms of monetary reward; no matter how many research publications or how much research quality they may have. In Thailand, hard science, rather than the soft science, is more likely to be highly valued by the scientific society due to an emphasis on industrial-technological development (Wailerdsak & Suehiro, 2004). Hence, research products from hard science are better rewarded than those from soft science. The evidence can be seen in the Thai R&D expenditures allocated to hard science at 40 percent, higher than that to be allocated to soft science subjects at 36 percent (National Science and Technology Development Agency, 2008). For this reason, although women and men can produce the same number of publications, RI women who concentrate on soft science tended to be less paid than men who focus on hard science. Similar to the UV case, although the gender gap in career advancement seems to happen in Thai research institute, RI female

researchers were likely to agree that men and women are treated equally in Thai research institute.

The conclusions of the hypothesis tests based on the wage regression and the multinomial logistic regression examined with research staff in RI is presented in Table 6-5. The finding illustrated that, in Thai research institute, older workers and those with overseas education are likely to earn more and be employed in more senior positions. This suggests that seniority and academic degree are the main criteria to make progress in Thai research institute.

Overall, as occurred in UV, the RI quantitative results can be interpreted in connection with the literature which advocates that the cause of the gender gap in career advancement originates from both the difference of individual characteristics (Stack, 2004) and gender discrimination (Sonnert, 1999). However, in order to understand the reasons behind this gender phenomenon, the next section discusses the qualitative analysis for interpreting the quantitative findings.

Table 6-5 Summary of hypotheses and results of wage regression and multinomial logistic model in Thai research institute

Hypotheses		Variables	B	Wage		Grade		
	Hypotheses	Variables	B	Women	Men	Researcher director	Department director	Senior researcher
H1	Academic career advancement in Thai research institute is related to seniority: workers who are older are more likely to hold higher grade positions and receive better pay.	Age	$B > 0$	√	√	√	√	√
H2	Educational background contributes to the success in Thai academe: workers with doctoral or overseas qualification are more likely to be in higher positions and receive better pay.	Overseas doctoral	$B > 0$	√	√	√	√	√
		Domestic doctoral	$B > 0$	X	√	√	√	√
H3	Thai academic career progress may vary within science fields: men are more likely to work in hard sciences while women in soft sciences. We test whether or not the different outcomes reflect different rewards across science disciplines.	Subject area	$B \neq 0$	X	X	X	X	X
H4	Thai academic career progress is enhanced by academic performance: workers with more publications are more likely to have higher positions and income.	Publications	$B > 0$	X	√	√	√	X
H5	Thai academic career advancement may be supported by networks: workers who have actively engaged in networks – formal or informal - are more likely to be in senior positions and better rewarded.	Formal network	$B > 0$	X	X	√	X	X
		Informal network	$B > 0$	X	X	X	X	X
H6	Family formation may be important in explaining the obstacles in Thai academic career advancement: family responsibilities are likely to reduce the probability of workers being employed in senior positions and receive more income.	Married with child	$B < 0$	X	X	X	X	X
		Married without child	$B < 0$	X	X	X	X	X
		Shared care in family	$B < 0$	X	X	X	X	X
H7W	Wages are related to grades or positions; those who are in higher positions are more likely to be better paid.	Researcher director	$B > 0$	√	√			
		Department director	$B > 0$	√	√			
		Senior researcher	$B > 0$	√	√			
H7G	Grade position is related to gender; men are likely to be in more senior positions.	Men	$B > 0$			X	X	X

Note: √ = Finding found the hypothesis accepted at significance at p-value = 0.05 level
        X = Finding found the hypothesis rejected at significance at p-value = 0.05 level

6.3   The qualitative analysis

As in the UV case, the findings in the 3 broad themes, composed with 11 sub themes are extracted from the original data as illustrated in Table 6-6: the factors creating the gender difference in career advancement in Thai research institute, support or strategies Thai female researcher employ in response to gender disparities in research careers, and the perception towards gender equality in Thai research science. In this regard, the multilevel analysis (Layder, 1993) is employed as main conceptual guide to understanding the experience of research staff in relation to gender and career advancement in Thai scientific careers.

The researcher approached 19 members of the research staff in RI across various backgrounds through social contacts and the snowball technique: 13 were female and the other 6 were male. 3 of the interviewees were research directors, another 4 were department directors, 8 were senior researchers and the other 4 were researchers. 3 had graduated with a bachelor degree, 13 with a master's degree, and the other 3 were doctoral graduates. Among them, 6 had earned a foreign degree. 10 were married, another 8 were single and the other one was divorced. Most participants were childless, only 6 of them had child/children.

A code was assigned to each participant, such as RIXYZ. The first two letters denoted the organisation type: RI as research institute. X was the number assigned for the individual participants. Y referred to the sex of participants as M for male research staff and F for female ones. Z was the grade level which participants held. That is, A was for participants being employed as a research director; B for participants being employed as a department director; C for participants being employed as a senior researcher; and D for participants being employed as a researcher. For example, the researcher coded as RI22FA meant a research institute's female participant who was assigned for number 22 with the position of research director.

Table 6-6 Themes and subthemes from RI interview findings

Themes	Subthemes
Theme I: Factors creating a gender gap in career advancement of Thai research institute	- Social contacts among non-academic activities provides career progress for men, rather than women - Gender attitudes obstructing women from the areas of hard science - Family as the first priority for Thai women - Feminine characteristics that view women inferior to men in Thai science community
Theme II: Supports and strategies women operate in response to the gender bias in Thai research institute	- Academic qualification and bonding with each other support women in gaining acceptance in Thai research institute - Family support and colleagues in the workplace support Thai women to maintain their focus on scientific careers - Rules and regulations & seniority system - Working with no conflicts
Theme III: Perception towards women's status in Thai research institute	- Liberal feminism view: Thai women seem to have an equal status as men in science academe. - Radical feminism view: the norms of Thai tradition value and Thai science community prefer men over women. - Thai female academic view: the attitude that men as the leader is likely to be accepted among female researchers.

6.3.1 Factors creating a gender gap in career advancement of Thai research institute

This section focuses on the gendered constraints on Thai female researchers in connection with career advancement in Thai research institute. Numerous variables were found to cause the difference between men and women for the progress in research careers such as informal networks providing social contacts with an advantage to male academics rather than female ones, gender attitudes obstructing Thai women from the areas of hard sciences, family as the first priority for Thai women, and feminine characteristics that are negatively viewed in Thai science community.

6.3.1.1 Social contacts among non-academic activities provides career progress for men, rather than women

The findings uncovered that Thai male researchers, rather than female ones, were able to develop their career path from social contacts through engaging in non-work-related activities. That is because not only is female access denied to men's social connections, but also women themselves do not use their socialisation for career gains, thus diminishing their career opportunity in science community.

The interview data revealed that social contacts tend to provide a number of opportunities in scientific careers. For example, when male senior researchers were asked to name people that advised them to apply to this research institute, they indicated that connecting through the old-boy network from the former school was the information source.

> *I got to work here because one of my classmates recommended me here.*
> *RI28MC*

Another RI male senior researcher also elaborated the advantage of get-togethers with colleagues after working hours.

> *Talking at the drinks can lead somewhere. It's not just drinks. It's a forum*
> *where we can exchange ideas and inspire each other. It's a small world.*
> *You'll be referred to for the next job. It's men's talk. RI10MC*

This suggests that channels to scientific careers in the Thai research institute context very much depend on a peer reference or informal activities. This is in agreement with Park (2007) that social contacts support scientists in obtaining the research opportunity i.e., research fund through recommendations from mentors or colleagues.

However, social connections largely belong to the men's world (Kay & Hagan, 1998) as mentioned earlier by a male participant (RI10MC) that men are likely to forge a single sex network – '*It's men's talk*'. This suggests that men are likely to build their closed networks to create the career opportunity for themselves with no female participation.

Whereas Thai male researchers enjoy forging social contacts through engaging non-academic activities for career gains, females are less likely to make use of their socialisation outside work for career proposition. According to Zuckerman (2001, p. 73), there is a difference in the use of networks between men and women in science as men, rather than women, are likely to spend this time for the career opportunity. Conversely, women are likely to join the network for leisure purposes. As a female researcher revealed that, rather than talking about a sense of career opportunity, contacts outside work among women are aimed to relax.

> *(When you socialise with women, do you talk about job?) Mostly if we're outside, we talk about something else...for fun but not talk about work. RI13FD*

Consequently, because Thai female researchers cannot make use of the career opportunity through informal social contacts, they are less likely to progress in research careers than their male counterparts, who are more likely to enjoy benefits from the same type of networking. That is because social contacts are meaningful for the professional opportunity in the context of the Thai research institute. This is in agreement with Acker (2006) that acquiring the career opportunity through social networks can perpetuate inequalities within organisations.

6.3.1.2 Gender attitudes obstructing women from the areas of hard science

There is a widely-held belief in science which advocates that men, rather than women, have an intellectual ability in hard sciences e.g. engineering, leaving Thai woman obstructed and seemingly unacceptable when joining these fields.

A common perception that male and female characteristics are different according to their gender stereotypes has resulted in men working more in the hard sciences and women more in the soft sciences. As a female senior researcher pointed, men are designed for engineering, but women for chemistry.

> *There were more women working in soft science - chemistry. The thing is women go for pure science because women like to memorise. But if it's production or engineering-based fields, there are more men. RI31FC*

It is, however, noteworthy that there is no limitation for men entering the soft sciences that are thought of congruent with female characteristics. The study did not find any practice of excluding men from such fields. In turn, men themselves prefer not to enter the soft sciences.

> *Men prefer applied over basic sciences perhaps because men don't want to work in the laboratory and memorise, which is not much challenged for him. RI07FC*

Conversely, female access to the hard sciences, thought as men's fields, is blocked. The current study found evidence that women are excluded from engineering. This is confirmed by a male research director who recalled his experience in the school that some female students were not allowed to study in the engineering faculty.

> *(Were there lots of women studying engineering?) There were two in my faculty (engineering) but the male academic adviser drove them to other faculties so there were no women at all (laughs). RI8MB*

A Thai university application form, reported by a female research participant, states that men are preferable in engineering subjects. As a result, in technical and engineering areas, there appears a limited number of women. This evidence conforms to Sonnert (1995/1996) that women are less likely to be allowed in the male-fields which always provide safeguards against women.

> *(Were there more men or women in engineering?) It's men. The application form indicates that men fit this faculty because the jobs are in the industrial sector. There are more men in engineering. RI31FC*

As previously mentioned, the scientific norms favour men over women with respect to competence in engineering, leaving women unaccepted even when women manage to join the workforce in the field. A female senior researcher elaborated the situation of women in the engineering profession as follows:

> *The tasks of an engineer are hard and require smart people with imagination. The tasks require fieldwork, not limited to the office area. We*

have to solve unexpected problems fast and decisively. That's why most

people trust male engineers more than female ones. RI21FC

Although the findings did not show any significant relationship between working in a particular science subject and career advancement in Thai research institute, it should be noted that the possession of a degree in engineering seems meaningful for top executives in the Thai research institute context. This suggests that women may find it hard to climb up the scientific career ladder because they have been prevented from joining the engineering fields.

6.3.1.3 Family as the first priority for Thai women

As the Thai traditional norms dictates the domestic domain belong to women only, female researchers are likely to devote less time to the jobs; thereby affecting the career advancement.

Traditionally, Thai women have been socialised to see the family as the top priority before anything else (Sodsangchan, 2008). A good wife in the Thai context is expected to care for children and daily home maintenance, rather than seek career success, as confirmed by a female research director.

> *Family is my top priority. If a wife is too obsessed with the work, it's not*
> *good. That's my principle. Even if I got a high position, I wouldn't take it if*
> *that would tear my family apart. As I said, family comes first. RI22FA*

On the contrary, Thai men, is expected to be a family leader, are less likely to be obligated to take household chores. Such a socialisation was expressed by a female researcher that it is normal for women to do housework. In turn, it is also common for men not to do so without guilt. This means that it is hard for Thai women to share domestic work with men within the family.

> *If a woman does the housework, it's common. If not, she's bad. It's ok if men*
> *don't do the housework because it's not their job. RI13FD*

Given the expected responsibilities for women in the Thai family, although Thai women these days need to work outside to earn income for economic reasons, they need to care for the family as well. A double burden thus appears to obstruct Thai

women from career success. The evidence was found that some female researchers had to skip some duties such as working late at night (RI27FC) or working in the fieldtrip (RI30FB) in order to avoid any change in family time.

> *I don't stay late since I got married. I should leave early. My husband never asks for that but I think it's my obligation to care for the family. RI27FC*

> *(Do you go to the provinces sometimes?) Sometimes, and my husband complains a little. But I go infrequently so that's fine. RI30FB*

Moreover, in order to conform to the Thai social norms that wife should provide a supportive role in the family, women are likely to leave the career opportunity behind and prefer to sacrifice it for their family. A female researcher revealed her choice not to study abroad to be with her family, stressing that her decision is on a voluntary, not compulsory, basis.

> *For me, with my family, it's better not to study overseas, even with a scholarship. RI13FD*

Because Thai women are dictated by traditional Thai values to base their identity as a mother and a wife, family responsibilities are an important variable obstructing Thai women from advancement in scientific careers.

6.1.3.4 Feminine characteristics that view women inferior to men in Thai science community

In addition to the gendered impact on women and men on scientific career advancement at the individual level, a more detailed analysis of gender bias towards Thai women in science at the organisational level has been examined.

In Thai research institutes, obstacles that hinder female participation at the organisation level largely stem from gender stereotypes that feminine characteristics seem incompatible with the norms of Thai science community.

Regardless of women's ability, there is a widely- held belief that typical female characteristics such as emotional sensitivity has prevented women from being accepted in science. As commented by both male (RI10MC) and female (RI31FC)

supervisors in RI that when they worked with women who display some sensitivity - a female flaw- they would have to deal with these women's unpredictable emotions.

> *The female management's working style is proactive. But being women, they are sarcastic. They don't obviously show their concern (laughs). I know it's women's style. RI10MC*

> *If the colleagues are truly female, it will be difficult to hang out with them. It's a bit annoying with talkative women. RI31FC*

Given negative stereotypes of women, male researchers tend to develop a bias against their female peers as admitted by a male researcher that, during the working time, male colleagues were less likely to accept women.

> *Women have limitations in dealing with male staff. It's hard for a female boss to give orders to the male staff. RI25MD*

Similar to the UV case study, gender stereotypes which differentiate typical male jobs from female ones have happened in the RI case as well. The quotation below illustrates that Thai men are placed in the academic role, directly linked to the social ladder in research institute (RI10MC). Conversely, the ideal workers for document jobs are women (RI22FA), in which jobs are related to supportive duties.

> *Most of my job concerns academic service. I'm responsible for academic projects nationwide. RI10MC*

> *Being a female, my jobs involve rules and regulations in budgets and finance, etc. RI22FA*

Because academic work appears an important criterion for a career success in science (Tien, 2007), the occupancy of different jobs between male and female research staff working in RI could impact on the career progress between genders. This is confirmed by a comment given by a male research director:

> *Working in the academics is the important part of the job. If the staff members have not joined such a job, their careers won't go ahead. RI09MA*

Moreover, gender stereotypes also affect women with respect to fieldwork. The interviews discovered that male researchers, rather than female ones, were assigned by supervisors to fieldwork because there is no safety concern for the male ones. In the Thai context, due to the protective role of men which has also become the duty of male supervisors to protect female employees, it would be unacceptable to permit women to perform dangerous tasks or transfer them to work in remote locations (Yukongdi, 2005). A male research director elaborated why he is likely to send male staff to work on field assignments.

> *To examine safety, every trip needs men. We have to find a male member of staff to join the trip for safety. RI09MA*

As organisational norms of the Thai research institute are relevant to the traditional values that prefer men over women and thus place Thai male academics in superior roles and the female ones in subordinate roles. This has obstructed female researchers from moving upward at work as a female senior researcher pointed out that women seem unaccepted at top ranks in the Thai research institute.

> *Absolutely, even with more women in the field now, Thai society doesn't accept women as leaders. Being provoked is common. RI21FC*

Overall, this section has identified the impact of both endowment variables and organisational practices on determining the difference in career advancement between men and women in Thai research institute. It is interesting to learn how Thai women react to the current situation, the next section thus explores the supports and strategies used by female researchers to gain and retain power in this sector.

6.3.2 Support and strategies women employ in response to the gender bias in Thai research institute

In order to overcome the above-mentioned gender obstacles, academic certificates and female social networks have paved the way for female researchers to power in the Thai research institute. In addition, the Thai extended family members and colleagues in the workplace can support female researchers to manage family obligations. Furthermore, female researchers also drew on the bureaucracy of Thai

organisations and attempted to avoid conflicts to deal with the challenges in science.

6.3.2.1 Academic qualification and bonding with each other support women in gaining acceptance in Thai research institute

Similar to the UV case, women in the research institute also use cultural and social capital (Bourdieu, 1986) through accumulating academic qualifications and bonding with each other to grasp power in the scientific fields.

Similar to the previous research (Park, 2007), an academic degree is an important factor permitting female researchers to be accepted in the Thai research institute as some female academics revealed that privileged education is viewed as a tool that helps upgrade the status of scientific staff. This is also consistent with the quantitative results which found that academic background is likely to have a positive impact on career advancement for female researchers in Thai research institute.

> *Becoming a PhD from overseas help me in securing grants and people treat the PhDs with respect. RI31FC*

In addition to accumulating human capital through an academic degree, Thai female research staff have forged social network by bonding with each other in the workplace so as to gain power.

Because women are excluded from the male networks that could provide career opportunities in science, female academics have also utilised the same strategy as men by developing a single sex network through building social relationships among the females within the workplace in order to secure power. As a female department director admitted that she rarely included men as a team. According to McDonald & Hite (1999), with these strategies, women are able to be visible in organisations.

> *(Are your team members mostly men or women?) More women and a few men. Frankly speaking, to make us a group; I wouldn't hire a guy at all. RI26FB*

Female inclusion has become a strategy for women in RI to draw on in order to gain an entry into and a firm standing in research careers. Besides, as Warrior (1997) put it, by taking part in a group, the ideas or professional networks are likely to further develop and create a process of learning together, resulting in a higher regards for women's performance in scientific field. This is also similar to the quantitative results indicating that RI female workers who always engaged in academic activities in the workplace were more likely to advance in research careers.

Consequently, in order to grasp power in Thai research institute, Thai female researchers need to gain either cultural capital in terms of academic qualifications or social capital through bonding with each other to strengthen their positions in the academic field.

6.3.2.2 Family support and colleagues in the workplace support Thai women to maintain their focus on scientific careers

A close relationship and support provided by the extended family members and colleagues in the workplace have assisted Thai female researcher in careers and alleviated their family responsibilities.

One of the most common forms of Thai family is an extended one in which relatives stay and work together for mutual support. According to Yukongdi (2005), the Thai family members do not isolate themselves to stay apart, but reside together for giving advice, helping each other, and looking after young children. As a female researcher revealed that she turned to the grandmother to care for young children.

> *It's my mother who currently stays with us. If something happens, my children can always turn to their grandmother. This is an advantage of the extended Thai family and the children aren't lonely. If it's a single family like in other countries, the children may be lonely and out of sight. RI22FA*

The support on childcare can provide Thai female researchers with time and focus on work. As reported by a female researcher, she can survive the conflict between work and domestic responsibilities through her relatives' assistance for all the housework.

> *For women, if they have relatives taking care of the house, they can fully devote themselves to work. RI33FD*

Similar to the UV case, the RI empirical data presented the recent roles of males and females in the Thai family in which both genders develop a mutual cooperation. With a supportive husband, Thai women in research careers can manage a balance between work and family life. As a female research director pointed out, her husband can support her work, and in general, a female's success very much depends on the husband.

> *I think a husband needs to understand his wife's duties and responsibilities at work. And my husband does, He's happy and proud of me. He supports me in undertaking household duties. Without him, I couldn't be successful (smiles). RI22FA*

Interestingly, the RI empirical data revealed that colleagues in the workplace were found as important support for Thai female academics in continuing the job when they need to fulfil family duties. A female research staff added that, apart from technical support, colleagues also help her deal with difficulties in working long hours as well as with the balance between family and work. This is opposed to that was found in the Western context in which scientists can draw upon colleagues for technical assistance and collaboration only (Reskin, 1978).

> *We work as a team here. I always tell them before taking leave for some family duty. My team will fill my part. RI13FD*

To sum, the extended family nature in Thailand can support women in Thai research institute and thus promote women's career gains. In addition to collaboration in the laboratory, colleagues are willing to support female researchers in managing family obligations. It is also noteworthy that this practice is more apparent for society in the Asian setting than in the West, where single families and individualist characteristic make family obligation an obstacle to women in scientific careers (Blackwell & Glover, 2008).

6.3.2.3 Rules and regulations & seniority system

In RI, female researchers can resort to the organisation's rules and regulations, including seniority system as their strategies to control the male subordinates. It is interesting to note that this characteristic is different from the Western organisation, where employees are largely rely on their own professional performance to accomplish their career goals (Chompookum & Derr, 2004).

Because RI is a public organisation, where rules and regulations largely depend on the Thai bureaucratic system with a clear division of labour and a chain of command through a top- down structure (Liamvarangkoon, 2002). This could make a good resource for female management to control the male subordinates, as reported by a female department director.

> *(When you attend a meeting and male staffs question your performance?) I always refer to the principle rule of what is right or wrong. If they don't get it, it's a shame for them. RI24FB*

Additionally, Thai society entails a strong relationship between the senior and the junior within the context of high power distance (Maneerat et al., 2005). Hence, young Thais in general do not assertively challenge the power of seniors, who in turn have the right to control them. That is why the RI older female workers were likely to have power over their male colleagues. As a female research director pointed out that, because of her seniority, she managed to gain respect from male counterparts in the junior level.

> *I grew up from here and thus have more seniority than anyone. Problems rarely happen because almost everyone has previously worked under my supervision. No problem with the male staff or even with the high-ranking staff because their seniority is quite far from mine and no match for me so far. RI23FA*

This implies that the seniority system can facilitate Thai female researchers to assist their power in research careers. The empirical data are consistent with the argument stated by Bhanthumnavin (2003) in the way that seniority is the main criterion for being accepted in the Thai public organisation. Also, the finding is

likely to confirm the quantitative analysis in which seniority had a significantly positive effect on career progress in Thai research institute.

6.3.2.4 Attempting to avoid conflicts

Instead of employing the rules and regulations in order to grasp power in science, RI female research staff prefer to maintain a relationship as smoothly as possible in order to avoid conflicts in the workplace.

As revealed by a RI female researcher, conflict avoidance was operated through a smooth conversation with sensitivity on the grounds that her colleagues were requested, not commanded, to perform tasks. That is because in the Thai organisation context, relatively soft characteristics are more likely to win cooperation, unlike the Western management style where straightforward personalities are likely to be accepted (Maneerat et al., 2005).

> *We can't order them too harshly. I usually don't assign them the jobs right away. I start with small talk and then go to the tasks. RI13FD*

As conflict avoidance appears to be the work principle for Thai people, rather than face-to-face confrontations - an unacceptable practice in Thai society (Chompookum & Derr, 2004), some RI female researchers were likely to keep the conflicts to themselves when they were faced with difficulties at work.

> *If we have a problem, it's better to keep it to yourself sometimes. It's not always a good idea to speak out. RI32FC*

Also, while being an ideal conflict avoider, RI female researchers seemed tolerant of any discrimination at work as part of daily life and tended to let such things continue without any action to improve. As the study found that an RI female senior researcher suggested that women should behave with patience without any fighting. The research result conforms to the argument of Holt & DeVore (2005) that people in collectivist culture are likely to live with harmony; thereby avoiding conflicts in the workplace is seemingly a better solution for them.

> *Women should be stable enough to patient against any pressure. I myself have accepted everything I can. RI21FC*

In other words, this section uncovered that in order to gain power and acceptance in the Thai research institute, female academics need to accumulate their endowment variables in the form of privileged education and women-only networks. Moreover, Thai female research staff also need to resort to rules and regulations, including family members as well as colleagues in the workplace to make their career advancement possible. However, despite gender discrimination in research careers, female research staff are likely to work while avoiding conflicts, rather than fighting against such discrimination.

6.3.3 Perceptions towards women's status in Thai research institute

Based on the liberal and radical feminists as a conceptual guide, this section explores why some participants believed that there is gender equality of career opportunity and why other respondents claimed that there were restrictions for women to progress in Thai research institute.

According to the liberal feminist approach, a better proportion of Thai female academics in management positions led some of them to believe that there is no more disparity between men and women in career advancement in Thai research institute. As a female department director added that men and women in Thai research institute are of equal status by citing that women are currently holding the top positions.

> *I think gender discrimination is rare here, especially in an academic career. Women are promoted to be directors but there was none before. There is growing acceptance of women and no more sex discrimination, thanks to the broad-mindedness of Thai men. If you look at the situation in other countries, men over there are different from their Thai counterparts. RI26FB*

Conversely, based on the radical feminist approach, it was clear that Thai organisational norms advocating for men as leaders persist in Thai research institute. Although a higher number of Thai women can enter the scientific workforce, they gain low acceptance, in comparison with men, when climbing up

the management ladder. A female research director revealed that low acceptance of the female management is still visible in Thai research institute. This practice presents evidence that gender bias is still ongoing in the Thai science community.

> *Nobody listens when a woman talks. On the other hand, if a guy talks, the whole room is quiet, even when they touch on the same topic. It's about the position. People don't trust women enough and we can't do anything about that. RI22FA*

Interestingly, the current study discovered that some Thai female academics were of the opinion that leadership was reserved for men. This attitude is influenced by the Thai norms that socialise women into being supportive, whereas men are supposed to be strong and to dominate the society (Patana, 2004). This suggests that Thai women are innate to believe that men are superior. An RI female researcher was taught that letting men lead is a common practice in the workplace.

> *The president of my batch was a guy and women took care of the recreational activities and food. Maybe it's because women pushed away the key positions to guys unknowingly RI13FD*

This can mean that as a result of the Thai traditional values that view men as leader and women as follower, female researchers are acquainted with the inequality in Thai science community. That is why men are likely to achieve higher visibility and thus are more advanced in Thai research careers. The situation is in agreement with Sonnert's statement (1999, p.43) : 'the causes of gender disparities in career achievement are held to lie within women themselves. The gender differences are said to be innate or else to be the result of gender-role socialisation or culture patterns'.

6.3.4 Conclusion: the qualitative results

Although the opportunity for Thai women to participate in scientific careers is better at the present time, the inequality in career advancement between men and women is still visible in the Thai context of research institute. Nevertheless, Thai women in science are likely to accept this situation as they are socialised to follow men.

Numerous variables that obstruct Thai women from progress in scientific careers are uncovered. Firstly, Thai women are assigned to place the family as their first concern, which leads female researchers to devote less time to careers. In addition, Thai female researchers are less likely to earn career gains from social contacts through non-academic activities. Moreover, women are less welcomed and less accepted in Thai science community due to Thai traditional customs and scientific norms. Also, attitudes towards gender stereotypes make Thai women excluded from engineering fields, which seem crucial for progress Thai scientific careers.

In order to cope with the current situation where women are discriminated in Thai research science, Thai female researchers have operated such working strategies as avoiding conflicts as well as accumulating cultural and social capital so as to grasp power. In addition, rules and regulations and seniority are found to be employed by female academics to fight against the bias from men in the workplace. Also, support from family members and colleagues can promote women to manage a balance between work and family.

6.4 Comparative findings of quantitative and qualitative analyses on gender equality in Thai research institute

This study aims at understanding the issues related to gender and career advancement in the Thai context of research institute (i.e., RI). The key findings of the quantitative and qualitative analyses are compared and presented in Tables 6-7. The findings complement each other and help develop some insights into Thai women's status in the research institute sector.

This study embraces the multilevel analysis, proposed by Layder (1993). The various endowment variables and organisational practices were investigated in order to discover the gender phenomena and career advancement in Thai research institute.

As mentioned in the quantitative analysis, this study found a gender pay gap in Thai research institute as female research staff were paid 12 percent less than men were. However, given the same qualifications, Thai female research staff were slightly more likely to be promoted than their male counterparts in terms of grade position, but this difference is not statistically significant.

Then, the study examined the factors affecting gender difference in Thai research institute. Some factors yielded similar results in both quantitative and qualitative analyses while others were different.

The present study found that subject segregation and informal networks are mentioned more frequently in the qualitative results and seem to have a negative effect on women's progress in science. The perception that men's and women's skills are different has constrained women in hard sciences (i.e. engineering fields); thereby being of inferior status in such fields. In addition, social contacts through engaging non-academic activities were identified to work for Thai male academics better than for female ones and that can enhance career opportunities for men in scientific careers. In the quantitative analysis, however, no significant relationship was found between these two variables and advancement in research careers.

In terms of organisational practice, the results revealed that feminine characteristics which do not fit with scientific norms, coupled with the difference

in division between male versus female jobs in the Thai research institute, make it hard for Thai women to win acceptance from male colleagues and thus advancement in research careers.

In order to answer the third research question asking how Thai women react to the gender discrimination in research organisations, the support and career experience associated with gendered practices in Thai research institute were exposed. Both quantitative and qualitative results found the importance of academic qualification for women's advancement in Thai research institute. Thai female academics with a privileged academic background were likely to be better rewarded and also accepted through credentials.

This study supports previous research on the importance of seniority to career advancement in Thai organisations (Bhanthumnavin, 2003) as the quantitative findings show that age was positively and statistically significant related to advancement in Thai research institute. The qualitative findings also indicate that seniority could be a career enhancer for individual power, particularly for women with seniority in terms of age, they were more likely to be respected by male colleagues in Thai research institute.

The qualitative findings identify the advantage of extended Thai family and colleagues in terms of support for Thai female research staff in managing the conflict between work and family. This may explain why, according to the quantitative results, no significant relationship was found between family formation and women's career advancement in Thai research institute, although the gendered roles in the Thai family make women set family as their first priority.

At the organisational level, Thai female researchers are likely to establish female networks in the workplace in order to secure their status, employ the organisational rules, largely based on the standard of Thai bureaucratic system, and attempt to avoid conflicts in order to deal with gender bias in the workplace.

Finally, this study employs the concept of liberal and radical feminists as a guide so as to examine the perception towards women's status in Thai research careers. The results indicate that men and women differ in terms of rewards and that women still face gender bias in Thai research institute. Yet, female researchers are

likely to accept the existence of this situation because Thai women in general are

likely to rate men as superior to themselves on cultural grounds.

Table 6-7 Comparison of the results between the quantitative and qualitative analyses in Thai research institute

Note: QT = Finding found in the quantitative findings
        QL = Finding found in the qualitative findings

Themes	Main findings	Finding
I. Gender gap in career advancement in the Thai research institute	- Thai female researchers were paid 12 percent lower than men and nearly half of it originated from gender discrimination. - With the same qualifications, Thai female and male researchers were likely to hold the same positions.	QT
II. Factors creating a gender gap in Thai scientific career advancement	Social contacts among non-academic activities provide career progress for men, rather than women.	QL
	Gender attitudes obstructing women from the areas of hard science	QL
	Thai female researchers have double burden of work and domestic responsibilities as family is their first concern.	QL
	Feminine characteristics are viewed negatively and that makes women inferior to men in Thai science community: - Typical female characteristics prevent women from being accepted by male colleagues. - Women's stereotypes make Thai female academics placed in supportive roles.	QL QL
III. Supports and strategies women draw on in response to the gender bias in the Thai research institute	Academic qualification support women to gain acceptance in Thai research institute.	QT, QL
	Inclusion among female researchers assists Thai women in gaining power in science.	QT, QL
	Family supports and colleagues in the workplace facilitate Thai female academics to manage a balance between family life and work in research careers.	QL
	Rules and regulations & working styles - RI Rules and regulations & seniority system - Working with no conflict	QT, QL QL
IV. Perceptions towards the status of women in Thai research science	Liberal feminism view: Thai women seem equal to men in research institute.	QL
	Radical feminism view: the norms of Thai tradition values and Thai science community prefer men over women.	QL
	Thai female academic view: the attitude that men as the leader is likely to be accepted among female researchers.	QL

6.5 Conclusion

This chapter presented an analysis of the data collected from the Thai research institute sector. The main results exhibited that the status of Thai women in the research institute has been improved with a higher chance of career success. However, the female advancement in this sector in terms of the equal opportunity is still moderated by the gender dimension of traditional Thai values. The significant feature between men and women, on the basis of the gendered roles, provide men and women in the Thai research organisation with different career opportunities. Employment values and the concept of ideal workers in science are derived from masculine characteristics. The superior positions in Thai research institutes are thus occupied by men, while the female characteristics typically prevent women from promotion or upward movement. This suggests that the values in both Thai society and scientific community offer more opportunities to men, and that hinders the female researchers from career success. Nevertheless, female academics in the Thai research sector, socialised by the value that men are superior to women, tend to accept their supporting roles and inferior status in science.

The following chapter will compare each of the themes from the findings identified in this chapter and the previous UV case (Chapter Five) in order to understand the gender phenomena and career advancement in scientific fields in the Thai context.

CHAPTER 7

COMPARATIVE DISCUSSION IN CAREER ADVANCEMENT BETWEEN MEN AND WOMEN IN THE THAI SCIENCE ACADEME

This chapter aims to gaining a better understanding of the gender gap that exists in scientific career advancement in Thailand. The current research discovered that, as one of the common indicators of gender equality, advocated by liberal feminism which is prominent in the Thai context, is the equal numerical representation between men and women, gender equality in Thai scientific careers are perceived as successful, as reflected by Thai women having the same access to academic careers as men. Moreover, both men and women in the Thai academic organisation are guaranteed for the basic rights to every aspect, on the grounds that the rules and regulations of Thai public agencies are gender-neutral. This means that the career opportunity in science is equally promoted for both men and women. However, it is noteworthy that the feminist liberal stance overlooked the gender bias which is embedded in the societal structure and thus failed to recognise the gender impact of culture from which men and women acquire different behaviours, roles, and responsibilities. Therefore, though provided with the same criteria of employment and individual endowments as men, women were restricted in climbing the management ladder, meaning equality could not be achieved. Yet, as a consequence of tradition values in society, reinforcing structural and cultural inequalities, Thai female academics tend to accept such an imbalance as part of their daily life.

In this chapter, four main themes are identified from the two case studies and the findings from previous studies are compared so that the patterns of gender disparities in the Thai science community can emerge.

Firstly, Thailand, though a developing country with relatively low competency in science, has progressive numeric indices regarding the status of women in comparison to many developed countries whose women's movements seem more highly advanced. Nevertheless, a gender gap in terms of pay and grade still persists

in Thai science academe both in the university and research institute sectors. Thai female researchers in the research institute sector were found to be better off than their counterparts because the organisational structure, rules and regulations (largely based on the Thai bureaucratic standard criteria) were equally applied to both genders.

Secondly, Thai female academics suffer discrimination for various reasons including national scientific policies which make engineering a priority for national development, gender bias in Thai academic organisations where men are viewed more favourably, job assignments that place Thai female academics in less – rewarded areas, social norms that prevent women from making social connections, and gendered roles which compel women to prioritise their families over their careers.

Thirdly, Thai female academics try to raise their professional status through a range of activities: increasing academic qualifications, bonding with each other through formal networks, employing the rules and regulations, working as hard as their male peers, deploying a working style of conflict avoidance, and being single as well as depending upon supportive family members or colleagues. However, some of these strategies seem to hinder their success in the Thai scientific community which values masculine characteristics such as strength.

Nevertheless, Thai women are likely to ignore gender inequality in science because the liberal feminist approach to the gender situation in Thailand has led some women to believe that they can participate in science as equally as men. In addition, as the terms of reference for all jobs are treated with confidentiality in accordance with the Thai organisational norms, the gender gap in academic career advancement goes largely unnoticed by Thai female researchers.

The findings argue that whilst some of the Western theories relating to discrimination can also be applied to the Thai case, others cannot. There are significant cultural differences and specific organisational norms which influence the working lives of Thai women which contribute to the differences in experience between male and female scientists.

7.1 Research setting

In order to compare the different structures of Thai academic organisations, we will firstly explore the background of Thai University (UV) and that of the Thai Research Institution (RI).

Both UV and RI are Thai public organisations and take an active involvement in the provision of science and technology education while undertaking a number of science-related research projects. UV is a leading public university in science; whereas RI is a state enterprise which focuses on scientific research and services. UV and RI staff possess different job descriptions, as employment contracts dictate UV staff's commitment to teaching, whereas RI staff are committed to undertaking scientific research with no teaching duties or supervision of postgraduate students.

The total number of UV employees in the science and technology faculties is approximately 700, while their RI counterparts number roughly double that. The proportions of female academic personnel in UV and RI account for nearly half the total academic personnel in each organisation, suggesting that gender discrimination in the form of the 'sticky floor' does not exist in either institution.

As essentially public academic organisations, both UV and RI are mostly funded by the Thai government. Although still subsidised by the government, the promotion process in UV departs from the usual of the Thai bureaucracy. Because UV has been prepared to a new status as a forcibly privatised - yet still public – university, the UV promotion process is partly based on the internal management structure (Tantiwiramanond, 2007). Conversely, at RI, the same criteria for salary ranges are more likely to be in use equally for all staff, in keeping with the strict salary increase and promotion system set by the Office of the Civil Service Commission, Thailand (OCSC) (Liamvarangkoon, 2002). However, it is noteworthy that the long-established bureaucratic culture of the Thai organisation (e.g. seniority) is still deeply rooted in both UV and RI management structure.

In the following sections, the findings from both UV and RI are compared in relation to the theoretical frameworks developed from the literature review in Chapter Two. The first theme aims to measure the gender gap in terms of pay and grade. The second theme identifies the determinants that cause differences between

genders in Thai scientific careers. The third addresses the practice as well as the support that female Thai academics draw on in order to pursue their careers. Finally, this study assesses how women perceive their gender status in the Thai science academe. Using a pragmatic paradigm, this research has utilised both quantitative and qualitative methods in order to uncover the realities of the gender phenomena in Thai science academy.

7.2   Gender gap in the Thai science academe

The current study has revealed that women in Thai science face disadvantages with respect to pay and grade. The quantitative evidence lies in both UV (15 percent) and RI (12 percent) and is consistent with the national statistical data indicating that Thai female academics earned 15 percent less than their male counterparts nationwide (National Statistical Office, 2008).

These findings could also be linked to existing knowledge about gender differentials in academia originating from discrepancies in either individual endowments (Stack, 2004) or gender disparity (Sonnert, 1999). As the Blinder-Oaxaca Decomposition (1973) analysis illustrated, half the gender pay gap at both UV and RI was caused by endowment characteristics while the other half was ascribed to reward differentials, suggesting a degree of gender disparity in Thai scientific careers.

Despite the lower pay for women in both UV and RI, RI women were found to be better off than their UV peers, as is seen in the wider gender pay gap of UV. On average, UV women received a salary of 27 percent lower than those working with RI. This is because RI is a state enterprise where annual bonuses and other extra cash benefits vary with the performance of each public research enterprise, meaning RI staff can enjoy a higher salary range than those in the public university sector. In addition, the job commitment for academic staff in UV tends to focus more on teaching duties and less on research services – a sector that can earn extra income elsewhere. Therefore, UV faculty members were likely to earn less than their RI counterparts.

Similar to the science academe in the West (Long & Fox, 1995), both UV and RI appear to have an organisational culture that favours male staff for top-ranking

positions as a third of academic personnel in top senior positions were females. This is consistent with the national statistical data. While Thai women constitute 51 percent of academic staff nationwide, only a quarter of personnel in senior levels were female (National Statistical Office & Office of Women's Affairs and Family Development, 2008). The 'glass ceiling' thus remains a reality for women in the Thai science academe. Even though their fortunes have improved in recent years, the absence of women in the highest positions is still noticeable.

Likewise, the career progression of RI women in terms of grade position is generally better than that in UV. Although RI women were outnumbered by men in senior positions, they have managed to reach top positions in soft sciences, the field which most attracts women (e.g. chemistry and pharmaceutical departments). In UV, on the other hand, despite a higher number of women in faculties related to soft sciences, female staff still face barriers to reaching the top ranks in such areas as they have rarely held a professorial position. Furthermore, although evidence of subject segregation was found in both research sites, RI women can enter more male- dominated fields as their presence in the engineering department was higher than UV women's.

RI women were likely to gain a higher status than their UV peers because of the more egalitarian RI rules and regulations that largely follow the promotion system set by the Thai Office of the Civil Service Commission (OCSC). This can reduce individual bias because reliance on the bureaucratic model's written rules and procedures is a guarantee of clear information and transparency of the evaluation process (Fox & Colatrella, 2006). In other words, the criteria for promotion of OCSC is aimed at an effective bureaucratic system, offering incentives for government workers in terms of rewards through rules and regulations, and thus can assure fairness to all members, regardless of gender (Liamvarangkoon, 2002).

However, in the case of UV, the recruitment and promotion process was partly based on its internal management structure as the university has been prepared to a new status as a forcibly privatised - yet public - university. This has resulted in a little more freedom from the rigid rules and regulations of OCSC (Tantiwiramanond, 2007). Furthermore, as previously stated, the UV promotion

criteria have been traditionally based on organisational values that favour men over women. The status of UV females has thus tended to be inferior to that of men.

The evidence supports the argument that different types of academic institution offer different patterns of professional progression for various genders (Connolly & Long, 2011). Although both academic institutions under scrutiny share the same national culture and certain organisational missions, their track record on female career is divergent as a consequence of organisational pattern.

This study also explores the differences between developed and developing countries. GDP per capita in the developed world is nearly tenfold of that in Thailand (World Economic Forum, 2009). However, even in a developing country like Thailand with a comparatively low experience in science, the gender indices for scientific careers are better than those in some developed countries.

For example, in contrast to developed countries where there is greater progress in science, women in the Thai science academe do not face 'sticky floor' disadvantages. Half of all academic staff are women, with a quarter in senior positions. On the other hand, Connolly & Long (2008, 2011) have revealed that UK women in science faced disadvantages regarding promotion and reward as compared to their Thai counterparts. A third of all academic scientists in the UK are women, with one-fifth making the highest grade. Also, the gender pay gap in UK scientific careers (roughly 20 percent) is wider than that of Thailand (15 percent).

In developed countries, the increasing number of women in science has largely been a consequence of education and policy change; the impact of economic growth; and the awareness of gender issues among scientific organisations (Organisation for Economic Co-Operation and Development, 2006). In the current study, however, the evidence suggests that, apart from these determinants, Thai academic organisational characteristics, social attitudes, and professional protocols have resulted in a higher proportion of women employed in the Thai science academe.

A reduction in gender disparities in Thailand can be attributed to the demand for qualified men and women in the fields of science and technology to aid the

country's development (Office of the National Economic and Social Development Board, 2008). Another reason is the rigid rules and regulations in the Thai public organisation system that are equally applied to both genders. That is because at the entry level, salary and promotion criteria are more likely to share similarities with the standard criteria of the Thai bureaucratic system which is gender neutral.

With regard to social attitudes, Layder (1993) has argued that academic careers are suitable for women because of job security. In Thai context, Chompookum & Derr (2004) argued that Thai people are satisfied with careers which offer secured job and fringe benefits. Such an argument may also explain why Thai girls have been encouraged by their parents to follow such a path.

On one hand, as Reskin & Roos'(1990) theory of job queue and gender queue asserts, women are more likely than men to obtain certain jobs because men may decide to enter at a level of higher reward. This is true of the Thai scientific labour market. The proportion of men (62 percent) was found to outnumber that of women (38 percent) in the private science and industry sectors (National Science and Technology Development Agency, 2008), where better rewards are offered (National Statistical Office, 2008, 2009). Moreover, many Thai private firms prefer to employ men due to their gender bias (Suriyasarn & Resurreccion, 2003).

Nevertheless, even the gender pay gap in developed countries such as the UK is wider than that found in Thailand. Only a quarter of such a gap is thought to be the result of discriminatory treatment based on gender (Connolly & Long, 2008). Conversely, although Thai women in science are likely to possess better status than their developed world counterparts, gender discrimination is evidenced in about half the gender pay gap. This suggests that gender discrimination is more likely to be hidden in the Thai science academe. Thus, the reasons behind such gender disparities need to be explored and the next section does so.

7.3   Factors creating a gender gap in Thai science academic career advancement

The second research question of this thesis asks which variables explain the gender differences in career advancement in the Thai science academe. The findings reveal certain dimensions that have not been indicated in the West including

female underrepresentation in engineering, Thai societal norms depriving women from social networks, women regarded as inferior to men in Thai family, and specific academic practices. However, it should be noted that the reasons behind gender disparities in both the higher education and research institute sectors are likely to be congruent. That is, apart from the fact that the practices of Thai academic staff are largely based on traditional Thai values, professionals in any organisation operating under a norm of public organisation community are likely to experience similar working condition and thus have much in common (Lipsky, 1980, p. 4).

7.3.1 Subject segregation excluded Thai women from the career progression in science

Although Thai female academics are outnumbered by men in the hard sciences - which is similar to developed countries, this study extends the existing literature by revealing the way gender segregation often results in the inferior status of women in science.

Most Western literature has revealed that women tend to congregate in the soft sciences and men in the hard sciences (Bowman, 2011; Powell et al., 2009). A similar separation has been observed in Thailand. This lack of Thai women in the hard sciences is common in both research settings and across the national level. The interviews located a social attitude that hard sciences (i.e. engineering) advocate masculine rather than feminine qualities. Hence, such attitudes have made Thai male academics in engineering distrust the competence of their female peers and therefore erect barriers to them.

Although studies in developed countries are less concerned with subject segregation as a determinant of women's status in science (Bowman, 2011; Powell et al., 2009), the current research shows that Thai female academics, mostly operating in the soft sciences, are likely to be less well-rewarded than men working in the hard sciences. While developed countries focus on both the soft and the hard sciences, developing countries like Thailand hold up the engineering subject area as more important. In the age of globalisation, the economic structures of developing countries have changed in response to the manufacturing and the

semiconductor industries. Employment in engineering has thus grown in those countries (Spence, 2011). As a result, women in Thai science may find it less well-rewarded and more difficult to reach the top positions as a result of their underrepresentation in this subject area.

The national statistical data shows that Thai academic staff in engineering earned approximately 20 percent more than those in the soft sciences such as chemistry (National Statistical Office, 2009). In addition, since Thai female academics are underrepresented in the hard sciences, they have been implicitly discouraged from the overseas scholarship programme supported by the Thai Ministry of Science and Technology. Although the programme itself is aimed at both genders, the Ministry places more importance on hard science subjects such as engineering, energy, and metallurgy (comprising 60 percent of the total) while soft science subjects, mostly pure sciences, were totaled only 35 percent (Coordinating Center for Thai Government Science and Technology Scholarship Students, 2011). Also, according to the staff profile of research science case study, the possession of an engineering degree was particularly meaningful when appointing top executives.

This study contributes to the existing knowledge (Wailerdsak & Suehiro, 2004) by arguing that the profile of an engineer is crucial for career progress in a technological organisation in a developing country where engineering personnel are particularly needed. Therefore, Thai female academics who are less likely to work in engineering are implicitly excluded from this career opportunity as a result of this subject segregation.

7.3.2 Societal norms deprive Thai women from social networks in science

The findings indicate that limited access to the male-dominated core networks diminishes career opportunities for women in science. This is consistent with previous studies relating to social connections and gender gaps in scientific career advancement (Reskin, 1978; Sonnert, 1995/1996). However, the findings further extend this Western notion by ascertaining that the influence of Thai societal norms hinders Thai women from building connections in science while also blocking their access to academic career opportunities.

During the interviews conducted in both UV and RI, a close relationship among male networks was identified. They tend to connect to each other in order to support their careers, and thus empower men to progress in the Thai academic field. Because these social networks are gendered (Kay & Hagan, 1998), Thai female academics are thus automatically excluded from social relations with male colleagues.

Not only do male academics exclude women from men's social relations, but female academics themselves also refuse to join male networks as a result of Thai societal norms that shape women's behaviours. In the Thai context, the social norms that value a woman's virginity have deprived Thai women of opportunities to interact with men (Tantiwiramanond, 2007). In Thai culture, men are not even allowed to touch women, even on the hand, in the workplace or anywhere else public. As a result, while Thai female academics must be careful to conform to these norms when joining male networks, men have more freedom and can thus enjoy the professional benefits of such networks.

In such a situation, when a social relation between men and women has become an issue of deep concern in Thailand, limited access to men's networks prevents women from obtaining a source of key information and crucial tactics to support their careers (Shantz, Wright, & Latham, 2011). In turn, Thai male academics clearly have a stronger chance for promotion than women in science. Such an environment perpetuates gender inequality in Thai scientific organisations because as long as women remain low in number within the main networks, it will be extremely difficult for them to be accepted and valued (Bronstein & Farnsworth, 1998).

7.3.3 Thai women are inferior to men within the family context

Family responsibilities have a negative effect on Thai women's career prospects in science. This assertion was reiterated in the interviews, during which some female academics in both UV and RI indicated that, as a result of an imbalance in domestic responsibilities between men and women, women were likely to be held back by family commitments.

Female employees of both UV and RI agreed that they tended to allocate more time than their male peers to domestic responsibilities, often resulting in spending significantly less time on their jobs. This is consistent with Thai national statistics that illustrate the number of hours per day spent on house work as 3.5 hours for women and 1.9 hours for men, with the number of hours spent on work being 8.1 hours for women and 8.6 hours for men (National Statistical Office & Office of Women's Affairs and Family Development, 2008).

Prior research in the West has demonstrated that, for female scientists, family responsibilities can have a particularly negative impact on the issue regarding to the work-life balance (Wynarczyk & Renner, 2006). This is also true in Thailand where the requirements of family care had a more negative effect on female academics than their male counterparts.

Despite this similarity, the main reason is rather different to that of the West. In addition to the social expectation that women should put family first - the same reason identified in the Western context (Lewis & Humbert, 2010) - Thai women are obligated to domestic duties because they are regarded as inferior to men as a result of the practice of Buddhism and traditional social values (Vichit-Vadakan, 1997). Buddhist law and Thai social value have promoted male holding supreme power over women, while taught Thai women to follow and support men. For being a good wife and supporting her husband, a woman thus needs to concentrate to domestic responsibilities.

Thus, in order to conform to the social norm that husbands have greater status, some female participants interviewed in this study decided to sacrifice their career opportunities. For example, some got stuck in their career paths as they needed to fill expected roles within the family too. One RI academic stated that, instead of studying abroad, she preferred to stay in the country and take care of her family. Thus Thai female researchers, often more concerned with family responsibilities, are less likely to progress in science, as compared to their male counterparts.

7.3.4 Thai Science is the male realm

As Ozbilgin & Tatli (2005) stated, the dynamics of any organisational culture establish power differences between men and women in the workplace. Similarly,

this study found that an embedded notion about the Thai academy being male-dominated helped to give career advantages to men working within scientific organisations.

Science has been the preserve of men for many decades. Even in developed countries such as Sweden, gender discrimination existed until the beginning of the twentieth century when the King of Sweden first granted women the right to enrol at a university (Määttä & Lyckhage, 2011, p. 380). The same is true of Thailand where the first female students were admitted to science and engineering programmes in the 1930s and 1940s. This was some decades after the founding of the country's first university. In the 1990s, the quota system came under attack for sexual discrimination and was formally abolished (Praparpun, 2009). Even at the end of the 2000s, only one of the fourteen Thai research institutes, the responsibility of the Thai ministry of Science and Technology, had a female president (Ministry of Science and Technology, 2011).

These phenomena are largely based on a perception that science and technology fields require robust and logical decision making (Long & Fox, 1995). Accordingly, men are commonly perceived as stronger, more active and more independent, and thus more compatible with scientific careers. Because of such professional norms, women are likely to face a bias in the Thai science academe. This study revealed that some Thai female academics both in UV and RI were not accepted or trusted by their male co-workers. For example, when women become leaders, there is a tendency for men to challenge this authority in several ways e.g. ignoring their presence.

There is a prevailing notion that different genders possess very different skills. This not only results in gender bias in the Thai science academe, but also results in different kinds of job being assigned to male and female academics. The survey data showed that Thai female faculty staff had to deal with paperwork more often than men while their male peers performed primarily academic jobs. Gender stereotypes socialise women to become emotional and nurturing while men are taught to be rational and aggressive (Yingchoncharoen, 2007). Accordingly, Thai female academics are likely to be promoted to jobs in supporting areas, and men to those in the core functions.

Although this study cannot identify any reward-job differentiation gap between genders, job segregation can affect the level of women's rewards in science. In the Thai science academe, the promotion criteria governing work performance specifies that research, not document work is the main requirement for anyone applying for an academic position (Intarakumnerd et al., 2002). For this reason, academics who engage in research projects or special courses can earn extra income. As a result, Thai female academics, who are more often assigned to support work, are likely to be earning less. Gender difference in job expectations also demonstrates salary difference in the United States, where female faculty members are disproportionately assigned to teaching undergraduates, having less time for research that might earn them more rewards (Ceci & Williams, 2011).

This unfair approach to work assignment also offers women in science less academic prestige. As argued by Long & Fox (1995), research performance is a type of endowment which determines an individual's social class in academic fields. Therefore, women who are often assigned to non-academic work are likely to lose their standing in the academic community. This factor became clear during the interviews, during which both UV and RI participants characterised associated females with typical feminine jobs such as supporting units. This is true also of the Western context. Reskin (1978) mentions that females work more on technical support while males focus on being apprenticed to be scientists. Advantage occurs in scientific careers when men receive a higher chance to upgrade their academic capability, which explains why men and women differ in rewards and recognition (Zuckerman, 2001). This also brings a superior status to men in science.

This research uncovered another dimension of the division of labour that is more relevant in the developing world: safety concerns. In poorer countries, the safety level is relatively low in comparison to developed countries. Therefore, supervisors often hesitate to assign women challenging jobs because of prejudices about female weakness. The interview findings from RI revealed that the physical characteristics of women are sometimes seen as unsuitable for activities like field surveys, and organisations are unwilling to send females on fieldtrips into unsafe environments.

This is very different to the Western experience where denying women such mobility could be interpreted as a form of discrimination against them (Janssens, Cappellen, & Zanoni, 2006). In the Thai context, however, it is the duty of supervisors to protect female employees (Yukongdi, 2005). According to Reskin (1978), such gender roles can give men undue power over women. Accompanying female workers with male colleagues or only sending men can undermine women's working capability, meaning that they need to depend on their male colleagues.

It is clear that Thai female academics face a range of obstacles to career progression in academia. The next section explores how they react to those challenges through certain support strategies that help their career prospects.

7.4 Support and strategies women draw on in the Thai science academe

This section aims to uncover individual endowments and working styles which women employ in order to reduce gender disparities. The findings show that women cannot progress thanks to their academic performance alone. They are held back by a gender gap dictated by social mores in both Thai society and the scientific community. Thai female academics need various support conditions and must operate an effective working style to retain their status in an academic organisation. For example, female academics often need to resort to Thai organisational norms, including rules and regulations as well as seniority, to solve issues with male colleagues. In addition, in order to be visible and accepted into the science academe, females must establish female network, work in the same style as men, and typically avoid conflicts. Finally, female academics choose to be single or need support from family members and colleagues in order to manage conflicts between work and home.

7.4.1 Academic qualification can support Thai women in resolving gender bias in science

As expected, the current research confirms the literature (Yukongdi, 2005) arguing that academic background is crucial for the success of Thai female science academics as superior accreditation.

The quantitative analysis in both UV and RI pointed out that educational background significantly affects Thai female academics in terms of pay, while this factor was statistically less important for men. A similar conclusion was also reached in the interviews when Thai women, rather than men, stressed the importance of higher education for progress in the science academe. This is also true in the case of Korean female academics, where privileged education positively affected income and was of more importance for female scientists than their male peers in terms of advancement (Park, 2007).

For women in science, academic qualification is not only a determinant of better rewards, it also resolves gender bias in the workplace. Bourdieu (1986) would point to this by arguing that an academic qualification is a form of symbolic capital which can make a difference for individuals in terms of social class. Academic qualification can thus assist Thai women to enhance their academic status. In the UV case, female faculty members with a good academic background can increase their power and obtain high positions. Likewise, RI female researchers revealed that a prestige degree is an advantage to them as they attempt to rise through the organisational hierarchy. The finding confirms the argument that, in Asian society, an academic degree is regarded as a privilege and thus one of the major determinants of an individual's status (Tantiwiramanond, 2007). This would support the conclusions of the current research and with other studies in Korea (Park, 2007) and Taiwan (Tien, 2007), where scientific personnel with privileged academic degree earned better rewards and higher ranks in the science academe.

7.4.2 Bonding with each other in formal networks keeps Thai female academics visible in science

Thai male academics provide social connection to each other which assists them in obtaining career opportunities. Meanwhile, their female peers must establish formal networks of their own in the workplace in order to counter the male power and enhance female cohesion within the organisation. This supports the argument made by Reskin (1978) that scientists excluded from informal communication spend more time on formal channels of information instead. Female academics may need to build their own networks in order to seek opportunities and make themselves visible in academic organisations.

The quantitative results of this study found that women in both UV and RI were likely to attend formal activities. Furthermore, the interview findings indicated that Thai female academics forge professional-related relationships with one other in order to retain their power in the science academe. As compared to other parts of the world such as the Middle East where religion and culture prevents women from building networks with men (Tlaiss & Kauser, 2011), women in these countries also employ well – connected colleagues when making professional promotion.

However, according to the quantitative findings, formal networks are a variable positively affecting employment in senior positions among RI female research staff. However, no such evidence was found among their UV counterparts. This is due to RI's organisational pattern relying on the traditional Thai bureaucratic system, in which close relationships within networks are more likely to influence promotion.

Nevertheless, a sense of membership, similarity, and loyalty to an organisation are common organisational values within a Thai public organisation (Maneerat et al., 2005, p. 188). Hence, limited female access to men's networks (which make up the core of the Thai science community) has an effect on women's career opportunities in this field. The finding is consistent with Timberlake's (2005) that, in male dominated organisations, if women are constrained in their connections with men, they are less likely to achieve job promotion. Therefore, formal female networks are often inadequate for facilitating female academics to attain career opportunities in the Thai academic organisation.

7.4.3 Thai organisational culture supports women in control over men

The culture of the Thai public organisation, characterised by strict rules and regulations as well as a seniority system, can support women in their supervision of men.

Although Thai organisational norms favour men over women, the pattern of Thai bureaucratic culture has been known to support female supervisors in both UV and RI, allowing them to exercise their right to order employees to fulfil commitments. The workings of the Thai public organisation are largely framed by the written

rules and regulations that assign authority and responsibilities to employees (Maneerat et al., 2005). For this reason, UV and RI women resort to 'rules and regulations' as tools to defend themselves within the public organisation, knowing full well that workers are obligated to conform to the rules by which they are employed (Lipsky, 1980).

Furthermore, the Thai academic organisation displays certain characteristics that distinguish it from the West. Essentially, it depends on the seniority system which is deeply rooted in Thai organisational norms. An unequal power relationships between old and young generations persists in Thai society; thereby influencing the pattern of management control in the bureaucratic system. Greater seniority can make Thai female researchers encounter fewer difficulties and is seen as an advantage in dealing with men in the workplace. It should be noted that, in turn, lack of seniority makes Thai female academics less likely to be accepted by senior male colleagues who treat junior female academics as females, suggesting less experience in the field. This is consistent with a "father-daughter model" introduced by Reskin (1978), indicates that junior women have less power in scientific organisations.

7.4.4 Working in a male style

Because masculinity is more the norm in scientific fields, simply 'doing what men do' is a strategy deployed by Thai female academics. The adoption of certain masculine qualities was identified by women as a strategy for gaining acceptance. Especially in UV where organisational norms privilege men over women, working in a 'male style' was more necessary for women in comparison to their RI peers. UV female faculty members added that they needed to put more effort into adjusting their working style such as being logical, strong-willed and competitive.

This is consistent with Adkins (2004), who argue that, in order to be accepted, agents seem to possess habit in line with the conditions qualified for the field. Therefore, as feminine characteristics are not welcome in the Thai science academe, Thai female academics can develop certain male traits in order to be accepted by male colleagues. Powell et al. (2009) argued that, in male-dominated

organisations, if female managers lack certain necessary masculine traits, career advancement is less likely for them.

7.4.5 Working hard and smooth relationships can save women from conflicts in the workplace

Aside from adopting a male working style, the current research has found that most Thai female academics try to avoid conflicts by working hard and maintaining smooth relationships in order to flourish professionally. However, apart from the previously mentioned strategies, it is interesting to note that some Thai female academics adhere to this style on the basis of Thai social norms.

When Thai female academics are assigned to non – academic work, instead of complaining about such unfairness, they choose to work harder. However, the reasons why Thai female academics work unconditionally differs from the previous literature which asserts that hard work is essential because women feel they need to prove themselves (McDonald & Hite, 1999). Conversely, Thai female researchers do not deny their workload as they tend to avoid conflicts and thus are likely to conform to orders at work.

Given that relationships are crucial in a bureaucratic community, instead of confronting the problems, workers in the public organisation are likely to avoid any conflict with co-workers (Lipsky, 1980). Furthermore, in place of the Western management style which is straightforward, ambitious, aggressive and accepted within organisations, Thai people choose a smooth conversational style which is polite, cooperative and sensitive, on the grounds that subordinates are requested, not commanded, to perform tasks (Maneerat et al., 2005). This is especially true for Thai women, as Bhanthumnavin (2003) observed, they are more vulnerable to social influence in the workplace than men, and will be more sensitive to work conflicts than men. That is why it is worth noting that some female academics in both UV and RI choose to avoid conflicts as part of their working style.

Additionally, Buddhism focuses on harmony so confrontations are seen as poor etiquette (Maneerat et al., 2005). Thai people thus try to avoid any aggressive action toward others (Chompookum & Derr, 2004). Relatively polite manners are favoured particularly by women (Patana, 2004). Thus, although Thai female

research staff in both UV and RI have authority over male staff through rules and regulations, they will utilise their female characteristics to control men such as coordinating skills, rather than direct commands.

However, these compromising characteristics are also a reason why women have been placed in less senior roles, while men, whose competitive and self assertive characteristics are more welcome in academia. As Sonnert (1995/1996) stated, because women adopt a harmonious style, they tend to be seen as less competitive in scientific fields where strong roles are emphasised. In contrast, men, who are viewed as more aggressive, tend to be more visible in the science field. Moreover, according to Powell et al. (2009), agents who do not adopt a masculine style are likely to experience failure in the male dominated field. Hence, women with a smooth communication or compromising working style are unlikely to go far in the sector.

7.4.6 Extended Thai family and colleagues support women in managing conflicts between work and family

In the Thai science academe, conflicts between work and family can be avoided by family members and colleagues helping female academics pursue their careers. This may signify cultural differences between Thailand and the West, where single families and the individualist outlook of society make family responsibilities a job barrier to women in science (Blackwell & Glover, 2008).

As most of the families in Thailand are extended (Elliott & Gray, 2000), married women can thus draw support from their relatives, for instance, parents can contribute to child care. The interviews found that most married female academics in both UV and RI enjoyed ample support in terms of childcare and domestic assistance from their parents; thereby having children has a relatively less impact on Thai female academics in their work contexts. The interviews yielded evidence that the extended Thai family assists female academics with the advancement of their careers. Further to this, where husbands possess supportive and understanding attitudes, they can support women's careers in the Thai science academe by sharing in family responsibilities. As argued by Tlaiss & Kauser (2011), if male and female roles in the family are generally based on mutual cooperation, the

different genders can support each other in sharing household duties and in pursuit of their careers.

Interestingly, because of the collectivist nature of Thai society compelling people to support one other in work-life related issues (Yukongdi, 2005), Thai female academics can depend on colleagues in the workplace to reduce their work life conflict. In the Western context, although scientists can draw some support from colleagues, such support tends to be limited to technical assistance and collaboration (Reskin, 1978). In Thailand, colleagues often help female researchers who are working longer hours to strike the right balance between family and work.

The argument was elaborated in the interview findings, especially in RI where the core function focuses on research and development, meaning that academic staff tend to spend a lot of time in the laboratory. Thus colleagues provide support by covering women's laboratory work when they have to leave early for family duties. However, a distinctive finding was identified in a contrast between women in UV and their counterparts in RI. As opposed to RI, women in UV did not reveal whether they receive support from their colleagues in fulfilling domestic duties. This may be down to the differences between job roles. As UV staff are committed to teaching - a relatively individual obligation - while the RI's work is mostly research, in which teamwork is a key to success in the laboratory. Thus, it is possible that UV women doing independent teaching jobs that cannot be covered by colleagues, are more negatively affected by family duties in comparison to their RI peers.

In order to avoid work-family conflicts, some UV women therefore have chosen to stay single. The strategy fits what Hakim (2004) has called 'work-centred', one of the types of lifestyle in 'preference theory', denoting a choice of female lifestyles between work and family preference. Hakim (2004) noted that women of this type have usually had a better education and are likely to focus on competitive activities. Hence, many of them delay decisions about marriage and remain childless. The 'work-centred' lifestyle was observed with women in the Thai science academe. The survey also illustrated that half of female respondents were single. This is very similar to the position of Western women in science; in the

UK, females do not wish to start a family as this would halt their career progress (Wynarczyk & Renner, 2006).

Overall, the findings have confirmed the career concept critique of Iellatchitch et al. (2003) who argue that even with a wide range of human capital, the practices of personnel in the workplace are still constrained by societal norms.

7.5 Thai female academics' perception towards the status of women in Thai science academe

It is apparent that the norms of the Thai science academe are derived from Thai culture and the structural components of the Thai academic organisation, which traditionally favours men over women. This condition strengthens men's status in Thai science academe. Although women develop their behaviour by creating a variety of strategies to mitigate the gender bias in science, such strategies are likely to focus on social relations and on forging status through accumulated education and forming academic networks, rather than through the control of men.

Thus, in order to investigate how Thai female academics perceive their status in careers, this study is based on the two main feminist approaches: liberal and radical ideologies, as stated in Chapter Two. The liberal feminist approach tells us that Thai academic science has equal terms of employment between men and women, whereas the radical outlook recognises the differences between men and women in this context. However, this study found certain distinctive dimensions within Thai women's perception towards gender discrimination in science. This thesis discovered that not only is gender inequality not perceived by females, but some women are likely to accept this situation.

7.5.1 Liberal feminism approach: women are equal to men in Thai science academe

According to the liberal feminist lens which focuses on the notion of rights and equality (Holmes, 2007), Thai women are seen as equal to men. The position of Thai women has advanced in many respects since 1974, the year in which the Thai Constitution introduced significant legislation guaranteeing gender equality and protection against discrimination (Yukongdi, 2005). Consequently, a high number

of women have joined social and national development affairs; and attitudes towards women have improved (Tantiwiramanond, 2007).

This can be reflected in Thai academic science. The female respondents from both UV and RI, according to the survey findings, felt that there was barely any difference in prospects for male and female career advancement in their field. That is because several support structures can be recommended for women who opt for science careers. The national development and education systems in Thailand have provided women with better opportunities to study. In 2007, half of all Thais with a doctoral degree in science and technology were female (National Research Council of Thailand, 2007). The increasing cultural capital through accumulated education as stated above has led some Thai female researchers to perceive that they have earned equal acceptance as men in science, certainly with respect to competence. They feel they are now empowered to play key roles in science.

Thanks to improved career opportunities, gender equality in the Thai science academic organisation seems to have improved, yet the actual gains are small. As illustrated in the empirical data in both the quantitative and qualitative findings, only senior female academic workers were found to have no problem with gender discrimination, whereas those at the bottom seem to have experienced some discrimination. As Cubillo & Brown (2003) stated, women in privileged groups are less likely to face gender discrimination.

In the Thai science academe, although the findings revealed the extreme participation of Thai women, the trickle up effect has not yet occurred to higher grade positions - only a quarter of academic personnel in senior positions are female (National Statistical Office & Office of Women's Affairs and Family Development, 2008). As stated by Määttä & Lyckhage (2011), the numerical representation does not equal a fair power relation because there may be some barriers inherent in the organisational structure.

7.5.2 Radical feminist approach: traditional values hinder women from becoming leaders in the Thai academic organisation

Giddens (1984) argued that the class position of members in organisations is determined by a closely knitted connection between their own individual

characteristics and structure conditions. Similarly, Thai women's status in science is not only determined by their own individual capital, but also by the culture and the norms within Thai academia.

Although they have accumulated human capital, Thai female academics have their status determined by Thai organisational values and social norms, which place them in a minority in the science sector. From a radical feminist perspective (Beasley, 1999), while more Thai women can enter science, gender inequality has not changed. The evidence in both the UV and RI quantitative findings and the Thai national statistics suggest that the proportion of Thai women in science remained lower than men in the top ranks (National Statistical Office & Office of Women's Affairs and Family Development, 2008) and that they were also less well-paid (National Statistical Office, 2008).

Social expectations of men as natural leaders and of women as subordinates indicate gender discrimination in the Thai science academe. This is in agreement with the concept of radical feminism (Beasley, 1999), in which masculine and feminine identities construct different status between men and women in society. The interview findings implied that some Thai female academics were treated with a lack of respect and harshly judged by certain male colleagues who could not accept women who challenge men's power. This is due to the persistence of a traditional attitude that Thai women should behave in line with their expected role as followers.

7.5.3 Gender is not an issue for Thai women in science

As opposed to the Western science academe where gender discrimination is largely cited by females on the grounds of organisational practices such as unfairness in the process of job hiring or career promotion (Ceci & Williams, 2011), this study found that Thai female academics themselves did not envision gender as an issue for them, while some of them accepted such discrimination but weren't worried about it.

Some Thai female academics had little awareness of discriminatory treatment and felt that they were in the same league as men. This may be explained by the fact that the terms of reference for all positions in both UV and RI are treated with

confidentiality. According to the nature of Thai public organisations, the promotion process for senior positions is likely to be secret (Bowornwathana, 2000). Thus the human resource departments in both UV and RI were not permitted to release such data. Thai academic staff are less likely to access promotion information, and individual rewards earned will be unknown to the public. Moreover, given the nature of the Thai academic organisation, where rules and regulations are gender neutral, Thai female academics are less aware about men's opportunities for greater rewards. For this reason, it is difficult to know where women stand in relation to men in terms of salaries and other kinds of reward.

Furthermore, Thai female academics acknowledge that they earn less than they could, but they are likely to accept this fact and no longer feel that discrimination is an issue for them. This could be a result of societal values and Buddhist principles. The gender-based attitude that men are more suitable for leadership is accepted among Thai women in science. Such a belief originates from the Thai traditional value that women are nothing more than men's belongings (Tantiwiramanond & Pandey, 1997), and thus mean women had less self-confidence. During the interviews, Thai female academics felt inadequately competent as leaders even though more of them joined the Thai scientific workforce. Although their qualifications have improved as the result of human capital promotion, they still underestimate their own capabilities by referring to themselves as the follower. Also, following the law of karma in Buddhism, Thai people typically tolerate unfortunate events in their lives (Siengthai & Leelakuthanit, 1990). For example, when an employee does not get a promotion, they will be philosophical about it, considering it just bad luck (Yingchoncharoen, 2007). That is the reason why Thai female academics accepted inequalities in science and agreed that things should be the way they are, without any effort to improve.

7.6   Conclusion

This study has provided comparisons of the gender gap between two different types of academic organisations in Thailand; university (UV) and research institute (RI), as summarised in Table 7-1. It has further extended the literature on gender

discrimination in academic careers by evaluating the impact of different types of academic organisation and by illustrating the types of gender difference that are found in the West, yet remain unidentified in Thailand.

The overall findings generally fit in with the multilevel analysis (Layder, 1993) which adequately addresses the gender phenomenon and relevant issues in a non-Western context. The status of women in the Thai science academe was presented through an interaction of the social structures and individuals' actions within male-dominated institutions. Gender influences the way men and women think and act. Differences in attitudes and behaviors between men and women are part of gendered accumulation, which attributes to the living patterns of men and women. Since the mainstream of both Thai society and scientific careers takes masculine characteristics as typical practice, women who behave and act differently from the male style are restricted in their career advancement in Thai science academe. In addition, due to the widespread liberal feminism as well as the acceptance of social unfairness in Thai society, female academics tend to disregard gender inequality in academic careers.

Four main arguments are identified in this study. Firstly, the findings identified that different types of institution may cause different patterns of professional behaviour. Although gender disparities were found in both sectors, women in the research institute setting generally enjoyed higher status than those in the university sector. This may be ascribed to the difference in organisational patterns.

Secondly, this study located various factors that contribute to a gender gap: subject segregation (Thai scientific policies place engineering as a top priority); lack of female access to male social networks (Thai social norms constrain women from making social connections); gender bias in the Thai academic organisation which favours men over women; and expectations that Thai women will fulfill the traditional duties as a wife and mother, rather than the professional roles of an academic worker.

Thirdly, in order to respond to the gender gap, the research results explored multiple support strategies that Thai female academics cited. These are often related to professional performance such as having a privileged educational

background; forging female networks: employing rules and regulations; possessing certain necessary masculine qualities: and a conflict avoidance style. Although Thai female academics intensively utilise their professional behaviour for career progress, they are more likely to be inferior in the Thai academic organisation. That is because most of these survival strategies mainly draw on a smooth relational style, which is due to societal gender roles and organisational cultures in Thai public academe. In order to avoid conflicts between work and family, being single as well as family members and colleagues can help female academics pursue their careers.

Finally, due to the liberal feminist stance in the mindset of female academics and the difficulty in accessing information on promotion decisions in Thai public organisations, female academics perceive they have equal access to opportunity as men do in science academe, and thus are less likely to observe a gender gap in academic career advancement.

The next chapter revisits the research questions and provides answers and directions for future research. Key issues have been highlighted and specific recommendations for gender policy and research into women's status in Thailand have been added.

Table 7-1 Comparative result of gender difference and career advancement across
a university and a research institute in the Thai science academe

Note: UV = Finding found in the university (UV)
RI = Finding found in the research institute (RI)
ST = Finding found in the Thai national statistics
W = Finding found that is similar to the West
T = Finding found that is similar to the West, but from a different perspective

Themes	Categories	Quantitative finding	Qualitative finding	Compare finding to the West
I. Gender gap in the Thai science academe	Gender pay gap	UV, RI, ST	-	T
	Gender grade gap	UV, RI, ST	-	T
II. Factors creating a gender gap in Thai science academic career advancement	Subject segregation excluded Thai women from the career progression in science	ST	UV, RI	T
	Societal norms deprive Thai women from social networks in science	-	UV, RI	T
	Science is the male realm	UV, RI, ST	UV, RI	W
	Thai women are inferior to men in family	UV	UV, RI	T
III. Supports and strategies women draw on in response to the gender bias in the Thai science academe	Academic qualification can support Thai women in resolving gender bias in science	UV, RI, ST	UV, RI	W
	Bonding with each other in academic networks keeps Thai female academics visible in science	RI	UV, RI	W
	Thai organisational culture (strict rules and seniority system) supports women in control over men	RI	UV, RI	T
	Working in a male style	-	UV	W

Themes	Categories	Quantitative finding	Qualitative finding	Compare finding to the West
	Working hard and smooth relationships can save women from conflicts in the workplace	-	UV, RI	T
	- Extended Thai family - Colleagues - Being single can support women in managing conflicts between work and family	-	UV, RI RI UV	T
IV. The perception towards the status of women in Thai science academe	Liberal feminism approach: women are equal to men in Thai science academe	ST	UV, RI	T
	Radical feminist approach: traditional values hinder women from becoming leaders in the academic organisation	ST	UV, RI	T
	Gender inequality is not an issue for Thai women in science	UV, RI	UV, RI	T

CHAPTER 8

CONCLUSION AND RECOMMENDATIONS

This chapter aims to present the overall conclusion in the light of the research questions of the thesis. The strength of this research is discussed. Some limitations of the study and some ideas for further research are identified. Finally, some recommendations at the policy and practical levels are suggested, with the objective of providing the government or organisations related to the areas of science and gender with actions or initiatives which might improve the status of Thai women.

8.1   Overall conclusion

Cubillo and Brown (2003, p. 285) state that 'the conceptualisation of gender varies from one country to another, depending on cultures, traditions and values'. This research is thus conducted in Thailand in order to contribute to the evidence of gender and career advancement in scientific academe in a non-Western context. The study of Thailand is also important in the context of developing countries as most literature tends to focus on the meaning of academic careers in developed counterparts (Ceci & Williams, 2011; Connolly & Long, 2011), while the scientific characteristics of developing countries are perhaps different from those of developed countries (Intarakumnerd et al., 2002).

Broadly speaking, this thesis presents the four main arguments associated with gender disparities in Thai academic careers in order to uncover the gender phenomena in Thai science academe. First, it is aimed to illustrating an existing gender gap in terms of rewards and revealing whether such a gap originates from the results of difference in endowment variables between men and women or gender discrimination. Second, as the causes of such gender disparities originate from the interaction of a range of variables including individual endowments, organisational practice, and social structure (Healy et al., 2005), multilevel variables that determine the gender gap in Thai academic science are explored. Third, the strategies women employ to fight such gendered bias in Thai science

academe are also identified in order to investigate how women survive in academic careers. Finally, the study investigates the perception towards the women's status in Thai science academe in order to assess the actual status of Thai women in this context and identify whether Thai women belong to the dominant or subordinate. Accordingly, multilevel analysis (Layder, 1993) is employed as main conceptual guide.

Since the thesis is aimed at measuring the gender gap in Thai academic careers in terms of numeric indicators and also to revealing reasons of such gender disparities, a combination of quantitative and qualitative approaches can assist the researcher in understanding gender dimensions in Thai academic careers. The findings are analysed from various sources including documentation as well as a questionnaire survey and interviews conducted with academic personnel in two public academic organisations: a university and a research institute in Bangkok, Thailand. The triangulation among all sources of data enables the researcher to gain further insights into the gender phenomena in Thai science academe.

The findings reveal that, while Thailand is not so progressed in science in comparison to its developed counterparts (Intarakumnerd et al., 2002), the gender indices for Thai academic careers are found better than those in some developed countries. For example, there is no evidence of gender disparities in terms of 'sticky floor' in Thai science academe. Unlike most developed countries that attempt to promote educational opportunities for women through national policy in order to increase the number of female workforce in science (Ceci & Williams, 2011), Thailand's high proportion of women in science is a result of various factors. Such factors include social attitudes towards academic careers in which their career characteristic as job security is suitable for women; promotion criteria at the entry level of the Thai academic organisation mainly based on the bureaucracy which is gender neutral; and professional protocols in the Thai scientific labour market where men tend to work more in industry sector rather than academic ones. Consequently, Thai women accounted for half of academic personnel in the Thai scientific sector (National Science Technology and Innovation Policy Office, 2007).

Nevertheless, the evidence of gender inequality can be seen in Thai science academe, where traditional attitudes in which men have been favoured in scientific areas are maintained (Long & Fox, 1995). The quantitative findings, derived from multiple regressions analyses, the Oaxaca decomposition (1973) and the multinomial logistic model highlight the existence of the gender gap in terms of rewards in Thai science academe. Gender discrimination in Thai science academe is evident in both the less pay and the glass ceiling for women.

However, in Thai higher education, where the promotion process is likely to rely on internal management and tends to favour men, the status of female academics seems worse than that of their peers in the Thai research institute sector, where promotion process mainly draws on the Thai bureaucratic system and is thus gender neutral. This suggests that difference in organisational characteristics appears to result in different work experiences for women. The finding are thus in agreement with the argument that different types of academic institution offer different levels of professional progression according to gender (Connolly & Long, 2011).

Further, the reasons behind the gender gap in Thai academic careers are revealed by the findings that the career opportunities for Thai women in science are under threat at multi- levels. There are some constraints on the national scientific level, where engineering is considered more important (Wailerdsak & Suehiro, 2004). As a result, the relatively low number of Thai women in engineering can leave women with an inferior status in science. At the organisational level, difference in perceptions about skills in terms of gender leads to a gender bias in the Thai academic organisation, where men are viewed more positively. In addition, Thai female academics are likely to be assigned to support areas in the workplace, which negatively affects their level of rewards and academic prestige. At the individual level, the current study found that Thai male academics have a better chance to move upward in science because they are strengthened by the surrounding social networks while being able to focus more on careers, thereby leaving family duties to women. In turn, Thai female academics have to struggle with family responsibilities more than men do and they also have limited opportunities to build social connections. The above findings suggest that it is

evident that women cannot achieve gender equality in science careers as long as there is difference in gendered attitudes between the two. The findings generally support the argument made by Giddens (1984) that apart from their own characteristics, the status of organisational members is closely connected to structural conditions.

Supports for Thai women in academic careers and their working styles are also revealed. It is apparent that Thai female academics have developed a different behavior in order to fight with gender disparities in careers. Given that a person's academic background is crucial for success in academic careers, some women tend to accumulate academic degrees for a higher chance of success. In the meanwhile, as masculine characteristics are more welcomed in science academe (Määttä & Lyckhage, 2011), some Thai female academics tend to adopt a male (i.e., strong or competitive) working style in order to prove that they can perform anything as well as men do.

The above strategies are yet inconclusive. Given that women are likely to face bias in the Thai science academe, they need to rely on rules and regulation as well as the seniority system in order to gain control and respect of male subordinates. In addition, in order to compete against the male power and become visible within the organisation, women have established networks of their own with their female peers in the workplace.

Nevertheless, this study uncovered some weakness in the female working style. That is, working without complaining and maintaining smooth relationships. It is noteworthy that when female academics adopt the harmony style, they tend to be placed in subordinated roles (Sonnert & Holton, 1996). This is because, as previously mentioned, the masculine style is more desired in science academe (Määttä & Lyckhage, 2011). This is also in agreement with McNay (1999) that working in a feminine style tends to generate an imbalanced social relationship (in which women are inferior to men) between agents.

In order to avoid any problem arising from having a family, some Thai female academics choose to be single. However, the research results also indicate that Thai female academics can draw support from family members and colleagues to

diminish work–life conflicts. This suggests that, though Thai women are expected to give family care as first priority, they can gain benefits from the collectivist culture in Thai society (Yukongdi, 2005), where people are compelled to support each other in work-life related issues. Interestingly, this is opposed to that found in the Western context, where single families and the individualist culture are the mainstream of society (Blackwell & Glover, 2008).

Finally, the actual status of women in Thai science academe is assessed through a range of viewpoints. Considering gender norms in the Thai context, it is obvious that men have an edge over women. For this reason, gender inequality is still commonly found in Thai science academe through evidence of female suppression in the Thai academic organisation. In addition, the findings revealed that although some female academics witness the existence of gender inequality in science, they tend to disregard it. This is because Thai women are socialised, by traditional values which accept social inequality, to believe that they are of less value than men and to endure any unfair incidents. However, Thai female academics, on liberal feminist grounds, seem to agree that they are equal to men in science as a result of the national development in the education and the promotion systems which apply equally to all, regardless of gender. This means that, as long as women in science continue to ignore gender issues in Thai science academe, gender discrimination remains a hidden problem.

The overall findings suggest that, although women may attempt to create various practices to survive in their careers, the success of such attempts often depends on the structural norms in Thai society, which suppose women act in compliance with the gendered roles. The findings exhibited that the social position of individuals is not only laid down by their capital, but also modelled on the gendered value given by society (Skeggs, 2004). Although Thai female academics are of their individual features, but their status in the scientific fields should be in line with the rule set by traditional Thai values. The current research found that, even though Thai female academics are well endowed with a privileged academic background, it is often inadequate in terms of gaining the equal status with men in Thai science academe. This is because the underlying premise in both society and the Thai science community is still in favour of men. Apart from these views, the status of Thai

women in scientific careers is explained by multilevel variables (Layder, 1993) and determined by the interaction between the social structure and individual endowments in predominantly male organisations.

8.2   Strength of the study

This thesis presents the benefits of conducting a mixed-method study, which facilitated the researcher in examining a range of factors by which Thai women are supported or constrained in academic careers. The quantitative findings capture a broad picture of the gender gap in Thai academic career advancement, while the qualitative ones permit the researcher to explore in more depth the reasons for such a gap and related issues.

The combined quantitative and qualitative approach can provide an overview of feminist research as it can facilitate a broader and deeper understanding of women's lives, as much as is possible (Reinharz, 1992). For example, the quantitative findings reveal that a privileged education tends to be significantly important for Thai female academics in terms of gaining better rewards. A similar argument is also found in the interviews, in which detailed answers about why education can promote Thai women in science are reiterated. Coupled with evidence in the documentation data that, the developments in the Thai education system has given Thai women better opportunities to join the fields of science and technology, although men, rather than women, tend to be appointed to international scholarships which are more widely available for engineering. In other words, the strength of this study is the pooling all sources of data which together can address the research questions of this study in order to fully understand the gender phenomena in Thai scientific careers.

According to Creswell and Miller (2000), in addition to providing the strength of the research, the triangulation of the quantitative and qualitative findings can diminish the bias of a single method. It is noteworthy that, although some of the variables do not appear meaningful in terms of quantitative significance, these variables should not be ignored. For example, subject segregation is a major issue of concern for the research participants in the interview, as it is meaningful in terms of its impact on promotion in the Thai academic science organisation.

However, the quantitative findings indicate that promotion in academic careers is insignificantly related to science-subject areas. Thus, if a researcher is reliant upon on a single method, he or she may miss some useful information (Johnson & Onwuegbuzie, 2004; Metz & Tharenou, 2001).

8.3 Limitations of the study

Some limitations of this study include the issues relating to the representativeness of participants, the reliance on a cross-sectional survey and the fact some variables in the quantitative models are missing.

This analysis has been conducted through fieldwork in Bangkok, the capital city of Thailand. Since Bangkok is the centre of education and employment, the women in Bangkok are seen as the nation's most advanced, compared to their counterparts in other regions (Yukongdi, 2005). Therefore, results obtained from samples of scientists in the Bangkok area and those in other areas possibly differ from each other. For example, the data collected from the samples in Bangkok may underestimate the existing gender gap. Nevertheless, this study still finds that men are likely to be better rewarded in Thai science academe despite the fact that Bangkok women are arguably better off than women in rural areas.

In addition, this study uses samples consisting of scientific staff in Thai public organisations only, meaning those in the private sector are excluded. The evidence suggests that more Thai women are entering science in the public sector (National Science Technology and Innovation Policy Office, 2007) while Thai men tend to go into the private or business sector (National Science and Technology Development Agency, 2008), which means that more opportunities are open to Thai female academics in the public sector. However, this study still finds that the gender pay gap reported from the sample of this study is likely to be similar to that of the national level. This is because employment in public sector science makes up most of the Thai science workforce in total. This study can be seen to represent gender phenomena in the Thai science community.

According to Stake (1978), while a case study may constitute a weak basis for generalisations, it can represent a particular community (for example, academic careers), thereby allowing some generalisations. Likewise, although this present

study has been conducted in just two academic organisations (a university and a research institute), this sample is adequate for providing a good representation of Thai academic sciences. The data presents a detailed view of the issues relevant to gender and career advancement in Thai science academe. Many of the issues resonate with the existing literature; thus it is possible that the findings of this study may be applied to similar situations elsewhere in Thailand or other countries. However, as Chompookum and Derr (2004, p. 418) put it, 'generalising findings from culture to culture should be done cautiously'.

The quantitative results in the current study are reported on the basis of data from the cross-sectional survey, which collected data at a specific point of time. However, scientific performance and career rewards are likely to be changeable, which might cause respondents' career advancement to change over time (Long & Fox, 1995). Therefore, the results of this research may not reflect the gender gap in scientific career advancement over a period of time.

In addition, the model specification, both in the wage function and the multinomial logistic regression calculated in this study, focuses on endowment variables only and does not consider the organisational or social factors, which may be integral to the composition of the gender gap (Long & Fox, 1995). This might affect the results of the study. However, in complementing the qualitative analysis, the current study was able to fill the missing variables in the quantitative ones.

8.4 Recommendations

In the previous sections, many issues relating to the status of Thai women in science have been raised. Thus, in order to improve the status of Thai women in science, some recommendations, drawn from the research findings, in terms of policy, practice and future research are proposed.

8.4.1 Recommendations for policy

The Thai national policy related to women issues both in terms of society and scientific fields seemingly fails to address women as target group and the existing legislation barely recognises gender equality as an important issue. In the Tenth Thai National Economic and Social Development Plan for 2007-2011, however, issues of raising awareness of nurturing equality between men and women were contained. Yet, certain deadlines or achievement targets have not been implemented so far (Office of the National Economic and Social Development Board, 2008). This makes it difficult to assess the effectiveness of the Plan in terms of how it has improved the female status. In Thai sciences, the manpower target solely stresses an increase in the proportion of scientific manpower by producing young researchers (Office of the National Economic and Social Development Board, 2008). Opportunities for Thai women in science thus are created by meeting the demand of scientific manpower, rather addressing the issues of gender.

This study, therefore, proposes certain policy recommendations for developing women's status in both society and Thai scientific sectors, which include raising awareness in women in the national development agenda; encouraging female role models in hard sciences, promoting publication as the key criterion for career progress in Thai academic science: and regularly collecting gender statistics in Thai sciences.

8.4.1.1 Raising awareness in women in the national development agenda

The Asian Development Bank (2002) confirmed that gender bias among decision makers in government agencies, that they are less likely to see the importance of gender issues in the national development agenda, exist in Thailand. As stated in Chapter Three, the anti-bias towards the feminist movement remains prevalent in

Thai society. Although feminist workers have attempted to raise the status of women, such attempts are attacked, by certain conservative agencies, for having domestic problems, supporting homosexuality, or working against the mainstream male dominated culture (Somswasdi, 2007). For these reasons, support for the women's agenda is limited and out of favour from the national administrators.

As argued by Pongsapich (1997), the efforts to promote equality or opportunities for women would be in vain if the gender bias or anti-feminism attitude among administrative agencies still prevails. Key proposals for raising awareness in women at the national level thus should start from changes in the patriarchal attitude among the top management at policy level. In Indonesia, for example, men and women in legal agencies are required to join the gender-sensitive awareness training in order to make them recognise the women's rights. According to the Asian Development Bank (2002), awareness in gender sensitive issues through a training program for policy and decision makers can promote the citizen's rights as well as personal awareness in the difference between men and women.

Further, in order to reduce the opposition of the agencies with an anti-feminism attitude, women's organisations themselves should relentlessly work to unite the male-female citizenship and to promote the harmony within society such as including men and children in women`s activities; and cooperating with family-related organisations through networking so as to exchange experience and strengthen each other. According to Somswasdi (2007), such an approach is more likely to win support from policy makers who see feminism as a threat to social institutions.

8.4.1.2 Raising awareness in the gender situation in science

Although both national statistic data as well as the survey data of the current study present evidence that Thai female academics are less rewarded, most female participants are less likely to be aware of such a situation. Instead, they tend to believe that they are rewarded as equally as men. Therefore, it is extremely important for female academics themselves and administrators in the scientific organisation to be provided with information of the current gender situation in scientific careers and become aware that women in scientific fields are disadvantaged and thus should be more promoted.

Both administrators and academic staff in the scientific organisation should be alert to gender discrimination in the workforce. In particular, they need to accept the existence of gender discrimination within the organisation. The Ministry of Science and Technology, Thailand and women-related agencies should collaborate in order to raise gender awareness among academic personnel by disseminating information on the gender situation in science, perhaps through media materials or printed materials. Furthermore, the scientific organisation as a whole should integrate a gender provision into their policy and inform their academic staff to take it into account. Also, activities with objective to promote women's development in science among scientific stakeholders (i.e. policy makers and staff in the scientific organisation, government agencies, and women-related agencies) should be introduced in order to establish a network for raising the awareness in gender issues, which might be useful for policy delivery. All of these initiatives could be done with a concerted effort in order to create positive attitudes on gender equality and encourage scientific workers of both genders to do their best at work.

8.4.1.3 Encouraging female role models in hard sciences

This research has uncovered obstacles to Thai women studying in science-related areas as a consequence of subject segregation, which affects their career promotion; therefore, the policy to encourage Thai women to study scientific subjects which used to be limited for them, that is engineering, should be implemented.

In Thailand, the policies and planning for the development of women has been established in order to push women to become more interested in science and technology (Office of the National Commission on Women's Affairs, 1995). However, these policies placed importance on how to make Thai women enrol in education in science-related fields, while failing to address the issues of gender segregation of the study fields as a concern. Although the educational quota system has been abolished since 1998 (Praparpun, 2009), male and female students tend to concentrate in fields that are traditionally thought as being suitable for their typical gender characteristics.

In order to encourage more female students to achieve their full potential in male-dominated subjects, providing women with role models is therefore recommended. Introduction to the role models of women in science have already become a policy to solve the problems of subject segregation in European countries (European Commission Directorate-General for Research, 2009). For example, in Greece (European Commission, 2008), a DVD showing the lives of female researchers working in male-dominated fields was produced in order to make women visible and to create a positive image of women in the male-dominated areas. Bowman (2011) argued that female role models in science and engineering, such as female academics in those fields, may raise the number of women enrolment in such fields. In light of the above research, promoting female professional role models in hard sciences to the Thai public should be set forth in order to create further motivation and build a positive attitude for female students who are interested in those subjects.

8.4.1.4 Promoting publication as the key criterion for career progress in Thai academic science

Publishing was less likely to be cited by the research participants, during the interview, as a determinant of their career success because other factors (that is, seniority or informal contacts), rather than the number of publications, are seen to be important criteria by which academic staff may progress in Thai public academic organisations. This evidence contradicts previous research conducted in other countries, where there is more progress in science. For example, scientific personnel in Korea have had to rely more on evidence of academic productivity to prove their scientific capability (Park, 2007). Similarly, a Taiwanese faculty was rewarded on the basis of research productivity (Tien, 2007).

The absence of a direct incentive to publish may explain why Thailand is not as progressive in science. Considering the ratio of science and technological publications in populations in other countries, it is apparent that Thailand has demonstrated lower competency, with one scientific publication for every 13.23 science personnel. Korea produces a scientific publication per 6.95 science personnel, and Taiwan has a scientific publication per 8.35 science personnel (National Science Technology and Innovation Policy Office, 2007).

According to Lipsky (1980), in order to maintain the quality of organisational performance, it is helpful if the consideration of personnel promotion relies on the professional performance related to outputs of an organisation. Therefore, it is necessary to encourage publications as a key promotion criterion and it should become a target, regardless of gender and age seniority. Over and above gender and seniority, this policy can motivate academic staff, especially in research institutes where the number of publications might be an important promotion criterion, to become more productive in terms of academic performance. This can eventually raise the level of scientific competency in Thailand while resolving the bias in the promotion.

8.4.1.5 Regular collection of gender statistics on the Thai science sectors and further gender research in science need to be conducted

During the process of reviewing the secondary data related to gender issues in the Thai academic context, the researcher is aware of the limitations of the statistics provided by relevant Thai agencies and that the government may not regularly collect gender statistics. Therefore, scientific staff profile statistics and nationwide research on gender should be carried out by the Thai government or other relevant organisations at regular times, in order to monitor the gender balance.

As argued by the European Commission (2008), the government or science-related agencies should collect statistics segregated by gender such as allocations of research grants and scientific personnel employed in each level of positions. These data should be regularly updated and available to the public in order to show the evidence of fair gendered practices and of implementation of the gender policies in science. In order to achieve this, the Thai government needs to regularly collect national statistical data on gender so that the decision-makers can understand male and female issues, especially an imbalance in gender and career advancement. When the administrators quantify the situation, a range of gender policies can be introduced to promote men and women equally.

During the review of gender research in the Thai context, the researcher attempted to search journal articles or publications related to gender in scientific careers, but the gender research in this area turned out to be rare. Most of the literature focused

on gender in the overall labour market, particularly women in semi-skilled or unpaid labours, rather than those in specific professional careers. This means that gender research on a comparison of career advancement between men and women in particular sectors needs to be further explored.

8.4.2 Recommendations for practice

The present study finds that Thai female academics are restricted by various factors that prevent them from progressing in science, for example limited access to the male network, which is the core issue in academic organisations, not being assigned to significant jobs, which contribute towards academic advancement, limited access to the information about promotion criteria, which prevents them noticing the gender inequality in science, and the dual roles of being a mother and an academic. Thus some recommendations on the practical level should be suggested, including providing an appropriate working environment to support Thai women so that they can work in science-related areas more easily and encouraging women to be viewed as being equal to men in Thai society.

8.4.2.1 Providing an appropriate working environment to increase women's opportunities to work in science-related areas

Firstly, as recommended by Shantz et al.(2011), in the male dominated organisation, women have difficulties making a connection and thus are likely to lose in their careers. This issue is also a concern in the European scientific community. Consequently, in order to solve this problem, the European Platform of Women Scientists (EPWS), established in 2005 as a networked organisation of women scientists, has covered over 10,000 female scientists from all scientific areas across European countries, with an aim to promote the career opportunity for women in science (European Commission, 2008). Such a type of female networks in science is consistent to the finding from the current study which revealed that bonding with each other can make Thai female academics visible in academic organisations. In light of the evidence, building a connection through networking among women should be reinforced to empower women in the Thai scientific community.

Additionally, the study found several claims that Thai women are not suitable to take assignments related to fieldwork because of safety concerns. Thai female academics are viewed by male colleagues as having limitations on some scientific assignments, such as those involving field trips. Such a view may obstruct women's career opportunities. However, if the overall infrastructure and transportation systems are well managed, such claims can be no longer valid. Thus, structural changes in achieving a safe workplace for science should be introduced in order to encourage women to take any job in scientific areas they are capable of doing. Moreover, as women are likely to assign to insignificant jobs that do not contribute to career progress, supervisors should allocate more meaningful jobs to female academics, including setting measures to ensure that such a job assignment can provide more opportunities for women in academic careers as equally to men.

The current research found that gender equality is likely to be hidden or unseen in Thai science academe because the promotion process is treated with confidentiality. This means that Thai female academics are unable to observe whether men are better rewarded. Thus, the promotion process should be transparent and the information about it should be easy to access. Since publicity is part of transparency, the whole process of recruitment (i.e., a job advertisement, selection criteria, its process and an evaluation report) should be accessible (European Commission, 2008). According to Lipsky (1980, p. 161), if workers in the organisation are able to compare work performance with each other (i.e. record keeping of performance), they are more likely to have a greater awareness of promotion criteria and try to achieve promotion; this can also reinforce the work performance among staff in public organisations.

Lastly, given that Thai men are less involved in supporting women in child rearing (Patana, 2004), the organisation should understand female issues related to a balance between work and family. Thus, women should be provided with support in time management and child care service so that they can spend their quality time both at work and home. As reported by Ceci & Williams (2011), in the United States, measures to enable women to follow a scientific career, coupled with managing family responsibilities, are taken by providing child care facilities and

flexible working hours in the workplace, which would allow women in science to manage work-life balance.

8.4.2.2 Encouraging ideas that women are equal to men in Thai society

Gender discrimination in Thailand is based on the Thai conservative culture regarding women in the private sphere, which is a result of the morality of the Thai culture, in that it tends to favour men over women (Sodsangchan, 2008). By changing social attitudes and behaviours, the roles of Thai men and women in the family should shift in support of opportunities for women. As argued by Reay (2004), children develop their modes of thinking and style in the family, which assigns a social value on the statuses of men and women in the public sphere. Therefore, it is necessary to initially promote the same treatment for boys and girls in the Thai family so that men and women grow up with an awareness of equality in terms of genders, which eventually helps diminish discrimination.

Also, Thai women need to overcome their feelings of low self-esteem and inferior capability. According to the interview findings, Thai women are discriminated against partly because the women themselves underestimate their own abilities. As Metcalfe (2011) proposed, in order to make women visible in the public sphere, women should boost their self-confidence. This can lead them to realise their hidden talents and cross the boundary of traditional gender roles. In other words, it is important for women to develop positive attitudes towards their potential so as to attain a status equal to that of men, both at work and in society.

8.4.3 Recommendations for future research

Future research should consider looking at sample representativeness, data segmentation, research tools and quantitative model specifications. In addition, further research should pay attention to employing a range of quantitative and qualitative approaches to examine gendered phenomena in feminist research.

This study has been conducted on academic personnel in just two public academic organisations in Bangkok, Thailand, which limits the scope of the study. Hence, a study on Thai scientific career advancement which compares the public and private sectors should be included. In addition, if the appropriate data could be acquired, further research should be carried out to compare and contrast academic workers in

rural areas in order to gain further insights into gender issues and to generalise a whole picture of gender disparities in science in Thailand.

This study estimated the reward functions both in wage function and grade position based on the data set as a whole. However, it is possible that the observed gender gap in academic career advancement among different groups should be considered. For example, the gender gap in rewards may be prevalent among academic workers in different science subjects because such a gap could exist in male-dominated hard science subjects. Thus, samples could be segmented in further research according to particular endowment background such as area of science subject and level of education. Sub-categorising the data in such a way might allow a clearer understanding of the gender phenomena in scientific careers.

By conducting a cross sectional survey during October 2009 and February 2010, the current study is able to cover gender aspects at this point of time. In order to minimise the limitations of a cross-sectional survey which only focuses on the phenomena in the fixed period (Neuman, 2006), future research should be conducted with longitudinal data to determine the trend for a gender gap in scientific careers. Also, according to Long & Fox (1995, p. 65), because of process of cumulative advantage and the association between scientific performance and career rewards, longitudinal evidence should be required in order to investigate gender disparities in scientific careers. This recommendation is based on the condition that if appropriate data could be available, further investigation should be carried out.

Some other factors should be added to the quantitative model of wage function and multiple outcome models in order to investigate the factors affecting academic career advancement. Beside the individual variables considered in the quantitative models in this study, other factors should be concerned such as organisational or social factors. For example, the findings in this study showed some of the working styles Thai women employ: adopting a male style or maintaining a smooth relationship so as to improve their status in scientific careers. Although a number of studies have addressed this issue (Powell et al., 2009; Sonnert, 1995/1996), the relationships among them with scientific career advancement in terms of quantitative impacts have not been examined. Therefore, the issues of

organisational and social variables and career advancement in science need to be further investigated in terms of numeric measurements in the future.

Lastly, this study supports using a qualitative analysis to complement the interpretation of statistics in conducting gender research as this can facilitate feminist researchers in better understanding the gender phenomena. Moreover, in terms of a gender-related policy, according the European Commission (2008), the policy maker needs both quantitative and qualitative indicators in order to implement and evaluate the policy since both types of indicators are essential for monitoring and evaluating.

8.5 Conclusion

This study contributes to the arguments about women's advancement in scientific careers: it provides a fuller understanding because it looks at the individual, organisational and social levels when interpreting gender data in Thai science academe. The theoretical framework and methodology chosen to conduct this research allow the researcher to examine the research topics in depth and from different perspectives. The information from various data sources gives further insight into the gender phenomena in academic careers in Thailand.

The research settings in Thailand contribute to the existing literature in a particular culture. Although Thailand has now embraced more opportunities for women, especially in terms of participating in the scientific workforce, Thai female academics still face difficulties in academic career advancement because their work experience are constrained by the gendered Thai traditional value as well as discrimination in the Thai science community. In other words, gender discrimination is difficult to eliminate in Thai science academe, no matter how much human capital women have, which reflects the persistence of the gender gap in academic careers.

As ignorance of the gender issues in Thai science academe results in slow change with respect to the status of Thai women in science, gender issues should, therefore, be integrated as part of national policy making, organisational practice and individual behaviour. In order to support Thai woman in science and advance gender equality in Thai society as a whole, we need to ensure that commitments to

gender equality are posted and implemented. Public awareness of gender issues in national, institution, and individual levels should be raised accordingly so that women can earn an equal status to men in the Thai scientific community.

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APPENDICES

APPENDIX 1 TOOLS AND MATERIALS
1.1 Survey items and the academic sources
1.2 Questionnaire
1.3 Content validity form
1.4 Semi-structured questions for interviews and the academic sources
1.5 Information Sheet
1.6 Consent form

APPENDIX 2 QUANTITATIVE STATISTICS FOR QUESTIONNAIRE DATA – ACADEMIC SCIENCE (UV)
2.1 Univariate normality statistics for female questionnaire data – Academic science (UV)
2.2 Univariate normality statistics for male questionnaire data – Academic science (UV)
2.3 Pearson correlations for female questionnaire data – Academic science (UV)
2.4 Pearson correlations for male questionnaire data – Academic science (UV)
2.5 Pearson correlations for questionnaire data – Academic science (UV)
2.6 Casewise Diagnostics for female wage regression – Academic science (UV)
2.7 Casewise Diagnostics for male wage regression – Academic science (UV)
2.8 Model fitting for female wage regression – Academic science (UV)
2.9 Model fitting for male wage regression – Academic science (UV)
2.10 The association between gender of the UV respondents and the perception towards gender difference in academic career advancement

APPENDIX 3 QUANTITATIVE STATISTICS FOR QUESTIONNAIRE DATA – RESEARCH SCIENCE (RI)
3.1 Univariate normality statistics for female questionnaire data – Research science (RI)
3.2 Univariate normality statistics for male questionnaire data – Research science (RI)
3.3 Pearson correlations for female questionnaire data – Research science (RI)
3.4 Pearson correlations for male questionnaire data – Research science (RI)
3.5 Pearson correlations for questionnaire data – Research science (RI)
3.6 Casewise Diagnostics for female wage regression – Research science (RI)
3.7 Casewise Diagnostics for male wage regression – Research science (RI)
3.8 Model fitting for female wage regression – Research science (RI
3.9 Model fitting for male wage regression – Research science (RI)
3.10 The association between gender of the RI respondents and the perception towards gender difference in academic career advancement

APPENDIX 1 TOOLS AND MATERIALS

Appendix 1.1 Survey items and the academic sources

Operational definitions	Source

Part 1 Career information
Conceptual definitions: Career advancement
Career advancement of academic personnel is considered as the dependent variable which is presented in two categories: career advancement on progression and career advancement on rewards.

1.1   How many years have you worked in your organisation? …… years   Liamvarangkoon, 2002; Metz & Tharenou, 2001; Yukongdi, 2005

1.2   Position at <u>start</u> in your current organisation
☐ Level 1 - director/ senior executive/ professor/ president
☐ Level 2 - principal researcher / associate director/ associate professor/ associate president
☐ Level 3 - senior researcher/ team or project manager / assistant professor/ faculty dean
☐ Level 4 - researcher/ lecturer/graduate trainee
Other (*please specify*) ……………………..
Official level at <u>start</u> …………...................
Monthly income at <u>start</u> ☐ ☐ ☐, 000 Baht

1.3   Position at <u>present</u> in your current organisation
☐ Level 1 - director/ senior executive/ professor/ president
☐ Level 2 - principal researcher / associate director/ associate professor/ associate president
☐ Level 3 - senior researcher/ team or project manager / assistant professor/ faculty dean
☐ Level 4 - researcher/ lecturer/graduate trainee
Other (*please specify*) ……………………..
Official level at <u>present</u> …………...................
Monthly income at <u>present</u> ☐ ☐ ☐, 000 Baht

1.4   Period of appointment to higher level of each level
1.4.1   Promotion from level 4 up to level 3 ………… years
1.4.2   Promotion from level 3 up to level 2 ………… years
1.4.3   Promotion from level 2 up to level 1 ………… years

Part 2 Personal information   Bourdieu, 1986
Conceptual definitions: Cultural capital concerns
Items in this section relate to cultural capital that influences career advancement as identified by Bourdieu. Each item is about the participant's socio-economic background, including personal background, family background, educational background, and work experience.

Personal and family background   Blackwell & Glover, 2008; Fox, 2005; Stack, 2004; Wailerdsak & Suehiro, 2004

2.1   Gender   ☐ Male ☐ Female
2.2   Year of birth ……………
2.3   Marital status   ☐ Single ☐ Married ☐ Widowed ☐ Divorced

Operational definitions	**Source**

2.4   Number of children …………… person (s)

2.5   Occupation of your spouse
☐ Worked in academic career ☐ Worked in non-academic career
☐ Self employed   ☐ Homemaker, retired, or not employed

2.6   The educational background of your spouse
☐ Lower than bachelor's degree   ☐ Bachelor's degree
☐ Master's degree   ☐ Doctoral degree

2.7   The total monthly income of your family   ☐ ☐ ☐, 000 Baht

2.8   The occupation of your parents

	Father	Mother
Worked in academic career	☐	☐
Worked in non-academic career	☐	☐
Self employed	☐	☐
Homemaker or not employed	☐	☐

2.9   The educational background of your parents

	Father	Mother
Finished lower than bachelor's degree	☐	☐
Finished bachelor's degree	☐	☐
Finished master's degree	☐	☐
Finished doctoral degree	☐	☐

Educational background

Liamvarangkoon, 2002; Park, 2007; Yukongdi, 2005

2.10   Highest degree earned
☐ Bachelor's degree ☐ Master's degree   ☐ Doctoral degree

2.11   Foreign degree earned
☐ Yes   ☐ No

2.12   Educational background

	Bachelor's degree	Master's degree	Doctoral degree
Field	………………	………………	………………
University	………………	………………	………………
Country	………………	………………	………………
GPA	………………	………………	………………

Holding an Honors' degree ☐ Yes   ☐ No

Work experience

Levin & Stephan, 1998; Reskin, 1978

2.13   How many years in total have you worked in an academic career?
…….. years (Exclude years in full time study)

2.14   During your academic career, have you worked or trained abroad?
(excluding postgraduate study/training)
☐ Yes   ☐ No

2.15   If Yes, for how long in total? …….. years

Part 3 Social roles and responsibilities
Conceptual definitions: Social capital
Items in this section relate to social capital that influences career
advancement as identified by Bourdieu. Items are expressions of
social roles and academic activity which is measured by
experience with other organisations, association membership, and
the participation in social activity outside working time.

Bourdieu, 1986

Operational definitions	Source
Experience with other organisations	Rothwell, 2002

3.1 Have you work experience with any sectors outside your institution? [Select all that apply]

☐ None ☐ Worked elsewhere in higher education
☐ Worked in public sector ☐ Worked in non-public sector

Experience in association membership	Hakim, 2004; Metz & Tharenou, 2001; Timberlake, 2005

3.2 Are you/have you been

	Yes	No
Member of an international committee?	☐	☐
Member of a national committee?	☐	☐
Member of an editorial board of an academic journal?	☐	☐

3.3 How many academic associations are you a member of or have positions in?

The participation in social activity out of working time	Maneerat, Hale, & Singhal, 2005; Reskin, 1978

3.3 Your activity out of working time.
Least: __1__:__2__:__3__:__4__:__5__ Most

1. You go to party associations with your colleagues.
2. You accompany your colleagues to provinces or abroad.
3. You attend professional activities.
4. Family care.
5. Further knowledge training.

Part 4 Career performance
Conceptual definitions: Symbolic capital concerns
Items in this section explore symbolic capital that influences career advancement as identified by Bourdieu. Items in the list are about status of specialty in academic careers which is measured by the amount of published output completed in the last 3 years.

Source: Bourdieu, 1986

4.1 In the last 3 years, how much research output have you had? (Include accepted publications that have a publication date, but not those that are still at the revision stage)

☐ Publications …………..
(books, book chapters, journal articles, instructors' manuals, research reports)
☐ Conference presentations …………..
☐ Patents …………..
☐ Other (*please specify*) …………..

Source: Levin & Stephan, 1998; Long & Fox, 1995; Tien, 2007

Part 5 Factors supporting academic careers
Conceptual definitions: **Capital concerns**
Items in this section survey different forms of capital that influence career advancement as identified by Bourdieu. Each item was assessed on a 5 point Likert scale ranging from 'strongly disagree' (value at 1) to 'strongly agree' (value at 5).

Source: Bourdieu, 1986

Operational definitions	Source

What will help you to progress in your career?
Strongly disagree: __1__:__2__:__3__:__4__:__5__ Strongly agree

5.1   Parents support
5.2   Spouse/ partner support
5.3   Educational degree
5.4   Graduating from an elite university
5.5   Earning a foreign degree
5.6   Work experience abroad
5.7   Academic career years
5.8   Research performance
5.9   Specialist skills
5.10   Good relations with colleagues in organisation
5.11   Good connection with stakeholder (s) outside organisation
5.12   Old boy network
5.13   Non-career break
5.14   Other (*please specify*) …………………………

Part 6 Perception about work environments related to academic careers

Conceptual definitions: **Institutional contexts**

Items in this section relate to the context of institutional constraints and opportunities. Each item was assessed on a 5 point Likert scale ranging from 'strongly disagree' (value at 1) to 'strongly agree' (value at 5).

Source: Acker, 2006; Hakim, 2004; Reskin & Roos, 1990; Somswasdi, 2007

Perception about work environments related to academic career
Strongly disagree: __1__:__2__:__3__:__4__:__5__ Strongly agree

6.1   My organisation has a good and fair performance evaluation process.
6.2   Getting promotion in my organisation is based upon personal accomplishments on the job.
6.3   Employees in my department are given equal opportunities in promotion.
6.4   In my organisation, males were promoted more than females.
6.5   In my organisation, if the capability of males is equivalent to females, males were promoted more than females.
6.6   In my opinion, on the whole men make better leaders than women do.

Part 7 Attitude toward intention to stay in academic careers

Items in this section relate to attitude of participant towards their expectations of their academic careers. Items in the list are about long-range career plans.

Source: Bourdieu, 1990; Iellatchitch, Mayrhofer, & Meyer, 2003; Kidd & Green, 2006

7.1   Do you 'aim' to become a top manager in your career life?
     ☐ Yes ☐ No
7.2   What is your long-range career plan? (Select the most appropriate response and <u>only one</u>)
     ☐ Remain in academic career
     ☐ Employment in non-academic career (*please specify*) ……..…
     ☐ Self employed (*please specify*) ………..
     ☐ Homemaker, retired, or not employed

Operational definitions	Source
7.3 Why do you plan not to remain in your academic career? [Select all that apply] ☐ Lack of career opportunity in promotion ☐ Marriage/family obligations ☐ Health reasons ☐ Other (*please specify*) …………………………	

Appendix 1.2 Questionnaire

QUESTIONNAIRE

THE RELATIONS BETWEEN GENDER DIFFERENCE AND ADVANCEMENT IN THAI ACADEMIC CAREERS

This questionnaire is conducted as part of my research project, which I am doing for my PhD at the Norwich Business School (NBS) at the University of East Anglia. This study aims to explore the gender and career advancement in academic careers in Thailand. The results of this study would be expected to increase the understanding of gender, which could then influence personnel to advance in this career field. The expected main contribution of this work is to offer useful information relevant to gender equality issues in academic careers. I would like to invite you to take part in this research study. All the personal information collected will be kept in a secure place to protect the confidence of participants. Therefore, your anonymity is maintained throughout the work. Thank you for your assistance in providing the information requested.

The questionnaire is divided into 7 parts (60 items)

Part 1 Career information

Part 2 Personal information

Part 3 Social roles and responsibilities

Part 4 Career performance

Part 5 Factors influencing career progression

Part 6 Perception about work environments related to academic careers

Part 7 Attitude towards intention to stay in academic careers

Please complete each item by marking √ in ☐ or fill in the blanks.

Part 1 Career information
1.1 In which field are you working? (Select the most appropriate response <u>only one</u>)
  ☐ Academic fields ☐ Physical sciences and Mathematical
           ☐ Medical sciences
           ☐ Chemistry and Pharmacology
           ☐ Biological Sciences and related fields
           ☐ Engineering and Industry
           ☐ Information Technology/ Computing sciences
           ☐ Other *(please specify)* …………….
  ☐ Non - academic fields *(end of questionnaire, and thank you very much)*
1.2 Your organisation ………………………. department …………………
1.3 How many hours do you devote for work? …………… hours a week
1.4 Please indicate the proportion of your time that you have spent for work.
  Academic job   ………………… %
  Management/administration   ………………… %
  Cooperate with stakeholder (client/academics) ………………… %
  Others (document work, non-related academic work)…………………%
1.5 How many years have you worked in your organization? …… years
1.6 Position at <u>start</u> in your current organization
  ☐ Level 1 - director/ senior executive/ professor/ president
  ☐ Level 2 - principal researcher / associate director/ associate professor/ associate
    president
  ☐ Level 3 - senior researcher/ team or project manager / assistant professor/
    faculty dean
  ☐ Level 4 - researcher/ lecturer/graduate trainee
  Other *(please specify)* ……………………..
  Official level at <u>start</u> …………….................
  Monthly income at <u>start</u> ☐ ☐ ☐, 000 Baht
1.7 Position at <u>present</u> in your current organisation
  ☐ Level 1 - director/ senior executive/ professor/ president
  ☐ Level 2 - principal researcher / associate director/ associate professor/ associate
    president
  ☐ Level 3 - senior researcher/ team or project manager / assistant professor/
    faculty dean
  ☐ Level 4 - researcher/ lecturer/graduate trainee
  Other *(please specify)* ……………………..
  Official level at <u>present</u> …………….................
  Monthly income at <u>present</u> ☐ ☐ ☐, 000 Baht
1.8 Period of appointment to higher level of each level
  1.8.1 Promotion from level 4 up to level 3 ………… years
  1.8.2 Promotion from level 3 up to level 2 ………… years
  1.8.3 Promotion from level 2 up to level 1 ………… years
1.9 How many years have you worked at the level of staff? …….. years

1.10 During your academic career, have you been project manager/ leader?
☐ Yes ………….. project (s)   ☐ No

1.11 In your current job, how many do you manage/have responsibility for other staff?
……………….. person (s)

1.12 Have you taken any career breaks?
Maternity leave   ☐ Yes   ☐ No
Become a monk   ☐ Yes   ☐ No

Part 2 Personal Information

2.1 Gender   ☐ Male   ☐ Female

2.2 Year of birth ……………

2.3 Marital status ☐ Single ☐ Married ☐ Widowed ☐ Divorced

2.4 Number of children …………… person (s)

2.5 Occupation of your spouse
☐ Worked in academic career   ☐ Worked in non-academic career
☐ Self employed   ☐ Homemaker, retired, or not employed

2.6 The educational background of your spouse
☐ Lower than bachelor's degree   ☐ Bachelor's degree
☐ Master's degree   ☐ Doctoral degree

2.7 The total monthly income of your family   ☐ ☐ ☐ , 000 Baht

2.8 The occupation of your parents

	Father	Mother
Worked in academic career	☐	☐
Worked in non-academic career	☐	☐
Self employed	☐	☐
Homemaker or not employed	☐	☐

2.9 The educational background of your parents

	Father	Mother
Finished lower than bachelor's degree	☐	☐
Finished bachelor's degree	☐	☐
Finished master's degree	☐	☐
Finished doctoral degree	☐	☐

2.10 Highest degree earned
☐ Bachelor's degree ☐ Master's degree ☐ Doctoral degree

2.11 Foreign degree earned
☐ Yes   ☐ No

2.12 Educational background

	Bachelor's degree	Master's degree	Doctoral degree
Field	………………	………………	………………
University	………………	………………	………………
Country	………………	………………	………………
GPA	………………	………………	………………

Holding an Honors' degree ☐ Yes   ☐ No

2.13 How many years in total have you worked in an academic career?
…….. years (Exclude years in full time study)

2.14 During your academic career, have you worked or trained abroad?
(excluding postgraduate study/training)
☐ Yes ☐ No
2.15 If Yes, for how long in total? …….. years
2.16 What has been beneficial to your career from work experience abroad?
[Select all that apply]
☐ Good for the CV ☐ Improving skills ☐ Increased salary
☐ Getting higher position ☐ Getting well known☐ Other (*please specify*)

Part 3 Social roles and responsibilities
3.1 Have you work experience with any sectors outside your institution?
[Select all that apply]
☐ None ☐ Worked elsewhere in higher education
☐ Worked in public sector ☐ Worked in non-public sector
3.2 Are you/have you been

	Yes	No
Member of an international committee?	☐	☐
Member of a national committee?	☐	☐
Member of an editorial board of an academic journal?	☐	☐

3.3 How many academic associations are you a member of or have positions in?
3.4 Your activity out of working time.

Item	Participation level				
	Least				Most
	1	2	3	4	5
1. You go to party association with your colleagues.					
2. You accompany your colleagues to provinces or abroad.					
3. You attend professional activities.					
4. Family care					
5. Further knowledge training					

3.5 What has been beneficial to your career from collaborating with any particular
professional activities? [Select all that apply]
☐ Good for the CV ☐ Improving skills
☐ Increased salary ☐ Getting higher position
☐ Getting well known ☐ Other (*please specify*) ………………

Part 4 Career performance

4.1   In the last 3 years, how much research output have you had?
(Include accepted publications that have a publication date, but not those that are still at the revision stage)

☐ Publications   …………..
(books, book chapters, journal articles, instructors' manuals, research reports)
☐ Conference presentations …………..
☐ Patents   …………..
☐ Other (*please specify*)   …………..

4.2   What has been beneficial to your career from good academic performance?
[Select all that apply]

☐ Good for the CV   ☐ Improving skills
☐ Increased salary   ☐ Getting higher position
☐ Getting well known   ☐ Other (*please specify*) ………………

Part 5 Factors supporting academic careers

What will help you to progress in your career? [Select all that apply]

Item	Level of Opinion				
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
5.1 Parents support					
5.2 Spouse/ partner support					
5.3 Educational degree					
5.4 Elite university graduated					
5.5 Earning a foreign degree					
5.6 Work experience abroad					
5.7 Academic career years					
5.8 Research performance (publication, conference, etc.)					
5.9 Specialist skills					
5.10 Good relation with colleagues in organisation					
5.11 Good connection with stakeholder outside organisation					
5.12 Old boy network					
5.13 Non-career break					
5.14 Other (*please specify*) …………………………					

Part 6 Perception of work environments related to academic careers

Item	Level of Opinion				
	Strongly disagree	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
6.1 My organisation has a good and fair performance evaluation process.					
6.2 Getting promotion in my organisation is based upon personal accomplishments on the job.					
6.3 Employees in my department are given equal opportunities in promotion.					
6.4 In my organisation, males were promoted more than females.					
6.5 In my organisation, if the capability of males is equivalent to females, males were promoted than females.					
6.6 In my opinion, on the whole men make better leaders than women do.					

Part 7 Attitude toward intention to stay in academic careers

7.1   Do you 'aim' to become a top manager in your career life?
☐ Yes ☐ No

7.2   What is your long-range career plan? (Select the most appropriate response and only one)
☐ Remain in academic career
☐ Employment in non-academic career (*please specify*) …….....…
☐ Self employed (*please specify*) ………..
☐ Homemaker, retired, or not employed

7.3   Why do you plan not to remain in your academic career? [Select all that apply]
☐ Lack of career opportunity in promotion
☐ Marriage/family obligations
☐ Health reasons
☐ Other (*please specify*) …………………………

7.4   Are there any other issues those come to your mind when you think about what factors or circumstances would enable you to advance in academic career in terms of increasing salary and higher promotion?
………………………………………………………………………
………………………………………………………………………

7.5   Do you think gender discrimination still remain in academic career, how do you know, what factors lead to gender discrimination in academic career, and what is needed to solve this issue?
………………………………………………………………………
………………………………………………………………………

Thank you very much for your cooperation!

Appendix 1.3 Content validity form

Instruction: This measure was designed to evaluate the content validity of a measure. Please rate the level of representativeness and the level of clarity on a scale of 1-4 by putting (√) in the space, with 4 being the most representative. Space is provided for you to comment on the item or suggest revision.

Operational definitions		Relevance			
Part 1 Career information **Conceptual definitions: Career advancement** Career advancement of academic personnel is considered as the dependent variable which is presented in two categories: career advancement on progression and career advancement on rewards.		1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant			
Items	**Source**	**1**	**2**	**3**	**4**

1.1   How many years have you worked in your organisation? …… years
1.2   Position at <u>start</u> in your current organisation
    ☐ Level 1 - director/ senior executive/ professor/ president
    ☐ Level 2 - principal researcher / associate director/ associate professor/ associate president
    ☐ Level 3 - senior researcher/ team or project manager / assistant professor/ faculty dean
    ☐ Level 4 - researcher/ lecturer/graduate trainee
    Other (*please specify*) ……………………..
    Official level at <u>start</u> ………….................
    Monthly income at <u>start</u> ☐ ☐ ☐, 000 Baht
1.3   Position at <u>present</u> in your current organisation
    ☐ Level 1 - director/ senior executive/ professor/ president
    ☐ Level 2 - principal researcher / associate director/ associate professor/ associate president
    ☐ Level 3 - senior researcher/ team or project manager / assistant professor/ faculty dean
    ☐ Level 4 - researcher/ lecturer/graduate trainee
    Other (*please specify*) ……………………..
    Official level at <u>present</u> …………..................
	Liamvarangkoon, 2002; Metz & Tharenou, 2001; Yukongdi, 2005				

Operational definitions		Relevance				
Monthly income at <u>present</u> ☐ ☐ ☐, 000 Baht 1.4　　Period of appointment to higher level of each level 　　　1.4.1　Promotion from level 4 up to level 3 ………… years 　　　1.4.2　Promotion from level 3 up to level 2 ………… years 　　　1.4.3　Promotion from level 2 up to level 1 ………… years						
What addition items would you recommend including? …………………………………………………………………… What addition items would you recommend deleting?　………………………………………………………………… Other comments: ………						
Part 2 Personal information **Conceptual definitions: Cultural capital concerns (Bourdieu, 1986)** Items in this section relate to cultural capital that influences career advancement as identified by Bourdieu. Each item is about the participant's socio-economic background, including personal background, family background, educational background, and work experience.		1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant				
Items	**Source**	**1**	**2**	**3**	**4**	
Personal and family background 2.1　　Gender　　　　☐ Male ☐ Female 2.2　　Year of birth …………… 2.3　　Marital status　☐ Single ☐ Married ☐ Widowed ☐ Divorced 2.4　　Number of children …………… person (s) 2.5　　Occupation of your spouse 　　　☐ Worked in academic career ☐ Worked in non-academic career 　　　☐ Self employed　　　　☐ Homemaker, retired, or not employed 2.6　　The educational background of your spouse 　　　☐ Lower than bachelor's degree　☐ Bachelor's degree 　　　☐ Master's degree　　　☐ Doctoral degree 2.7　　The total monthly income of your family　☐ ☐ ☐, 000 Baht 2.8　　The occupation of your parents 　　　　　　　　　　　　　Father　Mother 　　　Worked in academic career　☐　☐ 　　　Worked in non-academic career　☐　☐ 　　　Self employed　　　☐　☐ 　　　Homemaker or not employed　☐　☐	Blackwell & Glover, 2008; Fox, 2005; Stack, 2004; Wailerdsak & Suehiro, 2004					

Operational definitions		Relevance			

2.9   The educational background of your parents

	Father	Mother
Finished lower than bachelor's degree	☐	☐
Finished bachelor's degree	☐	☐
Finished master's degree	☐	☐
Finished doctoral degree	☐	☐

What addition items would you recommend including? …………………………………………………………………………

What addition items would you recommend deleting?   ………………………………………………………………………

Other comments: ……

Items	Source	1	2	3	4

Educational background
 	
2.10   Highest degree earned
    ☐ Bachelor's degree ☐ Master's degree   ☐ Doctoral degree
2.11   Foreign degree earned
    ☐ Yes   ☐ No
2.12   Educational background
 	
     Bachelor's degree Master's degree
     Doctoral degree
Field   ……………… ……………… ………………
University ……………… ……………… ………………
Country ……………… ……………… ………………
GPA   ……………… ……………… ………………
Holding an Honors' degree ☐ Yes ☐ No
	Liamvarangkoon, 2002; Park, 2007; Yukongdi, 2005				

What addition items would you recommend including? …………………………………………………………………………

What addition items would you recommend deleting?   ………………………………………………………………………

Other comments: ……

Operational definitions		Relevance			
Items	**Source**	**1**	**2**	**3**	**4**

Work experience
 	
2.13   How many years in total have you worked in an academic career?
       …….. years (Exclude years in full time study)
2.14   During your academic career, have you worked or trained abroad?
     (excluding postgraduate study/training)
     ☐ Yes   ☐ No
2.15   If Yes, for how long in total? …….. years
	Levin & Stephan, 1998; Reskin, 1978				

What addition items would you recommend including? ………………………………………………………………… What addition items would you recommend deleting? ………………………………………………………………… Other comments: ………………………………………………………………………………………………………					
Part 3 Social roles and responsibilities **Conceptual definitions: Social capital (Bourdieu, 1986)** Items in this section relate to social capital that influences career advancement as identified by Bourdieu. Items are expressions of social roles and academic activity which is measured by work experience of participant with other organisations, experience in association membership, and the participation in social activity outside working time.		1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant			
Items	**Source**	**1**	**2**	**3**	**4**

Experience with other organisations
 	
3.1   Have you work experience with any sectors outside your institution?
    [Select all that apply]
    ☐ None   ☐ Worked elsewhere in higher education
    ☐ Worked in public sector ☐ Worked in non-public sector
	Rothwell, 2002				

What addition items would you recommend including? ………………………………………………………………… What addition items would you recommend deleting? ………………………………………………………………… Other comments: ………………………………………………………………………………………………………					

Operational definitions		Relevance			
Items	**Source**	**1**	**2**	**3**	**4**

Experience in association membership
 	
3.2   Are you/have you been
 	
                          Yes   No
    Member of an international committee? ☐ ☐
    Member of a national committee? ☐ ☐
    Member of an editorial board of an academic journal?☐ ☐
3.3   How many academic associations are you a member of or have positions in?
	Hakim, 2004; Metz & Tharenou, 2001; Timberlake, 2005				

What addition items would you recommend including? ……………………………………………………………………… What addition items would you recommend deleting? ……………………………………………………………………… Other comments: ………………………………………………………………………					
Items	**Source**	**1**	**2**	**3**	**4**
The participation in social activity out of working time 3.4 Your activity out of working time. Least: __1__:__2__:__3__:__4__:__5__ Most 1. You go to party associations with your colleagues. 2. You accompany your colleagues to provinces or abroad. 3. You attend professional activities. 4. Family care. 5. Further knowledge training.	Maneerat, Hale, & Singhal, 2005; Reskin, 1978				
What addition items would you recommend including? ……………………………………………………………………… What addition items would you recommend deleting? ……………………………………………………………………… Other comments: ………………………………………………………………………					
Part 4 Career performance **Conceptual definitions: Symbolic capital concerns (Bourdieu, 1986)** Items in this section explore symbolic capital that influences career advancement as identified by Bourdieu. Items in the list are about status of specialty in academic careers which is measured by the amount of published output completed in the last 3 years.	1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant				

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Operational definitions		Relevance			
Items	**Source**	**1**	**2**	**3**	**4**
4.1 In the last 3 years, how much research output have you had? (Include accepted publications that have a publication date, but not those that are still at the revision stage) ☐ Publications ………….. (books, book chapters, journal articles, instructors' manuals, research reports) ☐ Conference presentations ………….. ☐ Patents ………….. ☐ Other (*please specify*) …………..	Levin & Stephan, 1998; Long & Fox, 1995; Tien, 2007				
What addition items would you recommend including? …………………………………………………………………… What addition items would you recommend deleting? …………………………………………………………………… Other comments: ……………………………………………………………………………………………………					
Part 5 Factors supporting academic careers **Conceptual definitions**: **Capital concerns (Bourdieu, 1986)** Items in this section survey different forms of capital that influences career advancement as identified by Bourdieu. Each item was assessed on a 5 point Likert scale ranging from 'strongly disagree' (value at 1) to 'strongly agree' (value at 5).		1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant			
Items	**Source**	**1**	**2**	**3**	**4**
What will help you to progress in your career? *Strongly disagree: __1__:__2__:__3__:__4__:__5__ Strongly agree* 5.1 Parents support 5.2 Spouse/ partner support 5.3 Educational degree 5.4 Elite university graduated 5.5 Earning a foreign degree 5.6 Work experience abroad 5.7 Academic career years 5.8 Research performance 5.9 Specialist skills 5.10 Good relations with colleagues in organization	Bourdieu, 1986.				

Operational definitions		Relevance			
5.11 Good connection with stakeholder(s) outside organization 5.12 Old boy network 5.13 Non-career break 5.14 Other (*please specify*) …………………………					
What addition items would you recommend including? …………………………………………………………………… What addition items would you recommend deleting? …………………………………………………………………… Other comments: ……………………………………………………………………………………………………					

Part 6 Perception about work environments related to academic careers **Conceptual definitions**: **Institutional contexts** Items in this section relates to the context of institutional constraints and opportunities. Each item was assessed on a 5 point Likert scale ranging from 'strongly disagree' (value at 1) to 'strongly agree' (value at 5).		1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant			
Items	**Source**	**1**	**2**	**3**	**4**
Perception about work environments related to academic career *Strongly disagree: __1__:__2__:__3__:__4__:__5__ Strongly agree* 6.1 My organisation has a good and fair performance evaluation process. 6.2 Getting promotion in my organisation is based upon personal accomplishments on the job. 6.3 Employees in my department are given equal opportunities in promotion. 6.4 In my organisation, males were promoted more than females. 6.5 In my organisation, if the capability of males is equivalent to females, males were promoted more than females. 6.6 In my opinion, on the whole men make better leaders than women do.	Acker, 2006; Hakim, 2004; Reskin & Roos, 1990; Somswasdi, 2007				
What addition items would you recommend including? …………………………………………………………………… What addition items would you recommend deleting? …………………………………………………………………… Other comments: ……………………………………………………………………………………………………					

Part 7 Attitude toward intention to stay in academic careers Items in this section relate to attitude of participant towards their expectation in academic careers. Items in the list are about long-range career plan.	1= the item is not relevant 2= the item is somewhat relevant 3= the item is quite relevant 4= the item is very relevant

Operational definitions		Relevance			
Items	**Source**	**1**	**2**	**3**	**4**

7.1   Do you 'aim' to become a top manager in your career life?
      ☐ Yes ☐ No
7.2   What is your long-range career plan? (Select the most appropriate response and <u>only one</u>)
      ☐ Remain in academic career
      ☐ Employment in non-academic career (*please specify*) ……...…
      ☐ Self employed (*please specify*) ………..
      ☐ Homemaker, retired, or not employed
7.3   Why do you plan not to remain in your academic career? [Select all that apply]
      ☐ Lack of career opportunity in promotion
      ☐ Marriage/family obligations
      ☐ Health reasons
      ☐ Other (*please specify*) ………………………….
	Bourdieu, 1990; Iellatchitch, Mayrhofer, & Meyer, 2003; Kidd & Green, 2006				

What addition items would you recommend including? ……………………………………………………………………………… What addition items would you recommend deleting? ……………………………………………………………………………… Other comments: ………………………………………………………………………………					

Appendix 1.4 Semi-structured questions for interviews and the academic sources

Question	Probes	Source
1. Do you have a clear understanding of the criteria for tenure and promotion in your career field? 2. Is this the case for all candidates for promotion or does this vary by person? (That is, is the same standard applied evenly, or does it vary?)	Is the same standard for promotion applied evenly in your academic organisation, or does it vary?	Bourdieu, 1990; Fox & Colatrella, 2006
3. Do you think that personal factors such as gender, seniority, educational background, family background, social participation, work performance or anything else - impact on advancement in your career? 4. If yes, in what ways do you think those factors impact on advancement in academic careers? 5. Which of them influences your own work? 6. In your career field, what is needed to advance to a higher position?	What needs to be done to advance to higher positions in academic careers?	Bourdieu, 1986, 1990; Fox & Colatrella, 2006; Ozbilgin & Healy, 2004
7. Do you think that male or female workers are still underrepresented in your organisation? Why? 8. Do you have experience of gender discrimination in the career advancement you mentioned above?	Perceptions of gender discrimination in academic careers and experience within the organisation.	Bourdieu, 1990; Fox & Colatrella, 2006

Appendix 1.5 Information Sheet

Title of research: The Relations between Gender Difference and Advancement in Thai
Academic Careers

Researcher: Miss Boonnanida Sodha
A postgraduate research student at Norwich Business School,
University of East Anglia (UEA), United Kingdom

I am a postgraduate research student at the Norwich Business School of the University of East
Anglia (UEA). This study aims to explore the gender and career advancement in academic
careers in Thailand. I would like to invite you to take part in this research study. Before you
decide to participate you need to understand why this study is being done and how it would
involve you. Please take your time to read and consider the following information carefully. If
there is anything not clear or you would like more information please ask me (researcher). Please
take your time to decide whether you wish to take part.

What is the purpose of the study?

This study aims to explore the gender and career advancement in academic careers in Thailand.
The results of this study would be expected to increase the understanding of gender, which might
then influence personnel to advance in this career field. The expected main contribution of this
work is to offer useful information relevant to gender equality issues in academic careers.

Why have I been invited? Do I have to take part?

You have been invited to participate in this study because you have experience working in
academic careers in a related field. It is up to you to decide if you wish to take part. If you agree
to participate in this study, you are free to withdraw from the study at any point without giving a
reason.

What are the possible benefits of taking part?

I cannot promise any direct benefit to you from taking part in this study. The information I get from you will provide findings, which can provide a deeper understanding of gender and career advancement in academic careers in Thailand. This would support executives and policy-makers in order to organise possible policies to encourage career advancement amongst personnel in this sector in the future.

What are the possible disadvantages and risks of taking part?

There will not be any obvious risk to you in taking part this study. However, you may have some anxiety when you are asked to recall your working experiences. If any sensitive issue is brought up, you can stop at any time. If you wish to terminate the participation, you may do so. You can withdraw from the study at any point without giving any reason. If you withdraw from the study, I will destroy all of your personal information.

Will my taking part in the study be kept confidential?

All the personal information collected will be kept in a secure place to protect the confidence of participants. Information such as your name will be marked and coded. Only the code will be used as an identifier in the thesis or any related publications. Therefore, your anonymity is maintained throughout the work. Your supervisor and your colleagues will not be told your information from taking part in this study.

Contact details

If you have concerns about any aspect of this study, you should ask me to answer your questions. Please contact:

Miss Boonnanida Sodha

Mobile phone in Thailand: 0066-(0)1 933 0787

E-mail address: boonnanida@yahoo.com

           b.sodha@uea.ac.uk

Appendix 1.6 Consent form

Title of research: The Relations between Gender Difference and Advancement in Thai Academic Careers

Researcher: Miss Boonnanida Sodha

A postgraduate research student at Norwich Business School, University of East Anglia (UEA), United Kingdom

Please initial box

1. I confirm that I have read and understand the information sheet, and have received the information from Miss Boonnanida Sodha (researcher) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	
2. I understand that my participation is voluntary and I am free to withdraw at any time without giving any reason.	
3. I understand that my name will be coded by a number; therefore, my name will not appear anywhere.	
4. I have read and understand the above information and agree to sign this consent form voluntarily.	

_____   _____   _____
Name of participant   Date   Signature

_____   _____   _____
Name of researcher   Date   Signature

When complete, 1 copy for participant, 1 copy for researcher.

APPENDIX 2 QUANTITATIVE STATISTICS FOR QUESTIONNAIRE DATA – ACADEMIC SCIENCE (UV)

Appendix 2.1 Univariate normality statistics for female questionnaire data – Academic science (UV)

Variables	N	Minimum	Maximum	Mean	Std. Deviation	Skewness			Kurtosis		
						Statistic	Std. Error	Z-skewness	Statistic	Std. Error	Z-kurrtosis
ln(wage)	73	5.59	7.28	6.30	0.36	0.58	0.28	2.06	0.07	0.56	0.13
Age	73	28	58	40.14	7.92	0.74	0.28	2.63	- 0.13	0.56	- 0.23
Years in org	73	1	31	11.56	7.90	0.78	0.28	2.79	0.11	0.56	0.19
Level of shared care in family	73	1	5	3.88	1.00	- 0.43	0.28	- 1.54	- 0.53	0.56	- 0.96
Number of publication	73	0	7	2.36	2.02	0.74	0.28	2.63	- 0.77	0.56	- 1.39
Formal network	73	1	5	3.34	0.82	0.21	0.28	0.76	0.42	0.56	0.76
Informal network	73	1	5	2.96	1.01	0.34	0.28	1.20	- 0.41	0.56	- 0.75

Appendix 2.2 Univariate normality statistics for male questionnaire data – Academic science (UV)

Variables	N	Minimum	Maximum	Mean	Std. Deviation	Skewness			Kurtosis		
						Statistic	Std. Error	Z-skewness	Statistic	Std. Error	Z-kurtosis
ln(wage)	51	5.87	7.39	6.41	0.41	1.06	0.33	3.18	0.18	0.66	0.27
Age	51	27	60	41.71	10.05	0.48	0.33	1.43	- 1.09	0.66	- 1.66
Years in org	51	1	36	14.00	10.56	0.62	0.33	1.85	- 0.87	0.66	- 1.33
Level of shared care in family	51	2	5	3.65	1.05	- 0.19	0.33	- 0.58	- 1.14	0.66	- 1.74
Number of publication	51	0	14	3.75	3.23	1.34	0.33	4.03	1.73	0.66	2.64
Formal network	51	1	5	3.12	0.86	0.15	0.33	0.46	0.08	0.66	0.12
Informal network	51	1	5	2.76	0.93	0.65	0.33	1.96	0.29	0.66	0.45

Appendix 2.3 Pearson correlations for female questionnaire data – Academic science (UV)

	ln(wage)	GradeA	GradeB	GradeC	Age	Years in org	Oversea phd	Domestic phd	Subject area	Publication (1-3)	Publication (>3)	Formal network	Informal network	Married with child	Married without child	Family shared care	Career break
ln(wage)	1.00	0.40	0.51	0.19	0.69	0.63	0.70	-0.16	-0.23	0.04	-0.01	-0.23	-0.23	0.07	-0.04	-0.07	-0.14
GradeA	0.40	1.00	-0.07	-0.15	0.44	0.44	0.24	-0.11	-0.18	0.05	-0.00	-0.09	-0.13	-0.08	0.10	0.03	-0.09
GradeB	0.51	-0.07	1.00	-0.24	0.56	0.56	0.64	0.17	-0.09	0.02	0.06	-0.08	-0.13	0.14	-0.10	0.09	-0.14
GradeC	0.19	-0.15	-0.24	1.00	0.20	0.16	0.01	0.08	0.15	0.27	0.21	0.02	0.03	0.13	0.12	0.03	0.30
Age	0.69	0.44	0.56	0.20	1.00	0.88	0.59	-0.26	-0.36	-0.04	0.02	0.16	0.18	0.11	0.04	0.05	-0.00
Years in org	0.63	0.44	0.56	0.16	0.88	1.00	0.52	-0.33	-0.35	-0.06	0.07	-0.09	-0.11	0.19	0.02	0.09	0.03
Oversea phd	0.70	0.24	0.64	0.01	0.59	0.52	1.00	-0.26	-0.03	0.05	0.06	-0.09	-0.11	0.09	-0.04	-0.01	-0.13
Domestic phd	-0.16	-0.11	0.17	0.08	-0.26	-0.33	-0.26	1.00	0.04	-0.01	0.13	0.01	0.08	0.01	0.24	0.10	0.04
Subject area	-0.23	-0.18	-0.09	-0.15	-0.36	-0.35	-0.03	0.04	1.00	-0.11	-0.04	0.08	0.05	-0.10	-0.08	0.26	-0.16
Publication (1-3)	0.04	0.05	0.02	-0.27	-0.04	-0.06	-0.05	-0.01	-0.11	1.00	-0.79	-0.06	-0.07	0.04	0.09	-0.22	-0.12
Publication (>3)	-0.01	-0.00	0.06	0.21	0.02	0.07	0.06	0.13	-0.04	-0.79	1.00	0.09	-0.03	0.04	0.12	0.35	0.07
Formal network	-0.23	-0.09	-0.08	0.02	0.16	-0.09	-0.09	0.01	0.08	-0.06	0.09	1.00	0.42	0.17	-0.04	0.24	-0.14
Informal network	-0.23	-0.13	-0.13	-0.03	0.18	0.11	0.11	0.08	0.05	0.07	-0.03	0.42	1.00	-0.02	0.02	0.17	-0.02
Married with child	0.07	-0.08	0.14	0.13	0.11	0.19	0.09	-0.01	-0.10	0.04	-0.04	0.17	-0.02	1.00	-0.35	0.25	0.88
Married without child	-0.04	0.10	-0.10	0.12	0.04	0.02	-0.04	-0.24	0.08	-0.09	0.12	0.04	-0.02	-0.35	1.00	-0.06	-0.09
Family shared care	-0.07	0.03	0.09	0.03	0.05	0.09	-0.01	0.10	0.26	-0.22	0.35	0.24	0.17	0.25	-0.06	1.00	0.35
Career break	-0.14	-0.09	-0.14	0.30	-0.00	0.03	-0.13	0.04	-0.16	-0.12	0.07	-0.14	-0.02	0.88	-0.09	0.35	1.00

Appendix 2.4 Pearson correlations for male questionnaire data – Academic science (UV)

	ln(wage)	GradeA	GradeB	GradeC	Age	Years in org	Oversea phd	Domestic phd	Subject area	Publication (1-3)	Publication (>3)	Formal network	Informal network	Married with child	Married without child	Family shared care	Career break
ln(wage)	1.00	0.79	0.26	0.05	0.84	0.83	0.46	0.08	-0.11	-0.20	0.21	0.13	0.03	0.46	-0.06	-0.07	0.55
GradeA	0.79	1.00	-0.17	-0.20	0.60	0.65	0.38	0.10	-0.18	-0.10	0.12	-0.05	0.10	0.22	0.05	0.03	0.25
GradeB	0.26	-0.17	1.00	-0.21	0.33	0.28	0.21	-0.13	-0.01	-0.14	0.16	0.19	-0.18	0.17	0.11	-0.16	0.28
GradeC	0.05	-0.20	-0.21	1.00	0.20	0.14	-0.19	0.22	0.09	-0.11	0.03	0.11	-0.03	0.20	0.04	0.12	0.35
Age	0.84	0.60	0.33	0.20	1.00	0.91	0.42	0.11	-0.08	-0.07	0.03	0.16	0.08	0.41	0.01	-0.15	0.59
Years in org	0.83	0.65	0.28	0.14	0.91	1.00	0.34	0.02	-0.03	-0.08	0.03	0.21	0.12	0.38	-0.04	-0.09	0.52
Oversea phd	0.46	0.38	0.21	-0.19	0.42	0.34	1.00	-0.23	-0.02	-0.26	0.29	0.03	-0.06	0.06	0.12	0.00	0.24
Domestic phd	0.08	0.10	-0.13	0.22	0.11	0.02	-0.23	1.00	0.01	-0.10	0.04	0.13	0.00	-0.04	0.18	0.04	0.12
Subject area	-0.11	-0.18	-0.01	0.09	-0.08	-0.03	-0.02	0.01	1.00	-0.06	0.02	-0.14	0.05	-0.01	-0.01	-0.19	-0.10
Publication (1-3)	-0.20	-0.10	-0.14	-0.11	-0.07	-0.08	-0.26	-0.10	-0.06	1.00	0.96	-0.12	0.26	-0.22	0.01	-0.02	-0.28
Publication (>3)	0.21	0.12	0.16	0.03	0.03	0.03	0.29	-0.04	0.02	0.96	1.00	0.17	-0.22	0.25	-0.08	0.08	0.24
Formal network	0.13	-0.05	0.19	0.11	0.16	0.21	0.03	0.13	0.14	0.12	0.17	1.00	0.18	0.15	-0.08	0.02	0.26
Informal network	0.03	0.10	-0.18	-0.03	0.08	0.12	-0.06	0.00	0.05	0.26	-0.22	0.18	1.00	-0.10	0.19	0.12	-0.06
Married with child	0.46	0.22	0.17	0.20	0.41	0.38	0.06	-0.04	-0.01	0.22	0.25	0.15	-0.10	1.00	-0.38	-0.01	0.81
Married without child	-0.06	0.05	-0.11	-0.04	0.01	-0.04	0.12	0.18	-0.01	0.01	-0.08	-0.08	0.19	-0.38	1.00	-0.08	0.13
Family shared care	-0.07	0.03	-0.16	0.12	0.15	0.09	0.00	0.04	0.19	-0.02	0.08	0.02	0.12	-0.01	-0.08	1.00	0.16
Career break	0.55	0.25	0.28	0.35	0.59	0.52	0.24	0.12	-0.10	-0.28	0.24	0.26	-0.06	0.81	0.13	0.16	1.00

Appendix 2.5 Pearson correlations for questionnaire data – Academic science (UV)

	ln(wage)	GradeA	GradeB	GradeC	Age	Years in org	Oversea phd	Domestic phd	Subject area	Publication (1-3)	Publication (>3)	Formal network	Informal network	Married with child	Married without child	Family shared care	Career break
ln(wage)	1.00	0.62	0.40	0.11	0.77	0.73	0.59	-0.10	-0.17	-0.08	0.12	-0.09	-0.13	0.29	0.08	-0.08	0.25
GradeA	0.62	1.00	-0.11	-0.19	0.53	0.57	0.34	-0.04	-0.15	-0.05	0.10	0.09	-0.02	0.14	0.03	0.01	0.18
GradeB	0.40	-0.11	1.00	-0.23	0.44	0.41	0.43	-0.16	-0.04	-0.07	0.12	0.04	-0.16	0.17	0.12	-0.04	0.11
GradeC	0.11	-0.19	-0.23	1.00	0.18	0.12	-0.11	0.03	0.08	-0.19	0.10	0.05	-0.01	0.12	0.10	-0.01	0.22
Age	0.77	0.53	0.44	0.18	1.00	0.90	0.51	-0.13	-0.22	-0.06	0.05	-0.02	-0.07	0.29	0.00	-0.05	0.33
Years in org	0.73	0.57	0.41	0.12	0.90	1.00	0.44	-0.20	-0.18	-0.08	0.08	0.04	-0.02	0.31	-0.03	-0.01	0.33
Oversea phd	0.59	0.34	0.43	-0.11	0.51	0.44	1.00	-0.27	-0.00	-0.12	0.21	-0.06	-0.11	0.12	-0.02	-0.02	0.14
Domestic phd	-0.10	-0.04	-0.16	0.03	-0.13	-0.20	-0.27	1.00	0.01	-0.02	0.03	0.02	0.04	-0.05	0.08	0.07	-0.05
Subject area	-0.17	-0.15	-0.04	-0.08	-0.22	-0.18	-0.00	0.01	1.00	-0.10	-0.01	0.02	-0.02	-0.04	0.03	-0.07	-0.08
Publication (1-3)	-0.08	-0.05	-0.07	-0.19	-0.06	-0.08	-0.12	-0.02	-0.10	1.00	0.86	-0.06	0.16	-0.11	-0.02	-0.12	-0.23
Publication (>3)	0.12	0.10	0.12	0.10	0.05	0.08	0.21	0.03	0.01	0.86	1.00	0.09	-0.12	0.15	-0.01	0.20	0.23
Formal network	-0.09	-0.09	0.04	0.05	-0.02	0.04	0.06	0.02	0.02	-0.06	0.09	1.00	0.33	-0.04	0.02	-0.12	-0.00
Informal network	-0.13	-0.02	-0.16	-0.01	-0.07	-0.02	-0.11	0.04	-0.02	0.16	-0.12	0.33	1.00	-0.08	0.07	-0.04	-0.07
Married with child	0.29	0.14	0.17	0.12	0.29	0.31	0.12	-0.05	-0.04	-0.11	0.15	-0.04	-0.08	1.00	-0.38	0.09	0.86
Married without child	-0.08	0.03	0.12	0.10	0.00	-0.03	-0.02	-0.08	0.03	-0.02	-0.01	0.02	0.07	-0.38	1.00	-0.04	-0.08
Family shared care	-0.08	0.01	-0.04	-0.01	-0.05	-0.01	-0.02	0.07	-0.07	-0.12	0.20	-0.12	-0.04	0.09	-0.04	1.00	0.05
Career break	0.25	0.18	0.11	0.22	0.33	0.33	0.14	-0.05	-0.08	-0.23	0.23	-0.00	-0.07	0.86	-0.08	0.05	1.00

Appendix 2.6 Casewise Diagnostics for female wage regression – Academic science (UV)

Case Number	Std. Residual		ln(wage)	Predicted Value	Residual	
1		0.38	7.20	7.12		0.08
2		0.67	7.28	7.14		0.14
16	-	1.83	5.81	6.18	-	0.37
17	-	1.04	6.50	6.72	-	0.21
18	-	0.39	6.74	6.82	-	0.08
19		0.07	6.74	6.72		0.01
20	-	0.11	6.79	6.81	-	0.02
21	-	0.60	6.79	6.91	-	0.12
22		0.53	6.99	6.88		0.11
23		0.15	6.99	6.96		0.03
24		0.35	7.01	6.94		0.07
75	-	2.20	5.81	6.26	-	0.45
76	-	0.55	6.10	6.21	-	0.11
77	-	1.16	6.10	6.33	-	0.24
78	-	1.00	6.15	6.35	-	0.20
79	-	1.00	6.24	6.44	-	0.20
80	-	0.61	6.32	6.45	-	0.13
81	-	0.62	6.32	6.45	-	0.13
82	-	0.41	6.32	6.40	-	0.08
83		0.78	6.32	6.16		0.16
84		0.18	6.36	6.32		0.04
85		0.19	6.36	6.32		0.04
86		0.88	6.36	6.18		0.18
87		0.46	6.36	6.27		0.09
88		0.35	6.50	6.43		0.07
89		0.31	6.50	6.44		0.06
90		1.44	6.50	6.21		0.29
91		0.55	6.50	6.39		0.11
92	-	0.39	6.50	6.58	-	0.08
93		0.77	6.60	6.44		0.16
94	-	0.86	6.63	6.80	-	0.18
95		1.94	6.76	6.37		0.40
96		0.19	6.79	6.75		0.04
97		2.39	6.79	6.30		0.49
98		0.23	6.79	6.74		0.05
220	-	1.85	5.59	5.96	-	0.38
221	-	1.63	5.67	6.00	-	0.33
222	-	0.71	5.74	5.89	-	0.14

223	-	1.04	5.81	6.02	-	0.21
224	-	1.26	5.81	6.07	-	0.26
225	-	0.67	5.81	5.95	-	0.14
226	-	0.99	5.87	6.08	-	0.20
227	-	0.78	5.87	6.03	-	0.16
228	-	0.94	5.93	6.13	-	0.19
229	-	0.21	5.93	5.98	-	0.04
230	-	0.25	5.99	6.04	-	0.05
231	-	0.68	6.05	6.19	-	0.14
232		0.15	6.05	6.02		0.03
233		0.38	6.10	6.02		0.08
234		0.31	6.10	6.03		0.06
235	-	0.21	6.10	6.14	-	0.04
236	-	0.04	6.10	6.11	-	0.01
237		0.09	6.10	6.08		0.02
238		0.84	6.10	5.93		0.17
239	-	0.50	6.10	6.20	-	0.10
240	-	0.04	6.10	6.10	-	0.01
241		0.39	6.10	6.02		0.08
242		0.43	6.10	6.01		0.09
243	-	0.55	6.15	6.26	-	0.11
244		1.06	6.15	5.93		0.22
245	-	0.12	6.15	6.17	-	0.03
246		0.41	6.15	6.06		0.08
247	-	0.60	6.15	6.27	-	0.12
248		0.18	6.15	6.11		0.04
249		0.50	6.15	6.04		0.10
250		0.32	6.24	6.17		0.06
251		1.22	6.32	6.07		0.25
252		0.21	6.32	6.28		0.04
253		1.48	6.32	6.02		0.30
254		1.33	6.32	6.05		0.27
255		1.42	6.32	6.03		0.29
256		0.82	6.32	6.15		0.17
257		1.56	6.50	6.18		0.32

Appendix 2.7 Casewise Diagnostics for male wage regression – Academic science (UV)

Case Number	Std. Residual		ln(wage)	Predicted Value	Residual	
8		0.24	7.28	7.25		0.03
9		1.19	7.38	7.23		0.15
10		0.84	7.39	7.28		0.11
43	-	1.05	6.50	6.63	-	0.13
44	-	0.76	6.50	6.60	-	0.10
45	-	1.03	6.54	6.67	-	0.13
46	-	0.14	6.57	6.58	-	0.02
47	-	0.30	6.57	6.60	-	0.04
48	-	0.86	7.01	7.12	-	0.11
49	-	0.61	7.01	7.09	-	0.08
50	-	0.64	7.11	7.19	-	0.08
51	-	0.15	7.28	7.30	-	0.02
149	-	1.79	6.24	6.46	-	0.23
150	-	0.86	6.36	6.47	-	0.11
151	-	0.75	6.36	6.45	-	0.10
152	-	0.07	6.40	6.41	-	0.01
153		0.18	6.50	6.48		0.02
154	-	0.00	6.36	6.36	-	0.00
155		0.20	6.50	6.48		0.03
156		1.87	6.57	6.33		0.24
157		0.01	6.60	6.60		0.00
158		1.21	6.63	6.47		0.15
159	-	0.79	6.66	6.76	-	0.10
160		0.96	6.79	6.67		0.12
161		3.10	7.11	6.72		0.39
328	-	1.38	5.87	6.05	-	0.18
329	-	1.12	5.93	6.08	-	0.14
330	-	1.13	5.93	6.08	-	0.14
331	-	0.24	6.05	6.08	-	0.03
332		0.09	6.05	6.03		0.01
333		0.10	6.10	6.08		0.01
334		0.36	6.10	6.05		0.05
335		0.08	6.10	6.09		0.01
336	-	0.42	6.10	6.15	-	0.05
337		0.32	6.10	6.06		0.04
338		0.72	6.10	6.01		0.09
339		0.58	6.10	6.02		0.07
340	-	0.73	6.10	6.19	-	0.09

341		0.40	6.10	6.05		0.05
342		0.22	6.10	6.07		0.03
343	-	0.13	6.10	6.11	-	0.02
344	-	0.04	6.10	6.10	-	0.01
345		0.24	6.15	6.12		0.03
346		0.59	6.15	6.07		0.07
347		0.05	6.15	6.14		0.01
348	-	0.68	6.15	6.23	-	0.09
349		0.71	6.15	6.06		0.09
350		0.72	6.19	6.10		0.09
351		0.37	6.19	6.15		0.05
352	-	0.06	6.19	6.20	-	0.01
353		0.40	6.24	6.19		0.05

Appendix 2.8 Model fitting for female wage regression – Academic science (UV)

Appendix 2.8A Histogram of female wage regression standardized residuals – Academic science (UV)
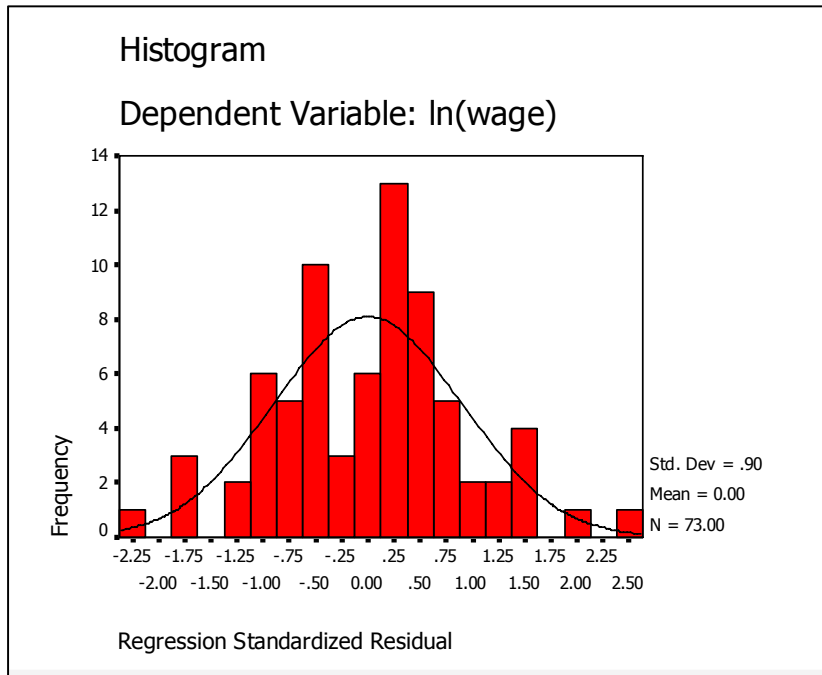
Appendix 2.8B Normal probability plot of female wage regression standardized residuals – Academic science (UV)
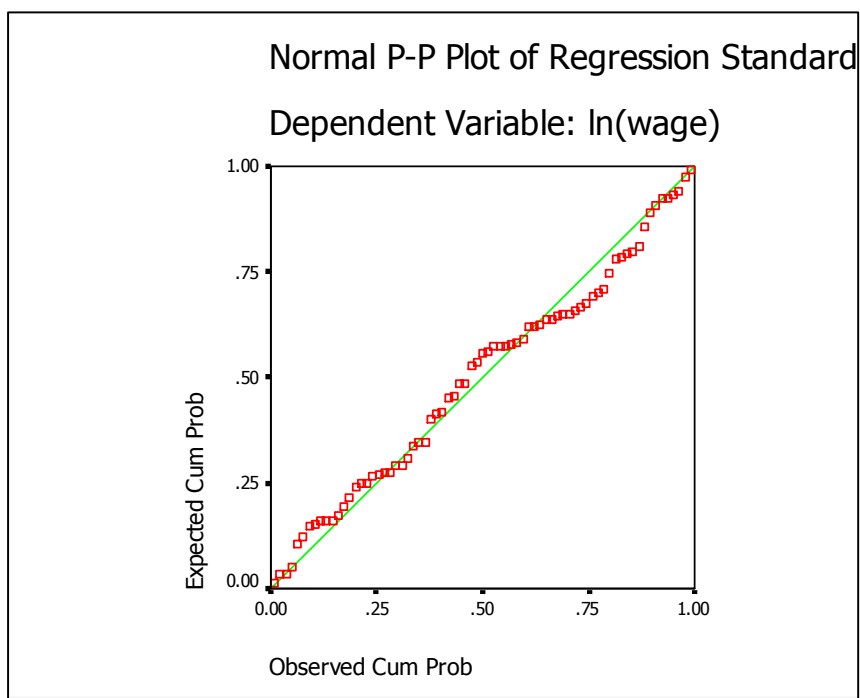
Appendix 2.8C Standardized predicted values and standardized residuals of female wage regression – Academic science (UV)

Scatterplot

Dependent Variable: ln(wage)
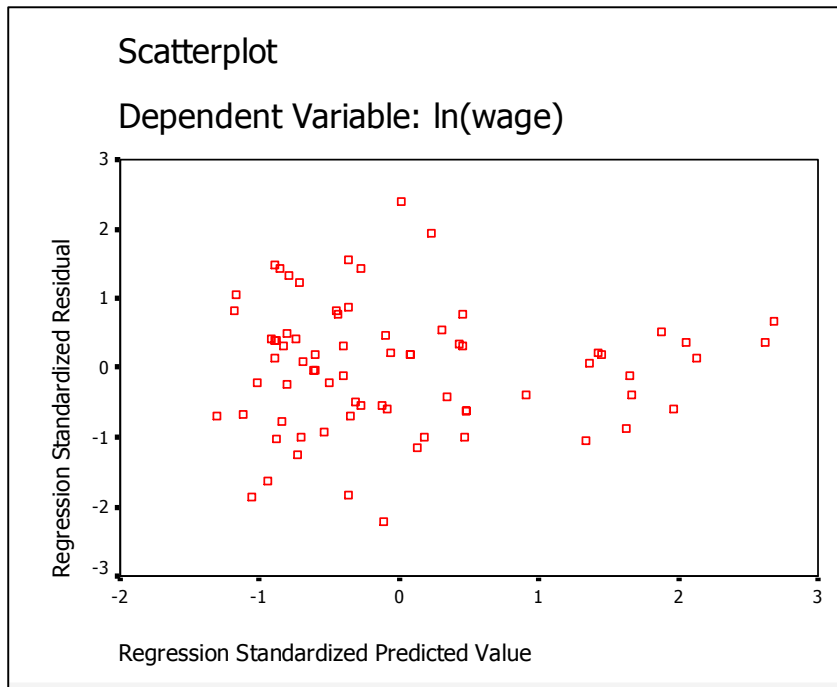
Appendix 2.9 Model fitting for male wage regression – Academic science (UV)

Appendix 2.9A Histogram of male wage regression standardized residuals – Academic science (UV)
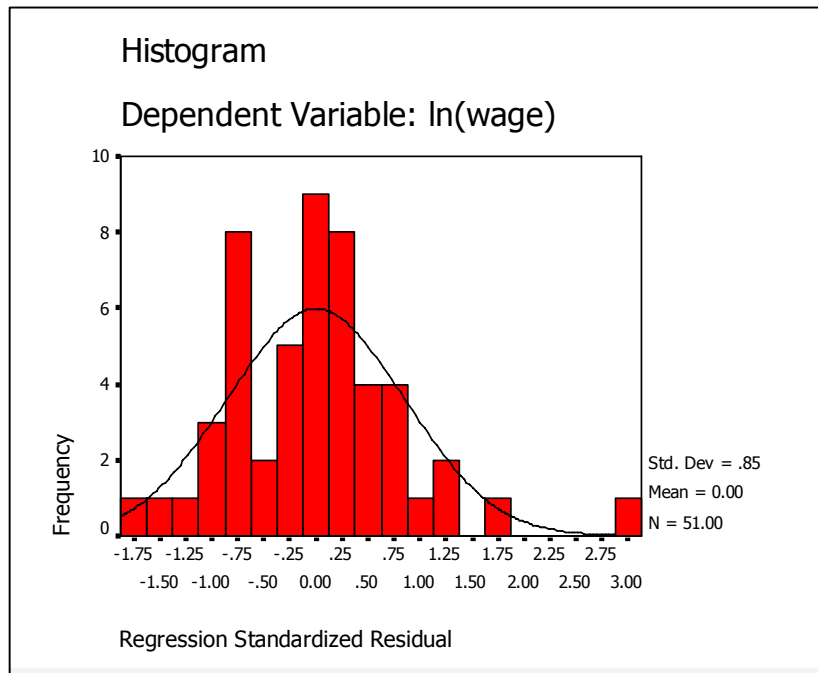
Appendix 2.9B Normal probability plot of male wage regression standardized residuals – Academic science (UV)
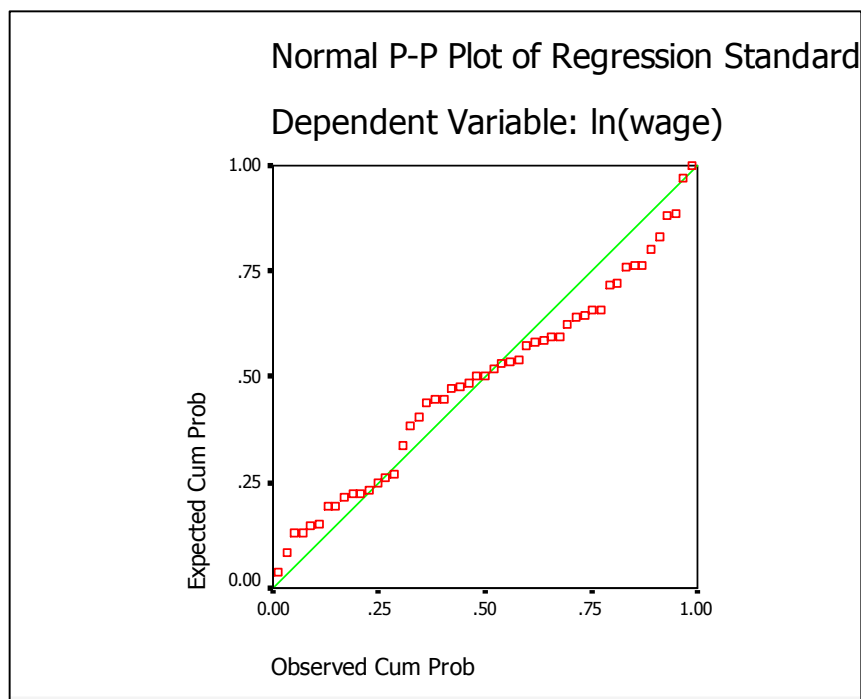
Appendix 2.9C Standardized predicted values and standardized residuals of male wage regression – Academic science (UV)

Scatterplot

Dependent Variable: ln(wage)
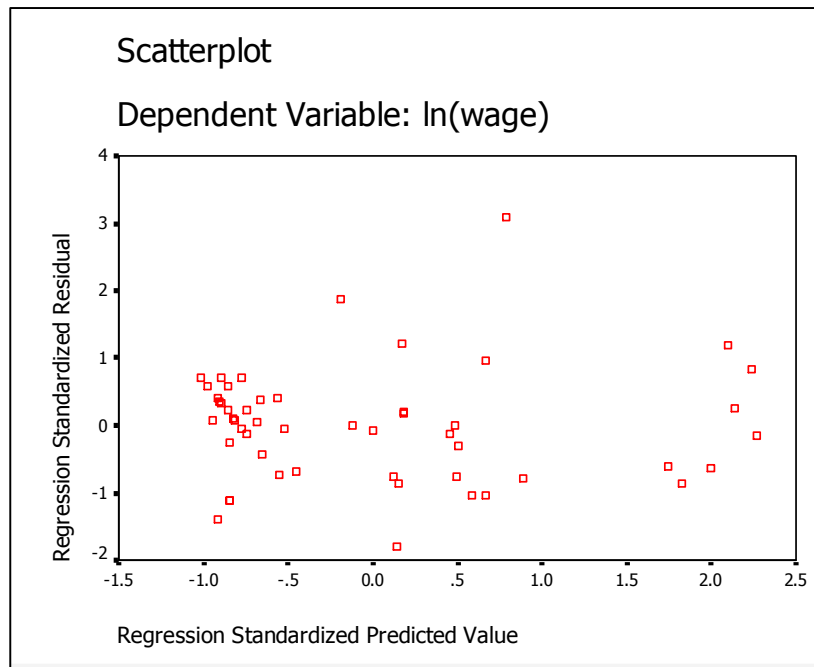
Appendix 2.10 The association between gender of the UV respondents and the perception towards gender difference in academic career advancement

Appendix 2.10A T-test analysis, the association between gender of the UV respondents and the perception towards gender difference in academic career advancement

Results of mean value

	female	N	Mean	Std. Deviation	Std. Error Mean
The perception of gender equality	female	73	2.3151	.94099	.11013
	male	51	2.3333	.88694	.12420

Results of t-test analysis on gender and the perception towards gender difference in academic career advancement

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
The perception of gender equality	Equal variances assumed	.262	.609	-.109	122	.913	-.0183	.16776	-.35036	.31383
	Equal variances not assumed			-.110	111.622	.913	-.0183	.16600	-.34718	.31065

Appendix 2.10B One-way ANOVA, the association between the number of publication of the UV respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (UV)

Levene Statistic	df1	df2	Sig.
7.463	2	70	.001

Results of ANOVA testing on publication and the perception of gender equality – female academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.738	2	.869	.981	.380
Within Groups	62.015	70	.886		
Total	63.753	72			

Results of tests of homogeneity of variances –male academics (UV)

Levene Statistic	df1	df2	Sig.
1.197	1	48	.279

Results of ANOVA testing on publication and the perception of gender equality – male academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.496	2	.248	.306	.737
Within Groups	38.837	48	.809		
Total	39.333	50			

Appendix 2.10C One-way ANOVA, the association between the educational degree of the UV respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (UV)

Levene Statistic	df1	df2	Sig.
1.751	2	70	.181

Results of ANOVA testing on education and the perception of gender equality – female academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.653	2	.326	.362	.698
Within Groups	63.101	70	.901		
Total	63.753	72			

Results of tests of homogeneity of variances –male academics (UV)

Levene Statistic	df1	df2	Sig.
3.557	2	48	.036

Results of ANOVA testing on education and the perception of gender equality – male academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.843	2	1.921	2.598	.085
Within Groups	35.491	48	.739		
Total	39.333	50			

Appendix 2.10D One-way ANOVA, the association between age of the UV respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (UV)

Levene Statistic	df1	df2	Sig.
.280	3	69	.840

Results of ANOVA testing on age and the perception of gender equality – female academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.830	3	2.610	3.221	.028
Within Groups	55.923	69	.810		
Total	63.753	72			

Results of tests of homogeneity of variances –male academics (UV)

Levene Statistic	df1	df2	Sig.
.826	3	47	.486

Results of ANOVA testing on age and the perception of gender equality – male academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.487	3	1.162	1.524	.221
Within Groups	35.846	47	.763		
Total	39.333	50			

Appendix 2.10E One-way ANOVA, the association between grade position of the UV respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (UV)

Levene Statistic	df1	df2	Sig.
.418	3	69	.740

Results of ANOVA testing on grade position and the perception of gender equality – female academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.222	3	1.074	1.224	.308
Within Groups	60.532	69	.877		
Total	63.753	72			

Results of tests of homogeneity of variances –male academics (UV)

Levene Statistic	df1	df2	Sig.
.211	3	47	.888

Results of ANOVA testing on grade position and the perception of gender equality – male academics (UV)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.159	3	.386	.475	.701
Within Groups	38.175	47	.812		
Total	39.333	50			

APPENDIX 3 QUANTITATIVE STATISTICS FOR QUESTIONNAIRE DATA – RESEARCH SCIENCE (RI)

Appendix 3.1 Univariate normality statistics for female questionnaire data – Research science (RI)

Variables	N	Minimum	Maximum	Mean	Std. Deviation	Skewness			Kurtosis		
						Statistic	Std. Error	Z-skewness	Statistic	Std. Error	Z-kurtosis
ln(wage)	143	5.99	7.39	6.55	0.32	0.37	0.20	1.83	- 0.51	0.40	- 1.26
Age	143	27	56	37.33	7.32	0.60	0.20	2.97	- 0.42	0.40	- 1.05
Years in org	143	1	28	10.43	6.51	0.45	0.20	2.23	- 0.46	0.40	- 1.15
Level of shared care in family	143	2	5	3.94	0.96	- 0.46	0.20	- 2.25	- 0.82	0.40	- 2.04
Number of publication	143	0	11	2.63	2.57	1.13	0.20	5.57	1.14	0.40	2.83
Formal network	143	1	5	3.09	0.77	0.22	0.20	1.09	0.05	0.40	0.13
Informal network	143	1	5	2.86	0.98	0.60	0.20	2.97	- 0.32	0.40	- 0.80

**Appendix 3.2 Univariate normality statistics for male questionnaire data –
Research science (RI)**

Variables	N	Minimum	Maximum	Mean	Std. Deviation	Skewness			Kurtosis		
						Statistic	Std. Error	Z-skewness	Statistic	Std. Error	Z-kurtosis
ln(wage)	153	5.81	7.54	6.64	0.39	0.31	0.20	1.60	- 0.84	0.39	- 2.15
Age	153	24	59	39.79	8.90	0.49	0.20	2.48	- 0.70	0.39	- 1.79
Years in org	153	1	28	11.44	7.64	0.58	0.20	2.96	- 0.68	0.39	- 1.74
Level of shared care in family	153	1	5	3.69	1.07	- 0.22	0.20	- 1.11	- 0.94	0.39	- 2.41
Number of publication	153	0	11	2.81	2.70	0.99	0.20	5.07	0.46	0.39	1.18
Formal network	153	1	5	3.02	0.91	0.54	0.20	2.74	- 0.33	0.39	- 0.86
Informal network	153	1	5	2.90	0.96	0.64	0.20	3.20	- 0.23	0.39	- 0.60

Appendix 3.3 Pearson correlations for female questionnaire data – Research science (RI)

	ln(wage)	GradeA	GradeB	GradeC	Age	Years in org	Oversea phd	Domestic phd	Subject area	Publication (1-3)	Publication (>3)	Formal network	Informal network	Married with child	Married without child	Family shared care	Career break
ln(wage)	1.00	0.38	0.58	0.21	0.62	0.54	0.62	0.10	0.07	-0.05	0.23	0.20	0.03	0.06	0.19	0.11	0.09
GradeA	0.38	1.00	-0.08	-0.15	0.36	0.32	0.16	-0.04	0.10	0.03	0.05	0.11	0.03	0.08	-0.00	0.05	0.07
GradeB	0.58	-0.08	1.00	-0.27	0.40	0.38	0.47	0.07	-0.10	-0.02	0.15	0.18	0.10	-0.12	0.23	0.05	-0.02
GradeC	0.21	-0.15	-0.27	1.00	0.21	0.15	0.04	0.14	0.05	-0.14	0.17	0.05	-0.13	0.22	-0.11	0.08	0.18
Age	0.62	0.36	0.40	0.21	1.00	0.84	0.25	0.07	0.01	-0.12	0.22	0.16	-0.02	0.14	0.08	0.09	0.18
Years in org	0.54	0.32	0.38	0.15	0.84	1.00	0.19	0.11	0.09	-0.16	0.23	0.14	-0.02	0.09	0.11	0.07	0.14
Oversea phd	0.62	0.16	0.47	0.04	0.25	0.19	1.00	-0.08	0.00	-0.00	0.12	0.15	0.03	0.04	0.00	-0.02	0.06
Domestic phd	0.10	-0.04	0.07	0.14	0.07	0.11	-0.08	1.00	0.03	-0.06	0.13	-0.02	-0.02	-0.08	0.03	0.01	-0.09
Subject area	0.07	0.10	-0.10	0.05	0.01	0.09	0.00	0.03	1.00	-0.07	0.07	0.03	-0.06	-0.04	0.05	-0.09	-0.08
Publication (1-3)	-0.05	0.03	-0.02	-0.14	-0.12	-0.16	-0.00	-0.06	-0.07	1.00	0.69	0.04	0.12	-0.01	0.18	0.06	-0.02
Publication (>3)	0.23	0.05	0.15	0.17	0.22	0.23	0.12	0.13	0.07	0.69	1.00	0.21	-0.09	0.04	0.17	0.02	0.07
Formal network	0.20	0.11	0.18	0.05	0.16	0.14	0.15	-0.02	0.03	0.04	0.21	1.00	0.15	-0.01	0.07	0.11	0.05
Informal network	0.03	0.03	0.10	-0.13	-0.02	-0.02	0.03	-0.02	-0.06	0.12	-0.09	0.15	1.00	-0.03	-0.01	-0.01	-0.02
Married with child	0.06	0.08	-0.12	0.22	0.14	0.09	0.04	-0.08	-0.04	-0.01	0.04	-0.01	0.03	1.00	-0.22	0.18	0.93
Married without child	0.19	-0.00	0.23	-0.11	0.08	0.11	0.00	0.03	0.05	-0.18	0.17	0.07	-0.01	-0.22	1.00	0.15	-0.09
Family shared care	0.11	0.05	0.05	0.08	0.09	0.07	-0.02	0.01	-0.09	0.06	0.02	0.11	-0.01	0.18	0.15	1.00	0.20
Career break	0.09	0.07	-0.02	0.18	0.18	0.14	0.06	-0.09	-0.08	-0.02	0.07	0.05	-0.02	0.93	-0.09	0.20	1.00

Appendix 3.4 Pearson correlations for male questionnaire data – Research science (RI)

	ln(wage)	GradeA	GradeB	GradeC	Age	Years in org	Oversea phd	Domestic phd	Subject area	Publication (1-3)	Publication (>3)	Formal network	Informal network	Married with child	Married without child	Family shared care	Career break
ln(wage)	1.00	0.52	0.50	0.05	0.65	0.49	0.38	0.28	-0.02	-0.03	0.26	0.17	0.01	0.26	0.20	0.21	0.38
GradeA	0.52	1.00	-0.11	-0.20	0.48	0.37	0.32	-0.03	-0.06	0.08	0.01	0.08	0.08	0.17	0.14	0.15	0.27
GradeB	0.50	-0.11	1.00	-0.30	0.27	0.24	0.12	0.30	-0.04	-0.08	0.20	0.05	-0.03	-0.04	0.26	0.05	0.12
GradeC	0.05	-0.20	-0.30	1.00	0.14	0.09	0.05	0.10	0.02	-0.08	0.10	0.10	0.02	0.17	-0.14	0.09	0.14
Age	0.65	0.48	0.27	0.14	1.00	0.80	0.33	0.11	0.00	-0.02	0.12	0.04	0.03	0.32	0.17	0.21	0.46
Years in org	0.49	0.37	0.24	0.09	0.80	1.00	0.22	0.11	-0.05	0.06	0.02	0.02	0.08	0.22	0.18	0.23	0.36
Oversea phd	0.38	0.32	0.12	0.05	0.33	0.22	1.00	-0.21	-0.14	0.01	0.16	0.09	0.08	0.07	0.09	0.03	0.13
Domestic phd	0.28	-0.03	0.30	0.10	0.11	0.11	-0.21	1.00	0.05	-0.11	0.23	0.10	-0.00	-0.10	0.07	-0.02	-0.03
Subject area	-0.02	-0.06	-0.04	0.02	0.00	-0.05	-0.14	0.05	1.00	-0.05	0.04	-0.03	0.02	-0.05	-0.14	-0.03	0.00
Publication (1-3)	-0.03	0.08	-0.08	-0.08	-0.02	0.06	0.01	-0.11	-0.05	1.00	-0.74	-0.03	0.09	-0.01	0.04	0.10	-0.02
Publication (>3)	0.26	0.01	0.20	0.10	0.12	0.02	0.16	0.23	0.04	-0.74	1.00	0.15	0.12	0.05	0.04	-0.02	0.05
Formal network	0.17	0.08	0.05	0.10	0.04	0.02	0.09	0.10	-0.03	-0.03	0.15	1.00	0.30	0.12	0.00	0.11	0.13
Informal network	0.01	0.08	-0.03	0.02	0.03	0.08	0.08	-0.00	0.02	-0.09	0.12	0.30	1.00	-0.02	-0.02	-0.05	-0.03
Married with child	0.26	0.17	-0.04	0.17	0.32	0.22	0.07	-0.10	0.05	-0.01	0.05	0.12	-0.02	1.00	-0.34	0.23	0.76
Married without child	0.20	0.14	0.26	-0.14	0.17	0.18	0.09	0.07	-0.14	0.04	0.04	0.00	-0.02	-0.34	1.00	0.16	0.03
Family shared care	0.21	0.15	0.05	0.09	0.21	0.23	0.03	-0.02	-0.03	0.10	-0.02	0.11	-0.05	0.23	0.16	1.00	0.24
Career break	0.38	0.27	0.12	0.14	0.46	0.36	0.13	-0.03	0.00	-0.02	0.05	0.13	-0.03	0.76	0.03	0.24	1.00

Appendix 3.5 Pearson correlations for questionnaire data – Research science (RI)

	ln(wage)	GradeA	GradeB	GradeC	Age	Years in org	Oversea phd	Domestic phd	Subject area	Publication (1-3)	Publication (>3)	Formal network	Informal network	Married with child	Married without child	Family shared care	Career break
ln(wage)	1.00	0.47	0.53	0.12	0.64	0.52	0.48	0.24	0.05	-0.04	0.25	0.17	0.02	0.19	0.21	0.15	0.28
GradeA	0.47	1.00	-0.10	-0.18	0.44	0.35	0.26	-0.02	0.03	0.05	0.03	0.09	0.06	0.14	0.09	0.10	0.20
GradeB	0.53	-0.10	1.00	-0.28	0.32	0.30	0.28	0.22	-0.05	-0.05	0.18	0.11	0.03	-0.07	0.25	0.04	0.06
GradeC	0.12	-0.18	-0.28	1.00	0.17	0.12	0.05	0.11	0.03	-0.11	0.14	0.08	-0.05	0.19	-0.13	0.09	0.15
Age	0.64	0.44	0.32	0.17	1.00	0.82	0.30	0.12	0.05	-0.06	0.17	0.08	0.01	0.26	0.14	0.14	0.37
Years in org	0.52	0.35	0.30	0.12	0.82	1.00	0.21	0.12	0.04	-0.04	0.11	0.07	0.04	0.17	0.16	0.15	0.28
Oversea phd	0.48	0.26	0.28	0.05	0.30	0.21	1.00	-0.15	-0.05	-0.00	0.14	0.11	0.06	0.06	0.06	0.00	0.11
Domestic phd	0.24	-0.02	0.22	0.11	0.12	0.12	-0.15	1.00	0.09	-0.09	0.19	0.06	-0.00	0.07	0.07	-0.03	-0.01
Subject area	0.05	0.03	-0.05	0.03	0.05	0.04	-0.05	0.09	1.00	-0.06	0.07	-0.02	-0.01	-0.04	-0.02	-0.09	-0.02
Publication (1-3)	-0.04	0.05	-0.05	-0.11	-0.06	-0.04	-0.00	0.09	0.06	1.00	-0.72	0.00	0.02	-0.01	-0.06	-0.08	-0.02
Publication (>3)	0.25	0.03	0.18	0.14	0.17	0.11	0.14	0.19	0.07	-0.72	1.00	0.17	0.02	0.05	0.10	-0.01	0.07
Formal network	0.17	0.09	0.11	0.08	0.08	0.07	0.11	0.06	-0.02	0.00	0.17	1.00	0.23	0.06	0.03	0.11	0.09
Informal network	0.02	0.06	0.03	-0.05	0.01	0.04	0.06	-0.00	-0.01	0.02	0.02	0.23	1.00	-0.02	-0.01	-0.03	-0.02
Married with child	0.19	0.14	-0.07	0.19	0.26	0.17	0.06	-0.07	0.04	-0.01	0.05	0.06	-0.02	1.00	-0.28	0.20	0.83
Married without child	0.21	0.09	0.25	-0.13	0.14	0.16	0.06	0.07	-0.02	-0.06	0.10	0.03	-0.01	-0.28	1.00	0.14	-0.01
Family shared care	0.15	0.10	0.04	0.09	0.14	0.15	0.00	-0.03	-0.09	0.08	-0.01	0.11	-0.03	0.20	0.14	1.00	0.20
Career break	0.28	0.20	0.06	0.15	0.37	0.28	0.11	-0.01	0.02	-0.02	0.07	0.09	-0.02	0.83	-0.01	0.20	1.00

Appendix 3.6 Casewise Diagnostics for female wage regression – Research science (RI)

Case Number	Std. Residual		ln(wage)	Predicted Value	Residual	
3		1.37	7.20	6.98		0.21
4		1.18	7.20	7.01		0.18
5		0.48	7.29	7.22		0.08
6		0.73	7.35	7.24		0.11
7		0.72	7.39	7.28		0.11
25	-	0.90	6.91	7.05	-	0.14
26	-	0.78	6.91	7.03	-	0.12
27	-	0.26	6.93	6.97	-	0.04
28	-	1.14	6.95	7.13	-	0.18
29		0.36	6.97	6.92		0.06
30	-	0.29	6.99	7.04	-	0.05
31	-	0.27	7.01	7.06	-	0.04
32		0.45	7.01	6.94		0.07
33	-	0.84	7.01	7.14	-	0.13
34	-	0.94	7.01	7.16	-	0.15
35		0.34	7.01	6.96		0.05
36	-	0.42	7.03	7.10	-	0.07
37	-	0.18	7.07	7.10	-	0.03
38	-	0.09	7.09	7.10	-	0.01
39	-	0.17	7.09	7.12	-	0.03
40		0.31	7.09	7.04		0.05
41		0.39	7.09	7.03		0.06
42	-	0.07	7.16	7.17	-	0.01
99	-	1.61	6.32	6.57	-	0.25
100	-	1.33	6.36	6.57	-	0.21
101	-	0.82	6.43	6.56	-	0.13
102	-	0.73	6.47	6.58	-	0.11
103	-	0.49	6.50	6.58	-	0.08
104	-	0.69	6.50	6.61	-	0.11
105	-	0.39	6.50	6.56	-	0.06
106	-	0.28	6.50	6.55	-	0.04
107	-	0.43	6.50	6.57	-	0.07
108	-	0.55	6.50	6.59	-	0.09
109	-	0.43	6.50	6.57	-	0.07
110	-	0.65	6.50	6.60	-	0.10
111	-	1.81	6.50	6.79	-	0.28
112	-	0.78	6.50	6.62	-	0.12
113	-	0.43	6.50	6.57	-	0.07

114	-	0.61	6.50	6.60	-	0.10
115	-	0.38	6.50	6.56	-	0.06
116	-	0.32	6.50	6.55	-	0.05
117	-	0.81	6.50	6.63	-	0.13
118	-	0.38	6.54	6.59	-	0.06
119	-	0.10	6.57	6.58	-	0.02
120	-	0.67	6.57	6.67	-	0.10
121	-	0.79	6.63	6.75	-	0.12
122		0.13	6.63	6.61		0.02
123	-	0.46	6.63	6.70	-	0.07
124		0.20	6.66	6.63		0.03
125		0.81	6.66	6.53		0.13
126	-	0.08	6.66	6.67	-	0.01
127		0.58	6.66	6.57		0.09
128	-	1.37	6.66	6.87	-	0.21
129	-	0.01	6.68	6.69	-	0.00
130		1.30	6.74	6.54		0.20
131		0.55	6.76	6.68		0.09
132		0.53	6.76	6.68		0.08
133		1.76	6.79	6.51		0.28
134	-	0.18	6.79	6.82	-	0.03
135	-	0.31	6.79	6.84	-	0.05
136		0.89	6.79	6.65		0.14
137		1.34	6.81	6.61		0.21
138		1.71	6.81	6.55		0.27
139		1.25	6.81	6.62		0.20
140		1.71	6.81	6.55		0.27
141		1.86	6.81	6.52		0.29
142		0.21	6.81	6.78		0.03
143		0.44	6.81	6.75		0.07
144		0.56	6.81	6.73		0.09
145		0.39	6.86	6.80		0.06
146		0.34	6.86	6.81		0.05
147		0.39	6.91	6.85		0.06
148		0.92	6.91	6.76		0.14
258	-	1.43	5.99	6.21	-	0.22
259	-	1.84	5.99	6.28	-	0.29
260	-	1.98	5.99	6.30	-	0.31
261	-	1.75	5.99	6.26	-	0.27
262	-	1.27	6.05	6.24	-	0.20
263	-	1.14	6.05	6.22	-	0.18

264	-	1.47	6.10	6.33	-	0.23
265	-	0.82	6.10	6.23	-	0.13
266	-	1.23	6.10	6.29	-	0.19
267	-	0.91	6.10	6.24	-	0.14
268	-	1.72	6.10	6.37	-	0.27
269	-	0.92	6.10	6.24	-	0.14
270	-	1.20	6.10	6.28	-	0.19
271	-	0.85	6.10	6.23	-	0.13
272	-	1.04	6.10	6.26	-	0.16
273	-	1.11	6.10	6.27	-	0.17
274	-	1.33	6.15	6.35	-	0.21
275	-	0.63	6.19	6.29	-	0.10
276	-	0.85	6.19	6.32	-	0.13
277	-	0.70	6.19	6.30	-	0.11
278	-	0.82	6.19	6.32	-	0.13
279	-	0.39	6.19	6.25	-	0.06
280	-	0.94	6.24	6.38	-	0.15
281	-	0.14	6.24	6.26	-	0.02
282	-	0.70	6.24	6.35	-	0.11
283		0.07	6.28	6.27		0.01
284	-	0.04	6.28	6.29	-	0.01
285	-	0.76	6.32	6.44	-	0.12
286		0.14	6.32	6.30		0.02
287	-	0.08	6.32	6.33	-	0.01
288		0.07	6.32	6.31		0.01
289	-	0.82	6.32	6.45	-	0.13
290		0.15	6.32	6.30		0.02
291		0.21	6.32	6.29		0.03
292		0.48	6.32	6.25		0.07
293		0.36	6.32	6.26		0.06
294		0.24	6.32	6.28		0.04
295		0.20	6.32	6.29		0.03
296		0.24	6.32	6.28		0.04
297		0.30	6.32	6.27		0.05
298	-	0.06	6.32	6.33	-	0.01
299		0.32	6.32	6.27		0.05
300		0.23	6.32	6.28		0.04
301	-	0.36	6.32	6.38	-	0.06
302	-	0.21	6.32	6.35	-	0.03
303	-	0.10	6.32	6.34	-	0.02
304	-	0.07	6.32	6.33	-	0.01

305	0.05	6.32	6.31	0.01
306	0.64	6.36	6.26	0.10
307	0.57	6.36	6.27	0.09
308	0.42	6.40	6.33	0.07
309	0.41	6.40	6.33	0.06
310	0.20	6.40	6.37	0.03
311	0.92	6.43	6.29	0.14
312	0.92	6.47	6.32	0.14
313	0.82	6.50	6.37	0.13
314	1.25	6.50	6.31	0.20
315	1.08	6.50	6.33	0.17
316	1.09	6.50	6.33	0.17
317	1.65	6.54	6.28	0.26
318	0.69	6.54	6.43	0.11
319	1.86	6.66	6.37	0.29
320	1.61	6.66	6.40	0.25
321	2.35	6.66	6.29	0.37
322	2.27	6.66	6.30	0.36
323	0.18	6.66	6.63	0.03
324	2.21	6.66	6.31	0.35
325	0.98	6.66	6.50	0.15
326	2.27	6.68	6.33	0.36
327	2.22	6.68	6.34	0.35

Appendix 3.7 Casewise Diagnostics for male wage regression – Research science (RI)

Case Number	Std. Residual		ln(wage)	Predicted Value	Residual	
11	-	0.42	7.28	7.36	-	0.08
12	-	0.55	7.34	7.44	-	0.11
13		0.84	7.42	7.25		0.17
14		0.41	7.42	7.34		0.08
15		0.53	7.54	7.44		0.10
52	-	1.77	6.76	7.11	-	0.35
53	-	0.74	6.86	7.01	-	0.15
54	-	0.89	6.91	7.08	-	0.17
55		0.33	7.09	7.03		0.06
56		0.15	7.09	7.06		0.03
57	-	0.19	7.09	7.13	-	0.04
58		0.01	7.09	7.09		0.00
59		0.07	7.11	7.10		0.01
60	-	0.24	7.11	7.16	-	0.05
61		0.01	7.11	7.11		0.00
62		0.30	7.13	7.07		0.06
63		0.27	7.16	7.11		0.05
64		0.31	7.16	7.10		0.06
65		0.04	7.20	7.19		0.01
66		0.14	7.20	7.17		0.03
67		0.45	7.20	7.11		0.09
68		0.23	7.20	7.15		0.05
69	-	0.21	7.31	7.35	-	0.04
70		0.05	7.31	7.30		0.01
71	-	0.28	7.32	7.38	-	0.05
72	-	0.39	7.34	7.41	-	0.08
73	-	0.11	7.35	7.37	-	0.02
74		0.11	7.42	7.40		0.02
162	-	2.18	6.10	6.52	-	0.43
163	-	2.61	6.19	6.70	-	0.51
164	-	0.85	6.32	6.49	-	0.17
165	-	1.18	6.32	6.55	-	0.23
166	-	1.30	6.36	6.61	-	0.25
167	-	0.90	6.40	6.57	-	0.18
168	-	1.05	6.40	6.60	-	0.21
169	-	1.28	6.40	6.65	-	0.25
170	-	1.13	6.43	6.66	-	0.22
171	-	0.68	6.43	6.57	-	0.13

172	-	1.12	6.50	6.72	-	0.22
173	-	0.51	6.50	6.60	-	0.10
174	-	0.09	6.50	6.52	-	0.02
175	-	0.63	6.50	6.63	-	0.12
176	-	1.12	6.50	6.72	-	0.22
177	-	0.25	6.54	6.58	-	0.05
178	-	1.02	6.54	6.73	-	0.20
179	-	0.22	6.54	6.58	-	0.04
180		0.23	6.57	6.52		0.04
181	-	0.73	6.57	6.71	-	0.14
182	-	0.01	6.57	6.57	-	0.00
183	-	0.89	6.60	6.77	-	0.17
184		0.07	6.66	6.64		0.01
185	-	0.10	6.66	6.68	-	0.02
186		0.23	6.66	6.61		0.05
187	-	0.36	6.66	6.73	-	0.07
188		0.30	6.66	6.60		0.06
189		0.16	6.74	6.71		0.03
190		0.04	6.74	6.73		0.01
191	-	0.11	6.76	6.79	-	0.02
192		0.90	6.76	6.59		0.18
193		0.17	6.79	6.76		0.03
194		0.31	6.79	6.73		0.06
195		0.46	6.79	6.70		0.09
196		1.14	6.79	6.57		0.22
197		0.90	6.81	6.64		0.18
198		0.53	6.81	6.71		0.10
199		0.77	6.81	6.66		0.15
200	-	0.09	6.81	6.83	-	0.02
201		1.23	6.81	6.57		0.24
202		0.34	6.81	6.75		0.07
203		0.75	6.81	6.67		0.15
204		0.94	6.86	6.68		0.18
205		1.02	6.86	6.66		0.20
206		0.16	6.86	6.83		0.03
207		1.38	6.91	6.64		0.27
208		0.68	6.91	6.77		0.13
209		0.83	6.91	6.75		0.16
210		1.04	6.91	6.70		0.20
211		0.49	6.91	6.81		0.10
212		1.81	7.01	6.66		0.35

213		1.72	7.09	6.75		0.34
214		1.83	7.11	6.75		0.36
215		0.06	7.14	7.13		0.01
216		0.20	7.21	7.17		0.04
217		0.97	7.23	7.04		0.19
218	-	0.01	7.23	7.23	-	0.00
219		0.31	7.24	7.18		0.06
354	-	2.53	5.81	6.30	-	0.50
355	-	2.28	5.99	6.44	-	0.45
356	-	2.02	6.05	6.44	-	0.40
357	-	1.67	6.05	6.37	-	0.33
358	-	0.45	6.10	6.19	-	0.09
359	-	1.53	6.10	6.40	-	0.30
360	-	0.70	6.10	6.23	-	0.14
361	-	0.72	6.10	6.24	-	0.14
362	-	1.30	6.10	6.35	-	0.26
363	-	0.09	6.10	6.12	-	0.02
364	-	0.44	6.10	6.18	-	0.09
365	-	1.16	6.10	6.32	-	0.23
366	-	1.00	6.10	6.29	-	0.20
367	-	1.82	6.10	6.45	-	0.36
368	-	0.71	6.10	6.24	-	0.14
369	-	1.32	6.10	6.36	-	0.26
370	-	1.11	6.10	6.31	-	0.22
371	-	0.57	6.19	6.30	-	0.11
372	-	1.11	6.19	6.41	-	0.22
373	-	0.71	6.24	6.38	-	0.14
374	-	0.30	6.24	6.30	-	0.06
375	-	0.55	6.24	6.34	-	0.11
376	-	0.56	6.24	6.35	-	0.11
377	-	0.30	6.28	6.34	-	0.06
378	-	1.05	6.28	6.49	-	0.21
379	-	0.17	6.32	6.35	-	0.03
380		0.51	6.32	6.22		0.10
381		0.25	6.32	6.27		0.05
382	-	0.26	6.32	6.37	-	0.05
383	-	0.33	6.32	6.39	-	0.07
384		0.19	6.32	6.28		0.04
385		0.65	6.32	6.19		0.13
386		0.08	6.32	6.30		0.02
387		0.13	6.32	6.30		0.02

388	-	0.16	6.32	6.35	-	0.03
389		0.72	6.32	6.18		0.14
390		0.45	6.32	6.23		0.09
391		0.48	6.36	6.27		0.09
392		0.02	6.36	6.35		0.00
393		0.80	6.36	6.20		0.16
394		0.22	6.36	6.32		0.04
395		0.20	6.40	6.36		0.04
396		0.24	6.40	6.35		0.05
397		0.29	6.40	6.34		0.06
398	-	0.11	6.40	6.42	-	0.02
399	-	0.42	6.40	6.48	-	0.08
400	-	0.11	6.40	6.42	-	0.02
401	-	0.26	6.40	6.45	-	0.05
402	-	0.20	6.40	6.44	-	0.04
403		1.10	6.43	6.22		0.22
404	-	0.44	6.47	6.55	-	0.09
405		0.88	6.50	6.33		0.17
406		0.00	6.50	6.50		0.00
407		0.33	6.50	6.44		0.06
408		0.99	6.50	6.31		0.19
409		0.82	6.50	6.34		0.16
410		0.97	6.50	6.31		0.19
411		1.47	6.60	6.31		0.29
412		1.59	6.66	6.35		0.31
413		0.98	6.66	6.47		0.19
414		1.70	6.66	6.32		0.33
415		1.51	6.66	6.36		0.30
416		1.43	6.76	6.48		0.28
417		2.11	6.79	6.38		0.41
418		2.18	6.79	6.36		0.43
419		2.96	6.91	6.33		0.58
420		2.21	6.91	6.47		0.43

Appendix 3.8 Model fitting for female wage regression – Research science (RI)

Appendix 3.8A Histogram of female wage regression standardized residuals – Research science (RI)

Histogram

Dependent Variable: ln(wage)

Std. Dev = .95
Mean = 0.00
N = 143.00

Regression Standardized Residual
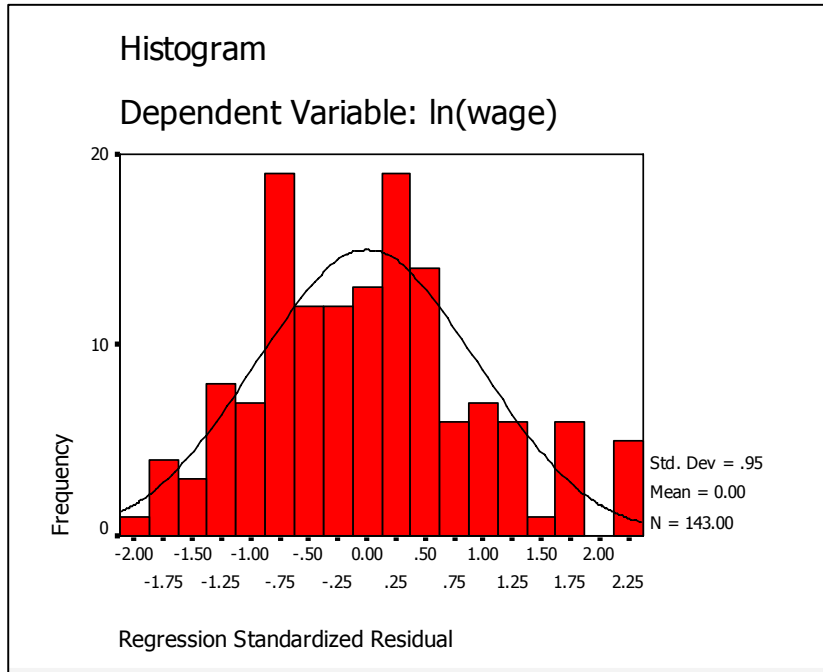
Appendix 3.8B Normal probability plot of female wage regression standardized residuals – Research science (RI)

Normal P-P Plot of Regression Standard

Dependent Variable: ln(wage)

Observed Cum Prob
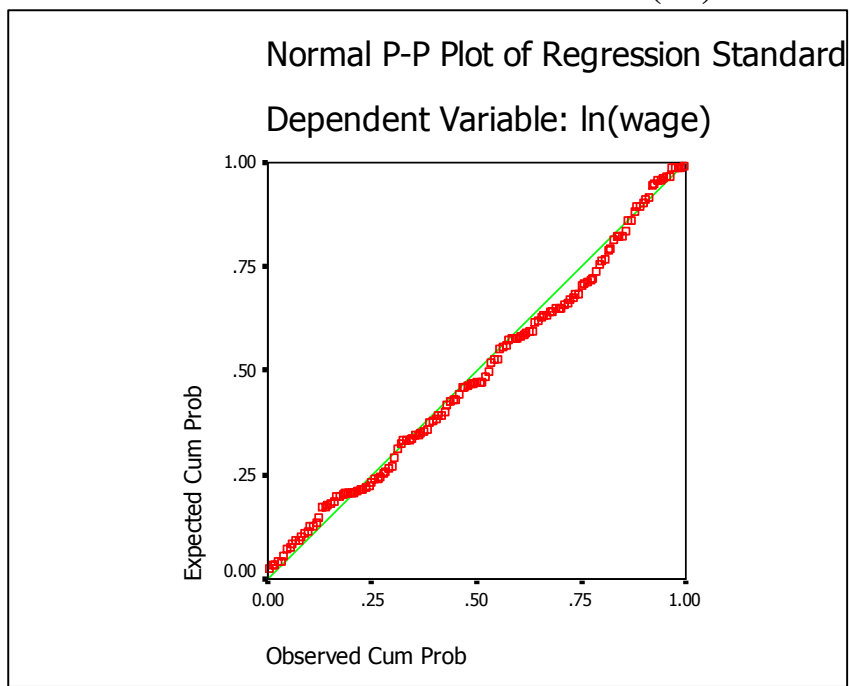
Appendix 3.8C Standardized predicted values and standardized residuals of female wage regression – Research science (RI)

Scatterplot

Dependent Variable: ln(wage)

Appendix 3.9 Model fitting for male wage regression – Research science (RI)
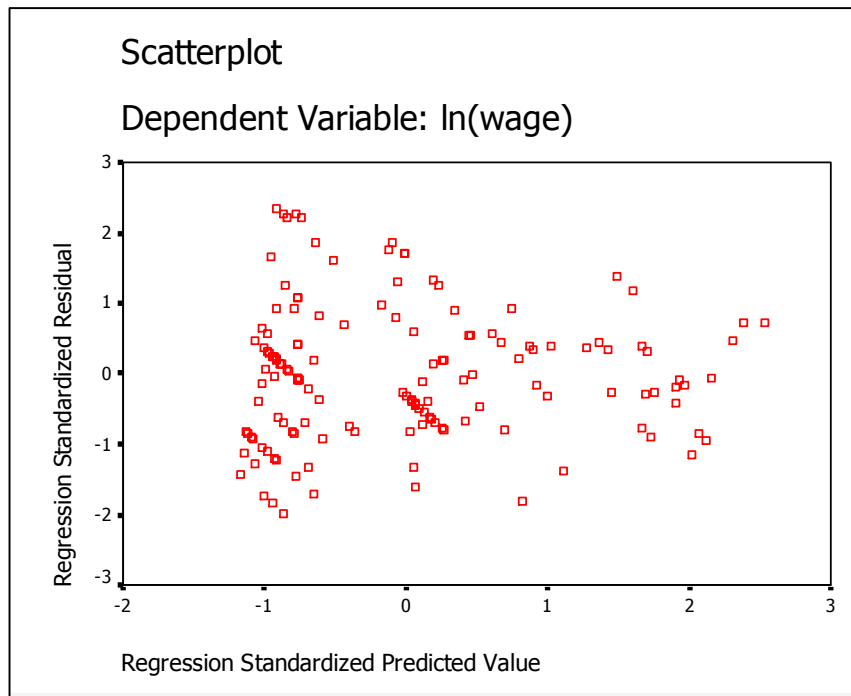
Appendix 3.9A Histogram of male wage regression standardized residuals – Research science (RI)

Appendix 3.9B Normal probability plot of male wage regression standardized residuals – Research science (RI)
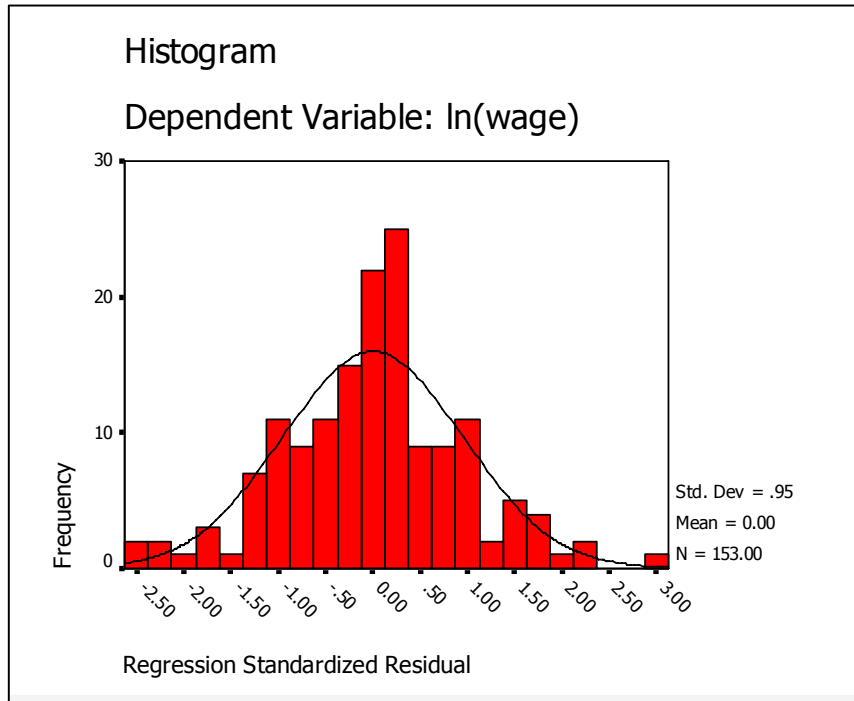
Appendix 3.9C Standardized predicted values and standardized residuals of male wage regression – Research science (RI)
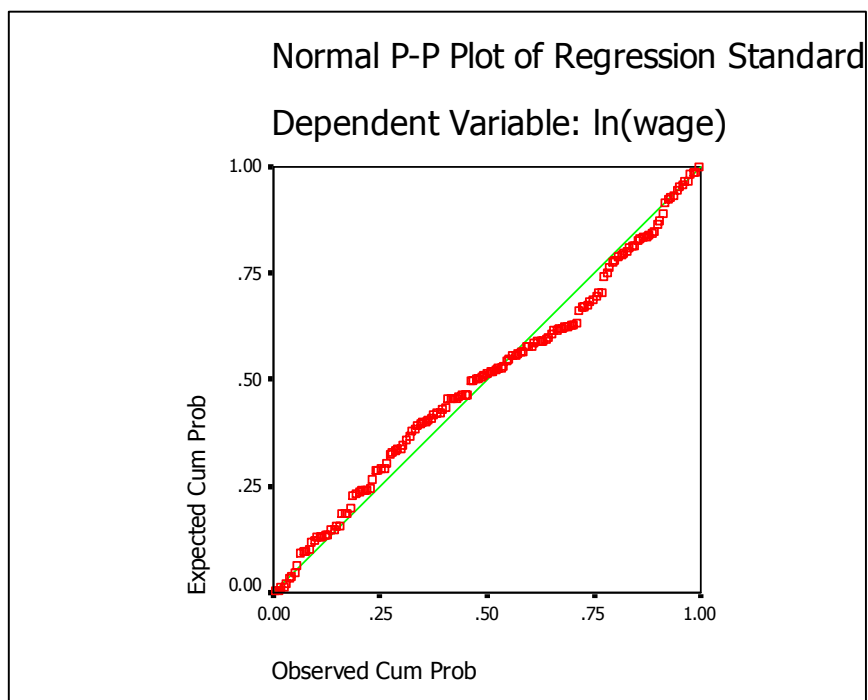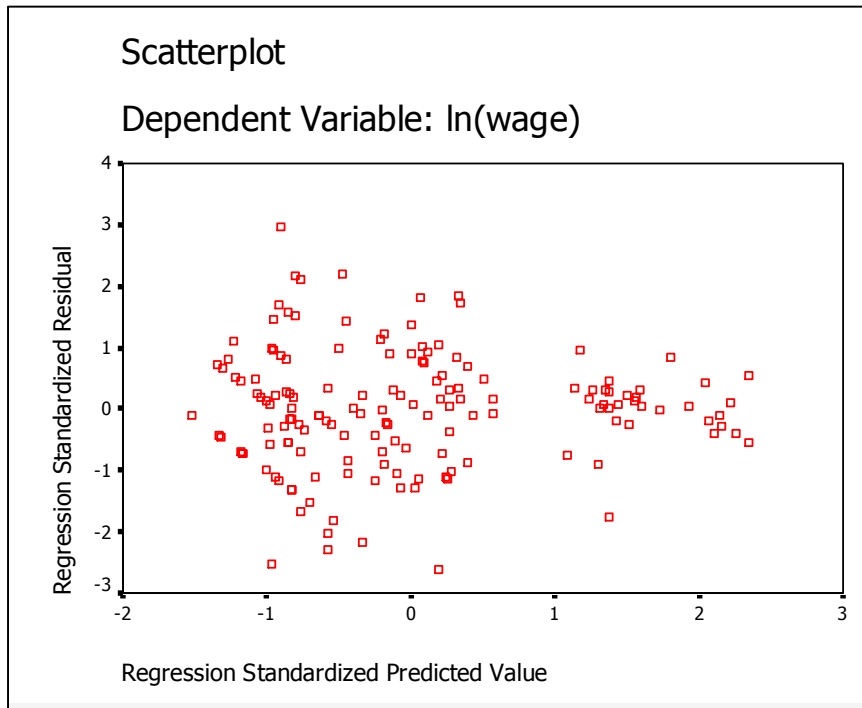

Scatterplot

Dependent Variable: ln(wage)

Appendix 3.10 The association between gender of the RI respondents and the perception towards gender difference in academic career advancement

Appendix 3.10A T-test analysis, the association between gender of the RI respondents and the perception towards gender difference in academic career advancement

Results of mean value

	female	N	Mean	Std. Deviation	Std. Error Mean
The perception of gender equality	female	143	2.0979	.79003	.06607
	male	153	2.0588	.87536	.07077

Results of t-test analysis on gender and the perception towards gender difference in academic career advancement

		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
The perception of gender equality	Equal variances assumed	2.948	.087	.402	294	.688	.0391	.09715	-.15212	.23028
	Equal variances not assumed			.404	293.647	.687	.0391	.09681	-.15146	.22962

Appendix 3.10B One-way ANOVA, the association between the number of publication of the RI respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (RI)

Levene Statistic	df1	df2	Sig.
2.382	2	140	.096

Results of ANOVA testing on publication and the perception of gender equality – female academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.077	2	.039	.061	.941
Within Groups	88.552	140	.633		
Total	88.629	142			

Results of tests of homogeneity of variances –male academics (RI)

Levene Statistic	df1	df2	Sig.
1.140	2	150	.323

Results of ANOVA testing on publication and the perception of gender equality – male academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.038	2	5.519	7.852	.001
Within Groups	105.433	150	.703		
Total	116.471	152			

Appendix 3.10C One-way ANOVA, the association between the educational degree of the RI respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (RI)

Levene Statistic	df1	df2	Sig.
3.066	2	140	.050

Results of ANOVA testing on education and the perception of gender equality – female academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.102	2	.051	.080	.923
Within Groups	88.528	140	.632		
Total	88.629	142			

Results of tests of homogeneity of variances –male academics (RI)

Levene Statistic	df1	df2	Sig.
.073	2	150	.929

Results of ANOVA testing on education and the perception of gender equality – male academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.307	2	1.154	1.516	.223
Within Groups	114.163	150	.761		
Total	116.471	152			

Appendix 3.10D One-way ANOVA, the association between age of the RI respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (RI)

Levene Statistic	df1	df2	Sig.
3.022	3	139	.032

Results of ANOVA testing on age and the perception of gender equality – female academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.985	3	.328	.521	.669
Within Groups	87.644	139	.631		
Total	88.629	142			

Results of tests of homogeneity of variances –male academics (RI)

Levene Statistic	df1	df2	Sig.
1.491	3	149	.219

Results of ANOVA testing on age and the perception of gender equality – male academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.988	3	.996	1.308	.274
Within Groups	113.483	149	.762		
Total	116.471	152			

Appendix 3.10E One-way ANOVA, the association between grade position of the RI respondents and their perception of gender equality

Results of tests of homogeneity of variances – female academics (RI)

Levene Statistic	df1	df2	Sig.
1.271	3	139	.287

Results of ANOVA testing on grade position and the perception of gender equality – female academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.836	3	.612	.980	.404
Within Groups	86.793	139	.624		
Total	88.629	142			

Results of tests of homogeneity of variances –male academics (RI)

Levene Statistic	df1	df2	Sig.
.678	3	149	.567

Results of ANOVA testing on grade position and the perception of gender equality – male academics (RI)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.644	3	.215	.276	.842
Within Groups	115.826	149	.777		
Total	116.471	152			